IT Sligo
An Institiúid Teicneolaíochta, Sligeach

2017 ENGINEERING EXPO

Abbott

IN ASSOCIATION WITH ABBOTT

Thursday May 4th, 2017
10.00am - 7.00pm

Knocknarea Arena
IT Sligo

INTERACTIVE - EXPLORE - FUTURE
- INDUSTRY - CAREERS - INNOVATION - TALKS

A Welcome From The President Of IT Sligo

On behalf of the Institute of Technology, Sligo, I am delighted to welcome you to the Engineering Expo 2017 at the Knocknarea Arena.

Engineering is the heartbeat of Irish Industry and it is central to the contribution that IT Sligo is making to the growth of the economy here in the North-West. Throughout its 47-year history, engineering has been an integral part of the Institute's education offering. We are deeply proud of that heritage and are fiercely ambitious to grow and develop the role that IT Sligo can play in the engineering sector, both educationally and as a collaborative partner with industry.

This special event is a collaboration between industry, educators and innovators, bringing together some of the best talent and expertise across Ireland. It is a public and interactive showcase of the very best of what the engineering sector has to offer, and also shines a light on future engineering technology trends. From cars to robotics to innovations in medical device technology, the breadth and reach of engineering touches almost every aspect of our lives.

Engineering is a creative enterprise, one that requires intense imagination and taps into our everyday curiosity about how the world works. You'll get a sense of that when you browse the truly diverse range of exhibits featuring some of Ireland's leading engineering companies alongside innovative projects developed by students and graduates from IT Sligo's School of Engineering & Design.

For students and jobseekers, the Engineering Expo provides a good insight into what a career in Engineering is really like.

You will also get to see the range of engineering programmes on offer by the Institute, provided on campus and online, which might stimulate you to continue your studies in Engineering.

As a qualified engineer myself, I am passionate about helping others to develop their engineering careers through education, which is why I fervently hope that this Engineering Expo at IT Sligo is a source of inspiration and motivation for the future generations of engineers.

Discover and enjoy.
Dr Brendan McCormack
President
IT Sligo.

A Welcome From The Head of School of Engineering & Design

Welcome to our 3rd Engineering Expo.

This year we are delighted to present an even bigger and more inspiring Expo than last year.

At the Engineering Expo you will see an extensive range of activities on show that include student projects, industry exhibits, guest speakers and a variety of workshops – all aimed to inspire future engineers, showcase our graduates, promote engineering in the Northwest and to open up engineering conversations and connections.

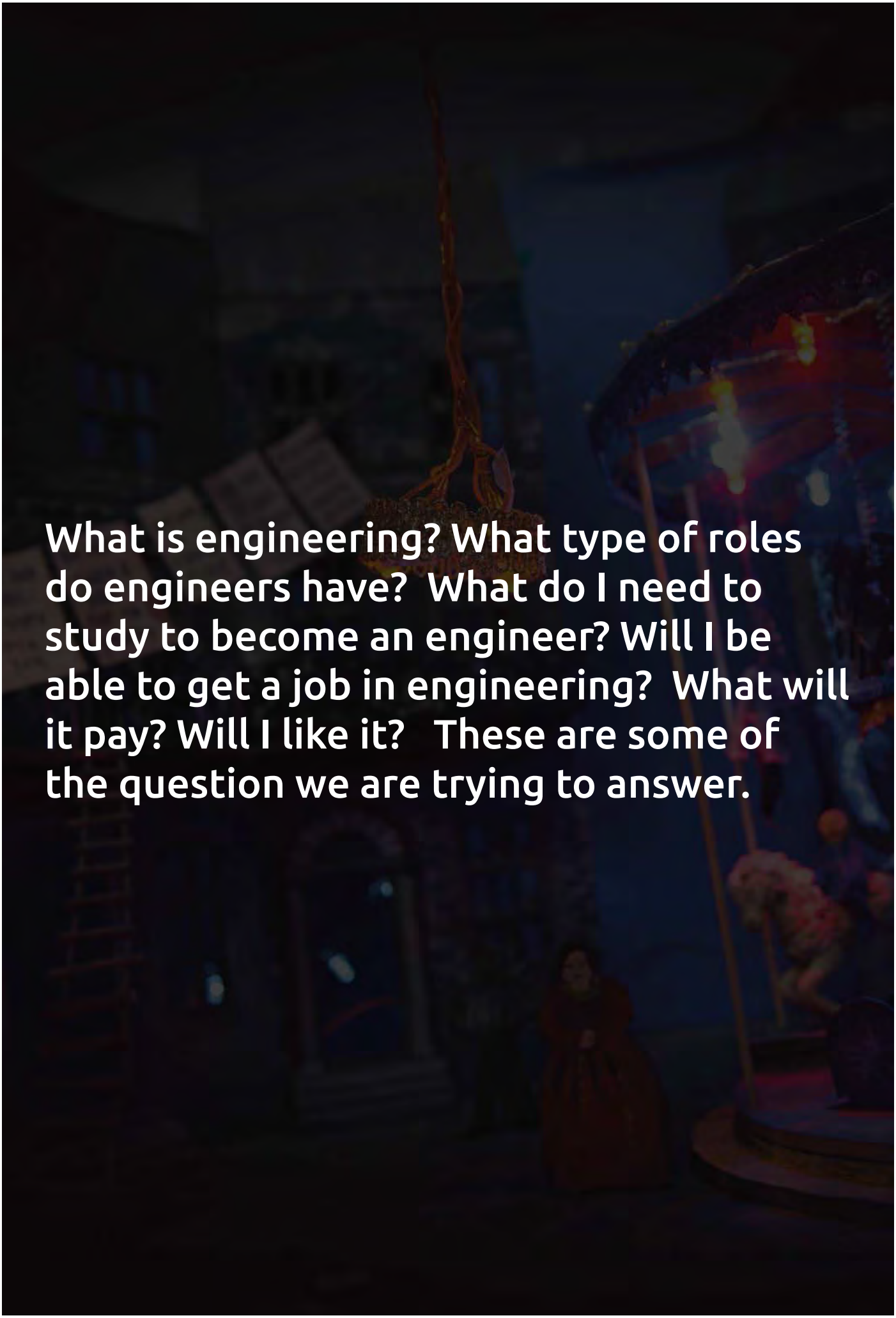
Over fifty of our final year students will showcase their projects that are the culmination of their education in IT Sligo. We are proud that we educate students that satisfy the needs of industry across a broad range of programmes including; civil engineering, mechanical engineering, precision engineering & design, mechatronics, electronic & computer engineering and computer science. Many of our graduates have gone on to leadership positions in some of the top companies in Ireland and around the globe.

We have 45 great companies showcasing the leading edge in engineering and technology. Between them they have 310 jobs on offer. Prospective job hunters and those interested about roles in engineering are invited to attend. We hope that primary and secondary students along with the teachers and parents will come along and be inspired about the potential of a career in engineering.

An event like this would not happen without a great team of people on board. I would like to thank everyone who contributed across many organisations and within IT Sligo. A special thank you to the industry steering group, our academic and technical staff who supported the student projects, our core IT Sligo organising team (Mary Nolan, Rudie Coppieters and John Weir), our event management partners Ocean fm (led by Daniel Brown) and our key industry sponsor Abbott.

I hope you enjoy Engineering Expo 2017.

Una Parsons, Chartered Engineer, FIEI
Head of School of Engineering & Design
IT Sligo



What is engineering? What type of roles do engineers have? What do I need to study to become an engineer? Will I be able to get a job in engineering? What will it pay? Will I like it? These are some of the question we are trying to answer.

Engineering is ...

the application of scientific knowledge to solving problems in the real world. The 45 companies at the engineering expo have engineers solving problem every day. Abbott our headline sponsor, where I previously worked for 13 years, creates solutions that help people live their best lives.

The companies at the engineering expo are impacting people lives, increasing efficiencies, providing employment, responding to customer demands and they are able to do this because of the contribution of engineers that work for them.

Engineers shape the future of the world around us. The Disability hoist project in Mechanical Engineering created an innovative solution to the real work problem. The purpose of this machine is to aid those in wheelchairs to stand up for periods of time, to help with blood circulation to their legs. Andrew Blackwell a Mechatronic project, Mimicking Hand Movements with Image Processing and Vision Systems. The concept of the project is to build a programme which can track the movement of human fingers, and to have robotic hand mimic those movements in real-time. Alex Wright in Electronic engineering has a project, Plantoon Self driving Vechicles for motorways. Platoon describes a compact set of vehicles travelling on a motorway which are connected wirelessly to a lead vehicle.

We are familiar with some of the roles of civil engineers from the roads we use , the bridges we cross but of course there is more. Anthony Blake is a Research & Development Engineer from University of Southampton, is a geotechnical engineer who specialise in research and development. Anthony will discuss Mathematics and R&D with renewable energy and sustainable engineering.

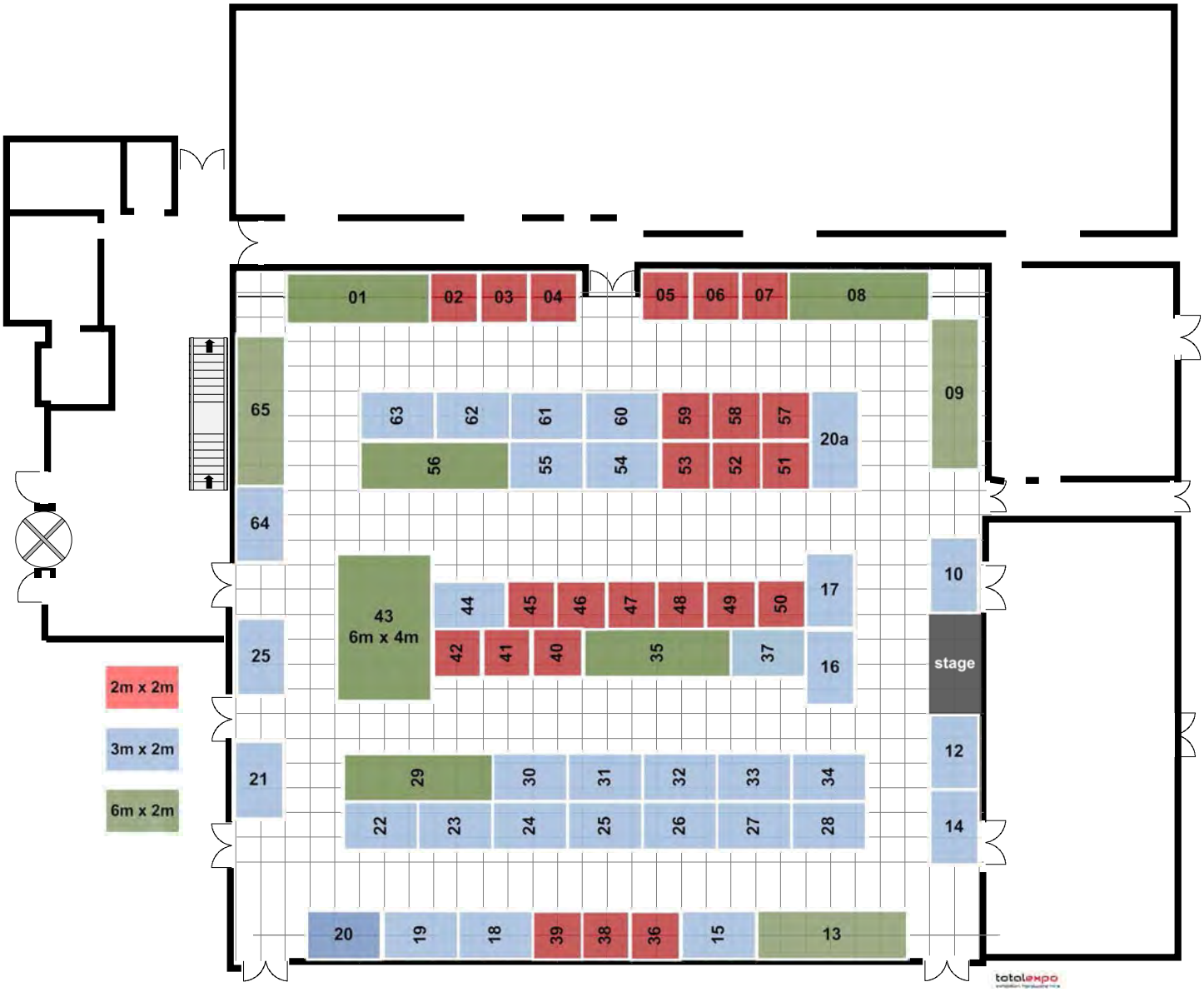
Computing is becoming increasingly a part of our lives every day. This is beginning earlier and earlier, our workshops on scratch programming, our little bits workshop and Button dash show us it is never too early to introduce elements of computer science.

I hope everyone enjoys the Engineering Expo

Kind Regards

Mary

Event map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Name of company / Student group

1. LotusWorks
2. Career wise
3. IT Sligo Students MTx2
4. IT Sligo Students -computing students
5. Jalmia Solutions
6. Engineering Documentation
7. Ophardt Ireland
8. Meusburger
9. IT Sligo Students Electronic Engineering
10. IT Sligo Students
11. Stage (no stand needed)
12. IT Sligo Students
13. IT Sligo Students
14. Dolmen Engineering
15. SF Engineeirng
16.Radionics
17. Collins McNicholas
18. IT Sligo Students
19. IT Sligo Students
20. IT Sligo Students
20A. Robotics and drive
21. IT Sligo Students
22. IT Engineering Stand
23. Hollister ULC
24. Western Development Commission
25A.Ocean FM outside broadcast (no stand)
25. BIM Hub /CITA
26. IT Sligo Students
27. IT Sligo Students
28. PEM Technology Gateway
29. Hasco
30. Allergan
31. Stiefel, a GSK company
32. Impactirl
33. Jennings O'Donovan
34. Allied Automation
35. Abbvie
36. Local Enterprise Office / Enterprise Ireland
37. Ward Automation
38. IT Sligo Students
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40. IT Sligo Students -
41. IT Sligo Students
42. National Instruments
43. Abbott
44. IT Sligo Students
45. Lapp group
46. IT Sligo Students
47. First Polymer
48. Tool and Gauge
49. IT Sligo Students
50. Ericsson
51. Sligo Chamber of Commerce
52.NeraTek
53. IBEC Medtech Ireland
54. Pharmaceutical Stainless Supplies
55. Prodieco Pharmaceutical Components
56. KUKA Robotics
57. IT Sligo Students -Civil students
58. Regionalist Finals of Cansat /Murdechs
59. Vension medical
60. Avenue Mould Solutions
61. Mergon International
62. Kilcawley Construction
63. ATS
64. Litec Moulding
65.SL Controls

Time table for Talks

•11.00-11.30am James Chambers, Engineer and Anthony Mannion, Engineer From Modular Automation

•11.30-12.00pm Anthony Blake Research & Development Engineer (Renewable Energy & Sustainable Engineering) From University of Southampton

•12.00-12.30pm Patricia McAfee
Research & Development Engineer From Boston Scientific

•12.30-1.00pm Stephen Merriman
Senior Mechanical Engineer From Google

•1.00-1.30pm Prize Giving

•1.30-2.00pm Conor Murphy
Site Director at Abbott Laboratories Site Director at Abbott Laboratories From Abbott

•2.00-2.30pm Claire Scanlon
Managing Director From Canny Futures

•2.30-3.00pm Shane Loughlin
Founder / CTO at SL Controls Ltd From SL Controls

•3.00-3.30pm Brian Cooney
General Manager at KUKA Robotics Ireland From KUKA Robotics

•3.30-4.00pm Professor Gerry Byrne
Fraunhofer Senior Advisor UK and Ireland (former College Principal, Dean of Engineering, Prof of Eng, University College Dublin)

•4.00-4.30pm Fergal Broder
CEO and Mark Butler, HR Manager From LotusWorks

•5.00-5.30pm Professor Dietrich Rebholz-Schuhmann Director Insight/Galway, Professor informatics NUIG, Galway From Insight

•5.30-6.00pm Andrew Lynch
Chief Innovation & Network Officer From Irish Manufacturing Research

•6.30 -6.45pm Una Parsons,
Head of School of Engineering & Design IT Sligo From IT Sligo

CHALLENGE YOURSELF TO DEFINE YOUR FUTURE.

ABBOTT PROFESSIONAL DEVELOPMENT PROGRAMME

At Abbott, we believe graduates and postgraduates are an essential source for future talent. Our award winning ***Professional Development Programme***, identifies the highest-performing graduates and invites them to gain experience working for a multinational company in a fast paced, challenging environment. On completion, candidates will have developed a range of skills and competencies and be ready to take on a rewarding career with Abbott.

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Every year, Abbott hosts hundreds of interns from the world's leading universities. Our chosen interns have the opportunity to work in functions that include engineering, science, information technology and marketing. The ***Abbott Ireland Internship Programme*** was awarded the GradIreland Best Internship Programme 2016.

For more information visit Abbott.ie/careers

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commissioning
calibration
operations & maintenance
automation
contract staffing

The calibre of our people is at the heart of our success - a success built on trust, integrity and accountability.

LotusWorks – Who we are?

LotusWorks are engineering and technical experts who work with some of the world's leading companies and household names around the world. With 28 years at the cutting-edge of various industries, our 470 staff gain exposure to the very latest technologies and innovations. Our people are at the heart of our business and we care about investing in them, their health and making sure they are happy as part of the LotusWorks team.

LotusWorks – What we do?

Specialists in Calibration, Commissioning, Contract Staffing, Operations & Maintenance and Automation, LotusWorks is almost three decades supporting some of the world's largest manufacturers in Ireland, the US and Israel. Our ability to tailor and deliver "best fit" expert technical and engineering services to our clients, allows our clients to focus on their core activity.

Careers – Who we hire?

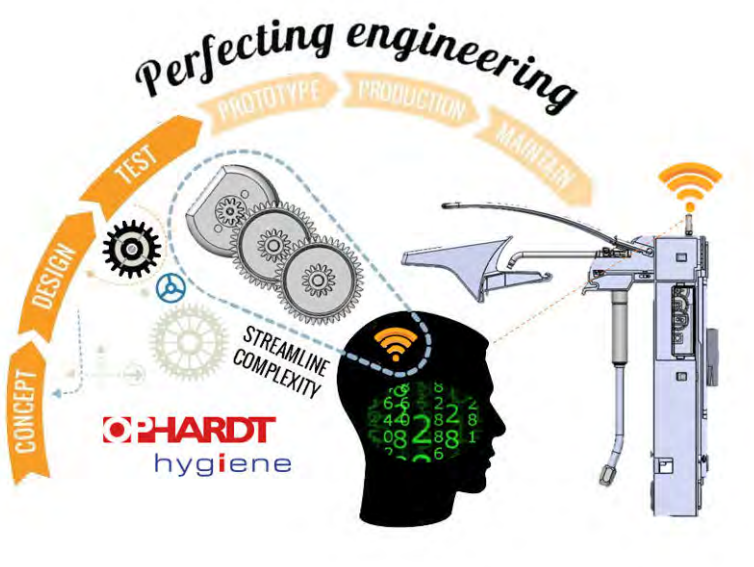
People who love making a real difference and relish new challenges. If you enjoy putting your knowledge and experience into practice; you will love working with us. We employ people who want to be the best and work with the best. Join our teams on our client sites - the majority of which are world-leading manufacturers and household names - across Ireland, Europe & the US. If you have an appetite to work with the best and have a longing to understand the latest technologies and manufacturing processes which save and transform lives, apply to join us at LotusWorks.

contact our recruitment team

email: jobs@lotusworks.com
phone: +353(0)71 9169783

lotusworks.com

Ophardt Hygiene



Ophardt Hygiene is a family owned business group.

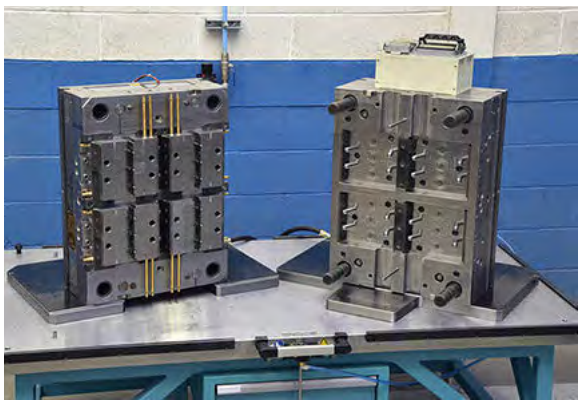
For more than 50 years we have been developing, manufacturing and distributing dispensing products and compliance solutions for hand hygiene.
Our brands are found in medical facilities and public washrooms worldwide. Our technology and designs are used in products of major global players in the health care markets. Ophardt Hygiene Irelands mission is to make the world a more hygienic place and preserve its natural resources. Ophardt Hygiene Ireland has a passion for technology and innovation.
Our goal is to meet the changing needs of our customers through continuous innovation and evolution. Every day we strive to further improve existing products as well as develop exciting new answers to the specific challenges of our customers and their markets.

There might be a specific pump design, bottle packaging, chassis or custom cover that showcases the customers company brand.

Ophardt Hygiene Ireland develops and designs the products which are manufactured on site and also consult with our sister companies across the globe on large projects.

Products manufactured on site are stainless steel and plastic pumps, metal and plastic dispensers and various other components used in the internals of the various pumps and
dispensers using a wide range of hybrid injection mould machines, a number of assembly machines and a wire bending machine.

The processes and tooling required to manufacture the high volumes and diverse product range are all developed and designed in house with the majority of the tooling being manufactured in house.
New concept designs are 3D printed to get a real feel for the components fit, size and gives an idea on the performance of the component utilising the 3D printer which is available on site.
Along with product development and design Ophardt Hygiene Ireland is constantly innovating, researching and developing new designs never used before using new technologies and techniques to further improve the way our products operate and the way the products are manufactured.



Meusburger

Ahead of the competition with Meusburger!

Meusburger is the leading manufacturer of high-precision standard parts. More than 17,000 customers all over the world make use of the numerous advantages of standardisation and benefit from the company's over 50 years of experience in
working with steel. Offering an extensive range of standard parts, combined with high-grade products in the field of workshop equipment, Meusburger is the reliable global partner for making dies, moulds, jigs and fixtures.

Meusburger sets standards

High-precision standard parts by Meusburger optimise the entire process chain. With the consistent use of high-quality standard parts, you can benefit from a large cost-saving potential in die, mould, and jigs and fixtures construction and the subsequent production of parts. All plates and bars by Meusburger are heat treated for stress relief and therefore provide a reliable basis for high-grade moulds, dies, and jigs and fixtures.

Short lead times

Via state-of-the-art production lines and well designed processes, the products arrive at the industry's largest warehouse for plates and accessories. The in-house quality assurance ensures consistently high quality of all products. The optimised logistics chain guarantees short lead times of 24 or 48 hours.

Reliable and global partner for making dies, moulds, jigs and fixtures

At Meusburger the range of products and services is continuously adapted to meet the customers' needs. Through easy ordering options, continuous availability of the products, short lead times and a reduced number of suppliers, the customer can save time and money.

Clearly arranged and informative sales documents as well as top service provided by a competent team of in-house and field sales staff perfectly complete the service package.

meusburger
WIR SETZEN STANDARDS

Dolmen Engineering

Dolmen Engineering was founded in 2014 and is a privately held company that is owner-led and managed. The company's vision is to provide World Class Process Design and Build Solutions for the Pharmaceutical and Life Sciences Sectors.

Our core value is our client-focused attention to detail. One of our main objectives is to create and maintain ongoing business relationships with our clients.

Dolmen and it partners, deliver a service that larger Engineering Houses simply are unable to provide. We work on our client's behalf and insure projects are delivered which exceed their expectations. We focus on relationships with our clients which establishes an expectation of support, value and true partnership.

What makes our company unique.

- Design and build capability for complex process systems
- Design for success approach to Engineering Projects
- 25 years of Life Science Industry experience.
- Focus on Return of Investment for the customer

What makes our company successful.

- Our team of expert engineers
- Our manufacturing Partners – Brinox Process System
- Our commitment to our values.
- Attention to our customers needs
- Shared vision.
- Creating genuine partnerships with our customers
- Ensuring our customer see the value in working with us
- Building long and sustainable relationships with our customers.

DOLMEN
ENGINEERING

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Collins McNicholas

Collins McNicholas is an award-winning Recruitment and HR Services Company with over 27 years' experience in sourcing talent for our clients. We have six offices nationwide, in Dublin, Cork, Galway (HQ), Sligo, Athlone and Limerick. The Sligo office opened in 1998 and for the past 19 years we have worked with many clients in the north west region to provide them with the best talent possible.

Collins McNicholas has a proven track record in permanent and temporary recruitment for a wide variety of sectors, including engineering, medical devices, pharmaceuticals, ICT, financial services, shared services and multilingual customer service. We offer a range of recruitment and HR support services and can tailor a package that best suits your company's requirements. You can outsource your entire recruitment process or you can avail of any of our individual services. We can provide a comprehensive payroll service, analysis of your recruitment needs, conduct detailed psychometric testing, design and facilitate large-scale assessment centres, consult on compensation and benefits packages, and draft contracts of employment and employee handbooks that fully comply with Irish legislation. Our recruitment consultants are highly skilled in end-to-end recruitment processes.

This includes developing job specifications; candidate sourcing; initial CV screening; and screening interviews. Our consultants receive regular training in carrying out competency based interviews, ensuring all interviews are thorough, transparent and accountable.

In the north west, we recruit for a wide range of engineering roles, mostly linked with manufacturing industries such as medical device and biopharmaceutical sectors. At present, we require R&D Engineers who will be involved at the early stages of new product development and new product commercialisation. Also in high demand are manufacturing / process engineers at various levels who could be supporting operations or working on projects such as lean initiatives or equipment development. These roles are generally open to mechanical, mechatronic or automation engineers. We also have several quality and validation engineering roles open at senior (management) and intermediate levels, this also includes design assurance where someone with a strong quality background would be interested in specialising more in the product development aspect of quality. Full job descriptions are available on our website and you can contact any of our experienced recruitment consultants to discuss the positions further.

To avail of any of our recruitment and HR services, or to apply for a job, please visit our website at www.collinsmcnicholas.ie, or contact us at 071 91 42411 or sligo@collinsmcnicholas.ie.
We look forward to working with you.

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Recruitment & HR Services Group


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Hollister

In Service to the Global Community
Hollister Incorporated is an independent, employee-owned company that develops, manufactures, and markets healthcare products and services worldwide.
We offer advanced medical products for Ostomy Care, Continence Care; Critical Care; and Wound Care.
Hollister has been serving healthcare professionals and patients for more than 95 years — making a difference in the journey of life for people throughout the global community.

Hollister Ballina
Hollister Incorporated opened its Ballina manufacturing facility in 1976 on a 40-acre campus in County Mayo. More than 700 Associates work at our Ballina facility. The Ballina facility manufactures products for global distribution that support our ostomy care and continence care product lines.
Over the years, we have expanded our operations beyond manufacturing to include Research & Development, New Product Development, Corporate Engineering, Supply Chain Management and Financial Shared Services. Global Research & Development for our Continence Care products is based exclusively in Hollister Ballina.

Hollister Ballina is a great place to work where individuals are valued and given the opportunity to reach their potential in a challenging and enjoyable work environment. Hollister Ballina continues to recruit talented professionals across all departments.
Current opportunities include the following:
• Graduate Project Process Engineer, Ostomy
• Project Engineer, Ostomy
• Senior Project Process Engineer, Ostomy
• Controls Engineer
• Controls Technician
• Maintenance Fitter
• Quality Engineer
• Design Assurance Quality Engineer
• Assistant Quality Manager

Learn more about Hollister Ballina here
https://www.youtube.com/watch?v=7NLXapdwV8I

Log on to
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to view and apply for current vacancies or to register your interest in future opportunities.


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The online guide to
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in the West of Ireland
LookWest.ie is a unique regional portal promoting
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attract people to invest and visit the West.
An initiative of the Western Development Commission

Engineering Documentation

'ENGdoc's experience in construction documentation positions them ideally to work with their clients through the suite of documents required within the BIM process.'

About ENGdoc

ENGdoc was founded in 2006 by directors David Mullen and Tim King with the vision of improving the standard of technical documentation within the building industry. Over the last 10 years the company has developed using the implementation of BIM as a key tool to drive quality, efficiency and accountability for our clients.

BIM Consultancy

ENGdoc's range of services extends right from conceptual design, through to construction and project validation. They work with clients to assist with their project needs and to ensure they fulfil their requirements in line with PAS1192. The company's background and experience in construction documentation positions them ideally to work with clients through the suite of documents required within the BIM process.

Capability

The ENGdoc BIM team comes from a range of backgrounds - architectural, structural and MEP. The company places emphasis on employing staff with practical 'on site' experience who can relate to the unique demands of this quick changing industry. This blend of knowledge and experience allows ENGdoc to not only produce BIM models to the highest standards, but also to assist and work with their clients to achieve the best possible outcomes on their projects. They have made significant investments over the last number of years in both hardware, software, as well as top of the range point cloud scanning and surveying equipment.

AUTODESK. Authorised Training Centre

Training

ENGdoc take pride in being an Autodesk Authorised Training & Certification Centre in their Sligo offices as well as a working BIM practice. This blend of academic and practical skills gives them access to latest methods, software and people when it comes to BIM implementation. Currently ENGdoc have training courses in Revit Architecture, Structure and MEP as well as courses in Navisworks and BIM Principles. Where relevant, ENGdoc can tailor their training courses into client specific modules – both in terms of content and scheduling – to help meet with the demands of a busy office and the need for knowledge.

ENGdoc Services

- BIM Consultancy Modelling Support
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- Digital Safety Files
- O&M Manuals
- CAD Services
- Training

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The Mission Statement of Local Enterprise Office Sligo

The Mission Statement of Local Enterprise Office Sligo is to generate sustainable employment in the County at large, through the development of an enterprise culture, the forging of multi-sectoral partnerships with various groups with an enterprise agenda, the fostering of economic development and provision of direct supports to small business.

The generation of sustainable employment is the principle objective of the LEO. It operates in the micro and small business sector, supporting start-up businesses and the expansion of existing enterprises.

The LEO structure consists of an Evaluation and Approvals Committee of 7 which includes representatives from small business, government agencies, and the Local Authorities. The LEO is supported by the LEO Centre of Excellence in Enterprise Ireland.

Encouraging and promoting an enterprise culture is an important area of activity for Local Enterprise Offices. In seeking to develop a thriving enterprise culture, it is critical that young people from all backgrounds see enterprise as a viable career choice. Entrepreneurial qualities and mindset need to be fostered from an early stage. If we are serious about developing an entrepreneurial ethos we must start with our school-children and young people. We must listen to their ideas and actively support their innovations, as these can be the secret to the business successes of tomorrow. Our young people need to be open to the idea of creating a new job rather than looking for one. For all of these reasons the Local Enterprise Offices have strategically focused much of their endeavours in the field of entrepreneurship development on the education sector. Through various programmes and initiatives they have sought to influence student attitudes in favour of enterprise. It is to be hoped that the proportion of young people who are prepared to "have a go" at founding their own business can be increased.

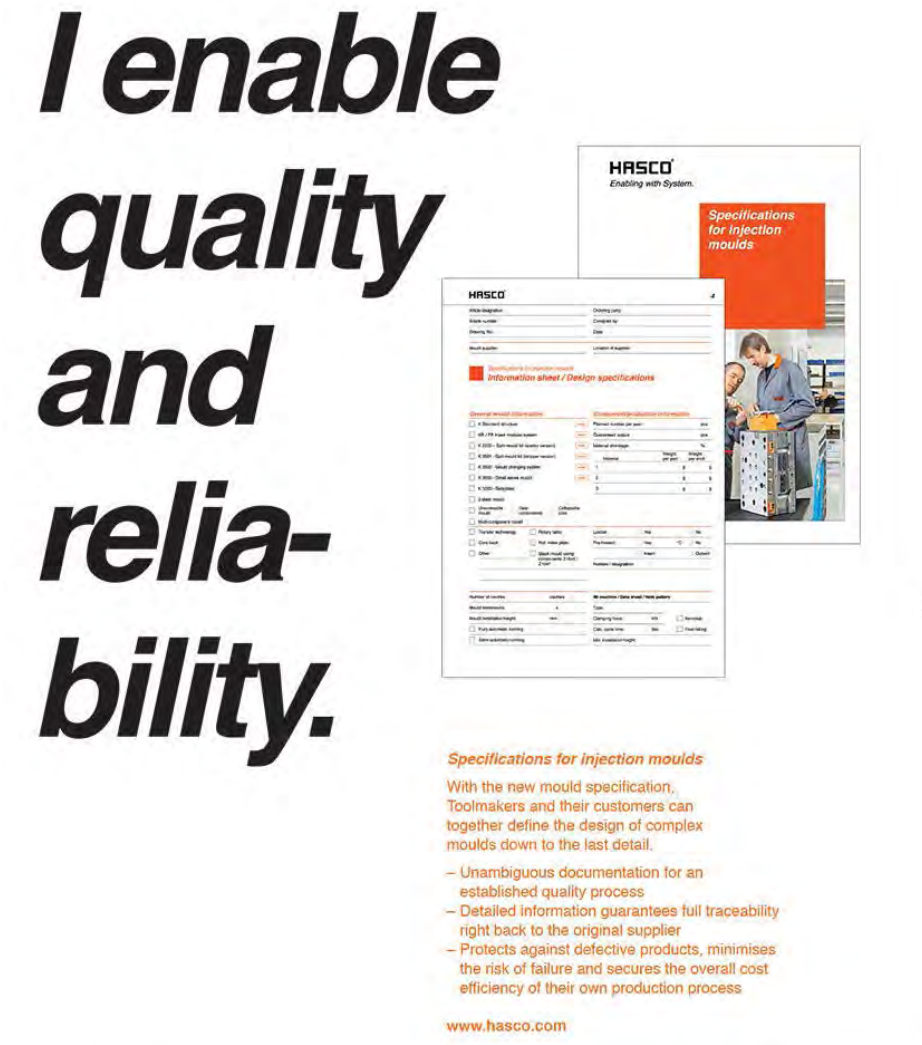
The LEOs continue to reinforce entrepreneurship in the education system as a critical element in the future development of small business in Ireland. A number of initiatives are run by the LEOs at both primary and secondary level with the flagship programme the Student Enterprise Programme.

Local Enterprise Office(LEO) Sligo was established in 2014 as part of a nationwide network of LEOs. The LEO acts is a first stop shop to provide support and services to help start, grow and develop small businesses in Sligo. LEO Sligo provides financial supports, business skills training, & business mentoring for small businesses in County Sligo. Any business employing less than ten people in County Sligo can arrange to meet a member of our team to discuss their business and receive information on how we may be able to assist them in either the establishment or development of their business. We are also a single point of contact through which all information on State supports for small and micro business can be accessed. LEO Sligo enhances the local authorities wider aim to promote economic development in County Sligo.

Oifig Fiontair Áitiúil
Local Enterprise Office

Clár Chistí Eorpacha Struchtúrtha agus Infheistíochta na hÉireann 2014–2020
Co-funded by the Irish Government and the European Union

European Union
European Regional Development Fund



New HASCO specification for quality and reliability

Specifically for mouldmakers and their clients, the leading international supplier of standard mould units, HASCO, has developed a comprehensive mould specification. With this specification, Toolmakers and their customers can together define the design of complex moulds down to the last detail. It serves as a practical tool for recording design instructions and project planning. The objective of the specification is to significantly simplify the mouldmaking operation for all involved, and to ensure the quality of the resultant injection moulding tool from the very beginning.

The HASCO specification also yields a valuable customer benefit. It makes certification or recertification of the users to DIN EN ISO 9001:2015 or ISO/TS 16949 very much easier.

In the auditing, it provides unambiguous documentation for an established quality process.

Since the beginning of quality standardisation in Germany, HASCO has opted for continuous quality management along the entire supply chain. HASCO has for many years been operating according to DIN ISO 9001:2008 and will be recertified next year to DIN ISO 9001:2015.

This means in practice that every HASCO product and all services connected to the product (consulting, delivery, service …) reliably comply with the quality requirements defined in the standards.

At product level, customers recognise the original HASCO quality by unmistakable product markings lasered into the product. Detailed information (for example, batch numbers in the raw steel) guarantees full traceability right back to the original supplier, thus offering protection against problematic copying.

At HASCO, the entire supply chain is quality-assured and thus offers significant competitive advantages for Toolmakers and Injection Moulders. The requirements made on the company's own quality assurance systems are guaranteed through the uninterrupted traceability.

To protect their own interests, customers should make the aspects of quality, quality management and certification the central selection criteria when choosing their suppliers. This protects against defective products, minimises the risk of failure and secures the overall cost efficiency of their own production process. It also makes the important aspect of quality much easier and more reliable. The HASCO specification provides optimum support in this

Allergan

100 **COUNTRIES**
Operations in approximately 100 countries

16,000 **EMPLOYEES**
More than 16,000 global colleagues

Leading Growth Pharma In Ireland,
our focus fosters deep engagement with medical specialists and we make it our business to listen closely to their needs so that together we can advance patient care. We combine this strategic focus with a diversified approach that enables us to follow our research and development into new specialty areas where unmet needs are significant.

In partnership with the medical community, we bring scientific excellence and rigour to deliver leading products that improve patient outcomes. We know we are successful when doctors and patients place their trust in our products and our company, when our employees excel and when our efforts make a meaningful difference in the lives of the patients and communities we serve.

Operations in approximately 100 countries
Allergan plc (NYSE: AGN), headquartered in Dublin, Ireland, is a bold, global pharmaceutical company and a leader in a new industry model – Growth Pharma. With commercial operations in approximately 100 countries, Allergan is committed to working with physicians, healthcare providers and patients to deliver innovative and meaningful treatments that help people around the world.

More than 16,000 global colleagues
Our Company's success is powered by our more than 16,000 global colleagues' commitment to being Bold for Life. Together, we build bridges, power ideas, act fast and drive results for our customers and patients around the world by always doing what is right.

Open Science
Allergan is an industry leader in Open Science, the Company's R&D model, which defines our approach to identifying and developing game-changing ideas and innovation for better patient care. This approach has led to Allergan building one of the broadest development pipelines in the pharmaceutical industry with 70+ mid-to-late stage pipeline programs in development.

Allergan is focused on developing, manufacturing and commercializing branded pharmaceuticals, devices and biologic products for patients around the world.

Allergan markets a portfolio of leading brands and best-in-class products for the central nervous system, eye care, medical aesthetics and dermatology, gastroenterology, women's health, urology and anti-infective therapeutic categories.

Stiefel / GSK

GSK is dedicated to improving the quality of human life by enabling people to do more, feel better and live longer. We are a science-led global healthcare company that researches and develops a broad range of innovative products in three primary areas of Pharmaceuticals, Vaccines and Consumer Healthcare.

We are the fourth largest employer in the pharma industry in Ireland, employing 1,800 people across four locations, and the largest British company in Ireland.

With world-class manufacturing sites in Cork, Dungarvan and Sligo, we research, develop, manufacture and make available a broad range of innovative healthcare products – from prescription medicines and vaccines, to well-known brands like Panadol, Aquafresh and Oilatum. In every area of our work we aim to help people do more, feel better and live longer.

Our manufacturing site in Sligo is a dedicated supply site for Stiefel skincare products and has been manufacturing in this region since 1975. It manufactures approximately 40 different formulations of skin healthcare products including Physiogel, Oilatum and Driclor for over 65 markets, producing 28 million units each year. A world-class manufacturing facility, Sligo has held a long tradition of innovation, technical brilliance and dedication. The site is focused and committed to advancing dermatology and skin science by delivering differentiated, science-led innovation and quality products across the care spectrum.

We have a unique partnership with IT Sligo, and have developed two unique qualifications for GSK employees the Level 7 Degree in Colloidal Science and the Higher Certificate in Good Manufacturing Practice.

We employ 205 people at the site from a wide range of disciplines including engineering, chemistry, biology, logistics and business.

GSK Sligo's apprenticeship programme offers exciting opportunities to both school and college leavers. Apprentices have the chance to study towards nationally recognised qualifications while gaining valuable work experience and also getting paid.

The application process for our apprenticeship programme has closed for 2017.

Welcome to Impact Ireland (Metals) Ltd

Founded over 40 years ago in 1973, Impact Ireland (Metals) Ltd. has become one of Ireland and Europe's leading multi-metal stockholder and distributor.

We are a trusted supplier of Steels, Plastics and Non-Ferrous Metals to a diverse customer base from Private Enterprises to Multi-National Corporations.

We source, stock and deliver countrywide from a vast range of European-sourced materials including ;
Stainless Steels in round bar, square bar, tube & plate -
Nickel Alloy Steels in round bar, square bar, tube & plate -
Aluminium in round bar, square bar, tube and plate cut to size -
Tool Steels to suit all applications -
Bright Steel in round bar, square bar, tube and GT&B plate -
Black Steel in round bar, square bar, tube & plate
Cast Iron round bar, square bar and plate
Chrome Plated Steel Rods, steel tubes
Steel Tubes in HFS, CFS, DOM, Hyd Feed Line, Welded & Seamless
Aluminium Bronze in round bar, square bar, tube & plate
Bronze - in round bar, square bar, tube & plate
Brass - in round bar, square bar, tube & plate
Copper - in round bar, square bar, tube & plate
Engineering Plastics in round bar, square bar, tube & plate, from Acetal to Peek
Titanium - in round bar, square bar, tube & plate
Special Metals & Plastics –

We stock a range of Materials to exact Customer Requirements and Specifications by request

Our unique combination of trading experience and product range enable us to offer a customer led service with a focus on continuous improvement of people, product and process.
All of the above materials have full source lot traceability.

When you choose Impact Ireland (Metals) Ltd. as your partner, you are choosing to work with a company with an accredited Quality Management System. Our procurement, stockholding, in-house cutting, drilling and first op machining have been assessed and registered against the provisions of AS9120A & BS EN 9001:2008.

If Metals or Plastics matters to you, choose Impact Ireland (Metals) Ltd.

www.impactirl.ie
www.impactengineeringplastics.ie
www.impactspecialmetals.com
Local Area Rep – eddieduffy@impactirl.ie

IMPACT IRELAND (METALS) LTD
Engineering Steel Stockist
Stainless Steels - Nickel Alloys - Engineering Steels - Engineering Plastics - Aluminium

Jennings O'Donovan & Partners Limited

Jennings O'Donovan & Partners Limited is a multidisciplinary consulting engineering firm specialising in renewable energy, water supply, wastewater treatment and in the provision of planning and environmental services. Founded in 1950, the company, which is wholly Irish owned, has offices in Sligo, Dublin, Castlebar and Letterkenny.

We are an ISO 9001, ISO 14001 and OHSAS 18001 accredited company. The extent of the services provided, based on almost 70 years of experience, are summarised below.

Renewable Energy
From project inception through planning, design, procurement, construction and commissioning, we offer engineering, environmental and business expertise for wind/solar projects. We act as technical advisors to Lending/Banking institutions operating in the sector and have significant experience in cost estimation, conciliation and dispute resolution.

Wastewater
Providing specialist engineering and environmental expertise in design, planning and management services for wastewater projects in collection, stormwater, pumping stations, treatment works and disposal.

Leisure and Recreation
We provide specialist engineering and environmental expertise in design, planning and management services for water / land based leisure and amenity projects including rowing facilities, playing pitches and centres of excellence.

Water Supply
Providing efficient water production, planning, environmental and management services in the areas of water treatment, storage, supply and distribution.

Civil Engineering
Providing detailed expertise in road design and geometric analysis, in flood risk assessments and hydraulic studies, in bills of quantities, cost estimation, scheduling, conciliation and dispute resolution. We draw on computer software packages including AutoCAD Civil 3D to provide specialist and comprehensive services.

Housing and Commercial
Providing feasibility studies, planning, detailed design and analysis, construction management and project supervision for developments of all type/scale.

Planning & Environmental
With an extensive portfolio of successful planning applications in Ireland and Northern Ireland, services include feasibility studies, EIS's, Appropriate Assessments, consultation with statutory and non-statutory consultees, public consultations and landowner negotiations.

Health & Safety
Services include acting as PSDP, Principal Designer and Health & Safety Co-ordinator. We also prepare and analyse risk assessments and method statements, carry out incident examination and reporting, perform safety audits, conduct training and manage safety files through the project life cycle to close out.

Structural Engineering
With considerable experience in structural design of commercial, industrial and infrastructural projects, we aim to provide sustainable structural engineering solutions which balance environmental, social and economic factors. We can provide detailed structural design and analysis using state of the art software including BIM.

Allied Automation

Allied Automation is dedicated to the development, design and precision engineering of customised automated equipment for many of the world's leading medical device and life science companies. We have a proven track record in developing robust solutions to challenging & complex production requirements.

Founded in 1998, the company was built on a foundation of expertise in high Precision Engineering, and we now partner with many of the leading most progressive manufacturing companies.

Our objective is to provide innovative solutions to our customers, from initial consultation all the way through to expert delivery and commissioning of high precision engineering solutions.

We help our customers to become successful through leading edge efficient production techniques. To make this possible, we invest time and expertise in developing a clear understanding of their requirements.

We have developed an in-house team with all the skill sets necessary to complete each project, giving us complete project control.

Today we employ a team of 30 across our different functions of:

- Mechanical Design
- Precision Tooling
- Project Management
- Process Control & Safety Systems
- Mechanical Assembly & Setup
- Research & Development (Proof-of-Principle Work)
- Documentation
- Business Development

We have to date successfully delivered over 500 Precision Engineering projects, making us one of the strongest and most experienced Automation solution providers in Ireland, with clients in Ireland & the UK, mainland Europe, USA and the Middle East.

Allied Automation

AbbVie

AbbVie is a global research-based biopharmaceutical company formed in 2013. It delivers world-class discovery, production and supply of critical medicines. A modern biopharmaceutical business, AbbVie has a significant footprint in Ireland that's focused on novel and breakthrough therapies for tough-to-treat diseases and unmet medical needs, with a reputation for quality.

Together with its wholly-owned subsidiary, Pharmacyclics, the company employs more than 29,000 people worldwide and markets medicines in more than 170 countries. In Ireland, AbbVie employs almost 600 people at five different manufacturing and commercial sites across the country. The company's commercial headquarters is based at Citywest in Dublin with a separate international manufacturing and engineering services centre also located in the capital at Santry. AbbVie has two manufacturing plants in Sligo, one of which is a global centre of excellence for medical devices. The company also has a third manufacturing centre in Cork.

AbbVie is committed to developing and manufacturing the cutting-edge therapies and innovations that hold the potential to improve health care worldwide. Meeting these ambitious health goals involves combining advanced science with deep knowledge of diseases and Ireland plays a central role across all stages across this process.

AbbVie harnesses and supports Irish expertise in complex chemical and biological R&D. The company tests discoveries through clinical trials involving Irish patients, doctors and centres. It supports the manufacturing of many of the medicines and delivery devices involved here in Ireland. In this way, Ireland contributes to every part of the medicine discovery process.

This platform then provides AbbVie's commercial team with the opportunity to make these new treatments rapidly accessible to Irish patients.

AbbVie believes strong local partnerships are crucial to achieving the best outcomes for patients as we seek to make a remarkable impact on people's lives.

In the company's core areas of immunology, cancer, neurology and virology,

AbbVie works with patient groups, caregivers, health providers and policymakers. This community focus is what drives AbbVie to deliver new best-in-class therapies with life-changing impact for people in Ireland and beyond.

And the company aspires to do this in a way that is sustainable for society.

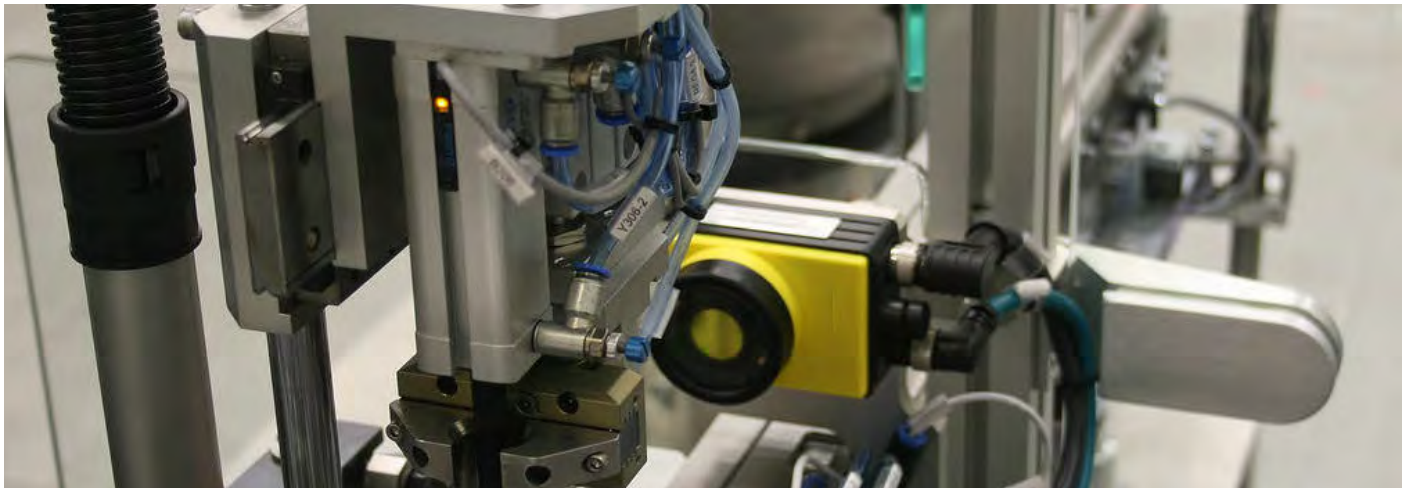
WARD Automation

Collaborative Robots at Ward Automation

O-ring assembly
A leading global med-device company approached Ward Automation with a project to automate the assembly process for some of their products.

One key part of this project was the assembly of a barrier coated O-ring onto a plastic component at a rate of 35ppm.

However any over stretching of the o-ring during assembly would damage the integrity of the coating, which could impact on the operation of the final product.



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Sligo, Ireland
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Phone: +353 (0)71 91 50039
E-mail: info@wardautomation.ie

Galway Location
Ward Automation (Galway) Ltd,
29 Glenrock Business Park,
Ballybane, Galway, Ireland
H91 EYo4
Phone: +353 (0)91 769100
E-mail: info@wardautomation.ie

WARD automation

LAPP GROUP

Cables, accessories and connectors.
Everything from one source.

ÖLFLEX® CLASSIC 110

The ÖLFLEX® Classic 110 YY multi-core number coded range
is ideally suited for use as a control, signal and power cable in a variety of applications. Its high flexibility ensures easy installation whilst the tough external sheathing will resist the effects of many acids, caustic solutions and various oils.

ÖLFLEX® CLASSIC SY

Having all of the benefits of the standard ÖLFLEX® Classic range
SY cable has the additional protection of a galvanised steel wire braid and transparent PVC outer sheath. It retains flexibility and ease of installation and offers a high degree of mechanical protection often extending the service life of an installation. Ideal for many industrial applications including the machine tool industry, where the extra protection of SY will prove invaluable.

ÖLFLEX® CLASSIC 115 CY

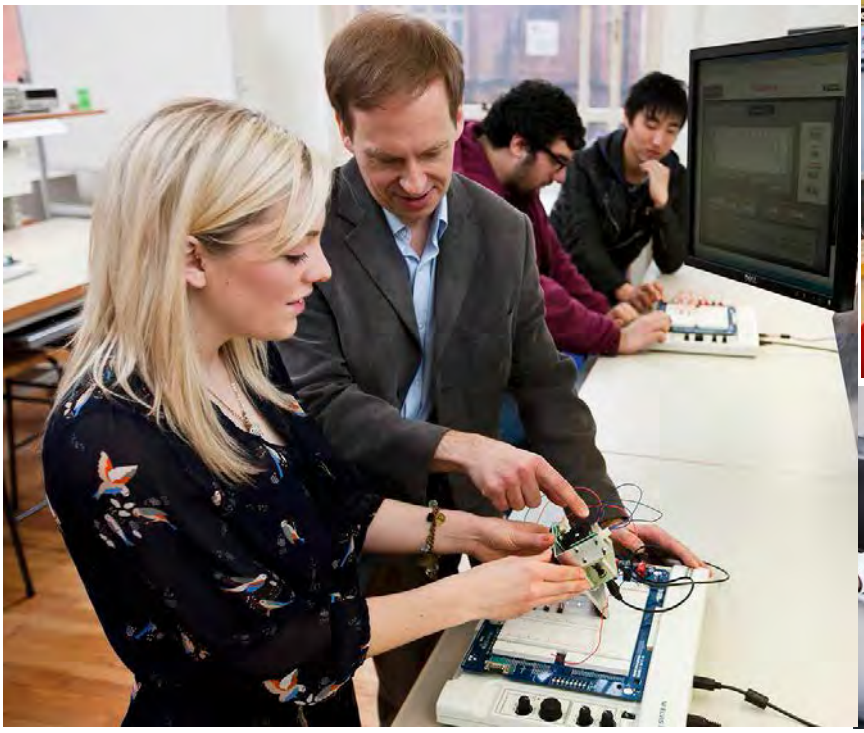
The ÖLFLEX® Classic 115 CY has a tinned copper braid
for all applications with particular reference to EMC critical installations.
The ÖLFLEX® Classic 115 CY can be used in fixed installations or where non-continuous but flexible movement is required. At room temperature they are widely resistant to acids, caustic solutions and oils.

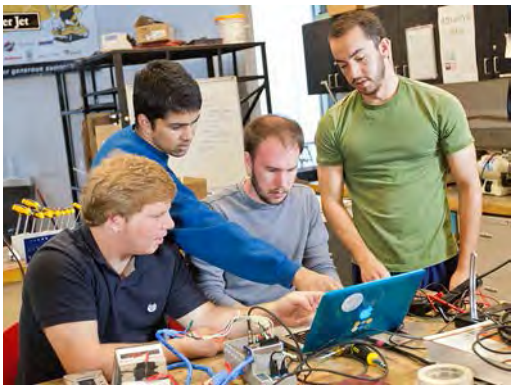
ÖLFLEX® ROBUST 210 & 215C

ÖLFLEX® ROBUST 210 & 215C are control cables for flexible and fixed installations
for robust mechanical use. At room temperature they have increased resistance against acids, caustic solutions and certain vegetable, animal and mineral oils. This range of cables are ideally suited for use in agricultural, food, beverage and pharmaceutical industries.

W: www.lappgroup.ie **T:** 020 8758 7800 **E:** sales@lapplimited.com

National Instruments





For nearly 40 years, NI has worked with engineers and scientists to provide answers to the most challenging questions.

Through these pursuits, NI customers have brought hundreds of thousands of products to market, overcome innumerable technological roadblocks, and engineered a better life for us all. If you can turn it on, connect it, drive it, or launch it, chances are NI technology helped make it happen.

Do Engineering: The NI Approach to Engineering Education

At National Instruments, we believe that hands-on learning is what solidifies theoretical concepts and prepares students for industry or advanced research. Skills learned in the classroom paired with platforms that scale to industry prepare students to solve the grand challenges of tomorrow; at NI, we put this into practice by packaging industry-standard technology into education form factors and working with partners to develop courseware. Learn how the same industry-leading NI hardware and software technology used by more than 35,000 companies also improves education in more than 6,000 universities around the world.

Get Involved

Gain hands-on experience with the latest measurement and automation software and hardware from NI and improve your product skills and knowledge.
The session, held in Newbury, will offer introductory content designed especially for beginners.

For more information visit:
http://uk.ni.com/events/tasters

Kind regards,

Alex Tailor
Events Intern
National Instruments UK & Ireland

t: 01635572434
alex.tailor@ni.com

First Polymer Training Skillnet

First Polymer Training (FPT) Skillnet operates as a training network for Irish Industry and is funded under the government's Skillnet initiative.
While they specialise in specific polymer programmes for the plastics and medtech industry, many programmes are aimed at the wider manufacturing sector, including a wide range of practical maintenance programmes.

Initiated and promoted by Plastics Ireland (Ibec) since 1999; First Polymer Trainings objective is to provide subsidised technical training to industry, both at their technical training centre in Athlone or in-company as required. The centre in Athlone is a state of the art facility with 4 injection moulding machines, an extruder, a thermoformer and purpose built maintenance training boards.

FPT is a QQI validated provider for a number of technical programmes and has developed a series of polymer processing and design awards since 1999. A range of free e-learning programmes are also available, which are used to complement existing programmes.

FPT initiated an online polymer engineering degree with Sligo and Athlone Institutes of Technology back in 2009 – B. Eng. Level 7(Ord) Degree in Polymer Processing. The sixth cohort graduated in 2016 and the programme is strongly subscribed each year. A new Level 6 Certificate in Polymer Technology was also recently developed as a means of entry to the degree or for those who already worked in industry and wanted to gain a formal technical polymer qualification.

Please contact FPT or visit www.firstpolymer.com for more details on all programmes.

www.firstpolymer.com
Tel: 090 6471223
email: info@firstpolymer.com

First Polymer Training SKILLNET

Tool & Gauge

Tool & Gauge provides world class Injection mould design, development and manufacture together with precision engineering capability to the plastics and engineering industries.
Our expertise covers:
• Med Tech
• Automotive
• Engineering/Electronics
• Packaging
• Aerospace

We employ highly skilled staff consisting of specialist design engineers, polymer engineers, toolmakers, technicians and machine operators.

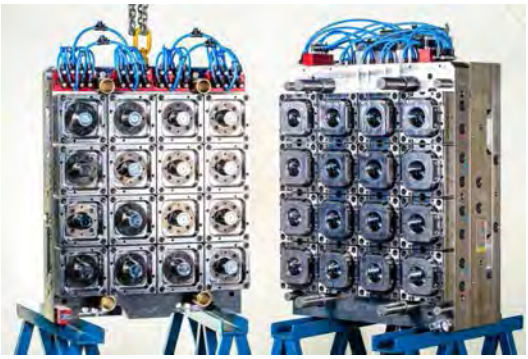
We consistently re-invest in the latest technology, equipment and staff development. Our employee Donal Logan represented Ireland at the World Trade Fair in Brazil in 2015 and in March this year Michael Flynn came first in the Ireland-Skills Apprentice Toolmaker award.

Our design team are vastly experienced working in partnership with clients delivering a 'one-stop' design service from initial concepts through to prototyping and manufacture.

• Product Design
• Product Development
• Part Analysis & DFM
• Mould Flow Analysis / Design Development
• Injection Mould Design
• Design review prior to machining
• Gauge & Fixture Design
• 3D Printing
• Prototyping
• Off-site storage of all design data

We manufacture Prototype and Low to High Volume production tooling up to SPI Class 101.
• 2 shot moulding
• Over moulding
• Complex cooling circuit design
• Insert Change capability
• Cassette Moulding.
• High cavitation moulds up to 32 cavities
• Mould capabilities up to 5 tonne.

Injection moulding capabilities range from 15 to 820 Tonne plus ancillary equipment.
• Tool Trials, Debug and Validation.



• Low to Medium Volume production.
• DV Runs.
• Product Validation.
• Assembly Work.
• SIM Studies
• Tool FAT (Factory Acceptance Test)
• CPK Studies.

We are currently ISO9001-2015 accredited by NSAI. Our policy is to continue to upgrade the skills of our employees ensuring their highest level of achievement.
We utilise "Best Practice" tools to provide the following information.
SIM Studies
FAT
PPAP
FMEA
Gauge R&R
CPS Analysis
PQ's
ISIR's

Research & Development
Our R&D engineers play a critical role R&D in helping our customers receive robust products best suited for production and assembly.
Advantages of collaborating on R&D Projects with T&G:
• Experienced design team
• Experience of both low and high volume tooling
• We facilitate testing, engineering design changes and evaluation prior to investment in production moulds.
• We can provide short-run production while a high-volume production mould is being manufactured
• Increases the overall speed of product to market.

SERVICES:
• Product Design
• Product Development
• Part Analysis & DFM
• Mould Flow Analysis
• Injection Mould Design
• Design review with customer
• Gauge & Fixture Design
• 3D Printing
• Prototyping

Tool & Gauge is committed to providing quality products, on-time delivery and excellent customer service.

Tool & Gauge
Precision Toolmakers

NeraTek

3D Printing
3D Scanning
CAD Services
Project Management

3D printing
industrial design
IDEA
FDM
CONTROL
Mould Design
INNOVATION
rapid prototyping
BIOTECH
POLY JET
concept
PLASTICS
ADVANCED MANUFACTURING
FUSED FILAMENT FABRICATION
DESIGN
Industrial Robots
schedules
Solid Modeling
PLANNING
3D metal printing
GRAPHIC DESIGNERS
SLA
Engineering
visualisation
engineering
projects
SLS
makers
Perspective
materials
ARTIST
3D Model
3D Scanning
Fused Deposition Modeling
MOULDING
AEROSPACE
industrial
neratek
stereolithography
Emerging Technology
PRODUCT DEVELOPMENT
MILITARY
PROJECT
additive manufacturing
Mould
2D Drawing
BUSINESS
SKETCH
medical device
FFF
CREATIVE
3D PRINTER
MANAGEMENT
3D Printer
REVERSE ENGINEERING
AUTOMOTIVE INDUSTRY
AUTOMATION

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NeraTek Limited is registered in Ireland, No. 588438 Director: D Forde

Registered Office: Glenview, Grange, Co. Sligo, F91 E3Y9, Ireland Office: Innovation Centre, IT Sligo, Ash Lane, Sligo, F91 WFW9, Ireland

The Precision Engineering and Manufacturing Gateway (PEM), based in IT Sligo, was established in October 2013 and to date has conducted over 100 industry projects. The PEM Gateway builds on the IT Sligo's research strengths in material science, laser processing, micro-machining, polymer processing, rapid prototyping, general manufacturing process control and statistical process analysis. PEM's areas of expertise include:

- Precision Engineering and Design
- Advanced Process Monitoring and Controls
- Manufacturing Process Modelling
- Material Synthesis and Characterisation

These areas of expertise provide a unique holistic industry support offering in precision engineering and manufacturing. Through coupling these areas of expertise together and exploiting common competencies, the PEM Gateway is positioned to provide comprehensive research and technology services to the Irish manufacturing industry across a range of sectors.

CASE STUDY: ATA Air Tools

Company overview: ATA is the world's leading manufacturer and distributor of precision engineering products for companies requiring a comprehensive range of material removal and finishing solutions. ATA design, manufacture and distribute a comprehensive and advanced range of tungsten carbide burs, pneumatic tools and abrasives – both bespoke and standard. They advise and serve customers operating in all major industry sectors including aerospace, automotive, oil and gas markets, shipbuilding and metal fabrication.

Project Scope: To research design optimisation of the key components and performance of the motor, specifically the turbine, the power output and rotational speed. The project work included:

- Design review
- Theoretical analysis
- CAD modelling
- Computational Fluid Dynamics (CFD)
- Rapid prototyping of key components

Project outcomes: Through the theoretical and CFD analysis the project delivered a more developed understanding of the motor performance, in particular the airflow through the turbine, optimised turbine design and options to control the natural rotational speed. The CAD modelling and rapid prototyping provided visual aids for both manufacturing research and key performance testing. ATA is now building on this research, scaling the design to a range of tool products, and is working on a new project with PEM.

3D CAD model and CFD Analysis

Client Testimonial: *"The work carried out by PEM has proved invaluable in the design of our latest high speed air driven turbine motor. The CFD analysis provided allowed us to experiment with various jet configurations, these were then 3D printed by PEM enabling us to run the necessary power, torque & speed tests. This process allowed us to optimise the motor output while learning a great deal about the flow & expansion of the air through the assembly. I look forward to working with PEM on further design projects in the future."* - Hugh McManus, R&D Manager

Prodieco
Advanced Engineering Solutions

Prodieco is the global leader in the design & manufacture of tooling change parts used in blister packaging machines for the Pharmaceutical Industry. Our customers include fortune 500 pharmaceutical companies operating in the branded, generic and contract manufacturing sectors.

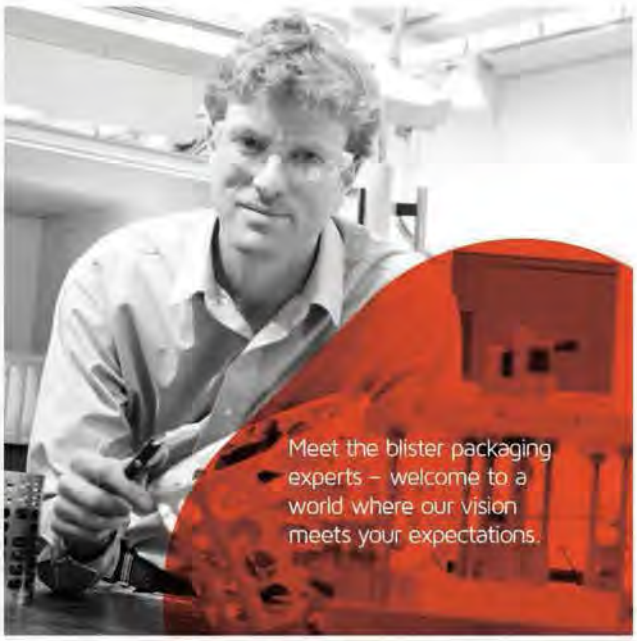
Prodieco's business thrives on change. Every time there is a change in the blister pack – pack size, tablet shape, tablet size, number of tablets per pack – new tools are required to form the new blister pack.

Founded in 1962 as a press tooling company, today our expert people have over 1500 years combined engineering experience with a relentless focus on enhancing tool design to increase the operating efficiency of pharmaceutical packaging lines.

Pharmaceutical companies work with Prodieco because of our knowledge, agility and focus on the pursuit of excellence. Our people are dedicated to enhance every tool design to produce the perfect blister pack.

In recognition of the high quality standards centred on patient safety in the pharmaceutical sector; quality in our tooling is key to our business. Prodieco continues to invest in our unique and unrivalled testing centre called Techlab, where we extensively trial the tools before they leave our factory.

Based in Dublin, Ireland we have built a successful business that retains our roots in expert engineering and innovation.



Our vision is to become a globally renowned engineering brand admired for our quality products, people and performance.

For more information, please contact:

Andrew Rennicks
Director

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m: +353 86 372 1795
e: andrew.rennicks@prodieco.com

KUKA

Robotic applications are revolutionising manufacturing

There exist many reasons why more and more manufacturers are introducing automated applications into their operations; increased product throughput, improved quality output and to remain competitive in an ever evolving manufacturing environment.

As robotics become smarter and faster, the ability to integrate automated processes into industries that have historically relied upon manual handling, is becoming more favourable; consider the food and logistics & supply chain industries.

Manual tasks that require continual repetition with high dexterity; picking, packing and placing. all are processes that can be carried out by robotics, providing cost savings through speed and precision that humans aren't able to achieve.

Here at KUKA we understand that flexible, automated systems allow you as a business, to continue to operate without limiting what you are able to produce for your customers.

From industrial work alone units to collaborative robots, our extensive portfolio covers all common payload categories and robot types.

From industrial work alone units to collaborative robots our extensive portfolio covers all common payload categories and robot types.

If you are looking to adopt automated robotics to support your business growth, contact Brian Cooney at KUKA.

KUKA - Robotic solutions engineered to provide your quickest route to production.

Brian Cooney
KUKA Robotics Ireland
T: +353 (0)42 9395034
E: brian.cooney@kuka.ie

Sligo Chamber Skillnet

Launched September 2015, Sligo Chamber Skillnet is growing from strength to strength.

Managed by Mary Harty the network is based in Sligo Chamber of Commerce offices, the largest business organisation in the North West of Ireland representing over 250 businesses which employ 6,000 people.
The core remit of Sligo Chamber and Sligo Chamber Skillnet is "Helping Sligo Grow".
Sligo Chamber Skillnet offers an extensive portfolio of training courses across a wide range of areas which are enterprise led and responsive to the present and future skills needs of the companies.

Programme Effectiveness is underpinned by ensuring that all provision is demand led, directly relating to workplace practice.
The training programming has a blended delivery methodology which is frequently under review and is measured within the networks linked TNA activity ensuring audience relevance and fit.

Learning styles optimisation of adult learners needs is constantly been addressed with opportunities provided for the following:

- knowledge transfer
- peer to peer learning
- skill development
- competence development

The result is tailored and subsidised training for your business.

Sligo Chamber Skillnet is funded by member companies and the Training Networks Programme, an initiative of Skillnets Ltd. funded from the National Training Fund through the Department of Education and Skills. For further information visit ***http://www.skillnets.ie/***
Training Programme – Summer/Autumn 2017

Quality
Internal Auditor Training
Cleanroom Operations
Quality and Good Manufacturing Practice
Quality Risk Management and ISO 14971
Applied Continuous Improvement
Managing Safety in Construction
Technical
CAD
Alan Bradley/Siemens Training
CDM Training
Confined Space Training
Radiation Training
Management
Leadership
Project Management
Finance for Growth

What are the benefits of training with a Skillnets training network?
1. Cost
As an employee you can attend a range of Skillnets courses at no cost to yourself - all costs are paid by your company and Skillnets.
2. Relevant courses
Skillnets training networks, and the courses they provide, are industry-led so you can:
• Attend courses that are needed by, and relevant to, not only your company but also wider industry
• Enhance your knowledge of current market trends in your sector/region
• Open up career progression and development paths
• Achieve new, relevant work qualifications
3. Networking
By training with employees from other companies, as well as unemployed people, you can:
• Create new business contacts
• Benefit from shared knowledge and networking

Do I have to join a training network to avail of training?
No, the company you work for joins the training network, so that you can avail of subsidised training. Membership costs vary from network to network but in some cases it is free for your company to join and in others there is an annual fee.

Once you have found a course that you are interested in, contact the training network that is running the course to find out about membership costs.

avenue

Defining Precision.

Mould & Moulding Solutions

Avenue Mould Solutions Ltd, Finisklin Business Park, Sligo, Ireland

T: +353(0)71 916 95 10 E: info@avenuemouldsolutions.ie

www.avenuemouldsolutions.ie

Avenue is a dedicated single source solution provider to the medical device and pharmaceutical sector.
It specialises in the design, manufacture and validation of ultra-precision, multi-cavity injection moulds for high volume applications.
It also offers an injection moulding service in an ISO 13485:2003 approved class 8 cleanroom

Avenue Mould Solutions Ltd. Finisklin Business Park, Sligo, Ireland
T: +353 (0)71 916 9510 F: +353 (0)71 916 9511 E: info@avenuemouldsolutions.ie

Career Wise

CareerWise Recruitment specialises in the multinational sector in Ireland which predominantly encompasses the Medical Device, Sciences/Pharma and ICT industries.
We also work into the Indigenous Engineering and Food Processing/Agri sectors.

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Louise Mulligan – Senior Recruitment Consultant - BBS CIPD

• 16 years Recruitment experience with Collins McNicholas (Dublin, Galway & Athlone), HRM (Dublin), Lionbridge (Mayo) and Team Horizon (Mayo & Dublin).
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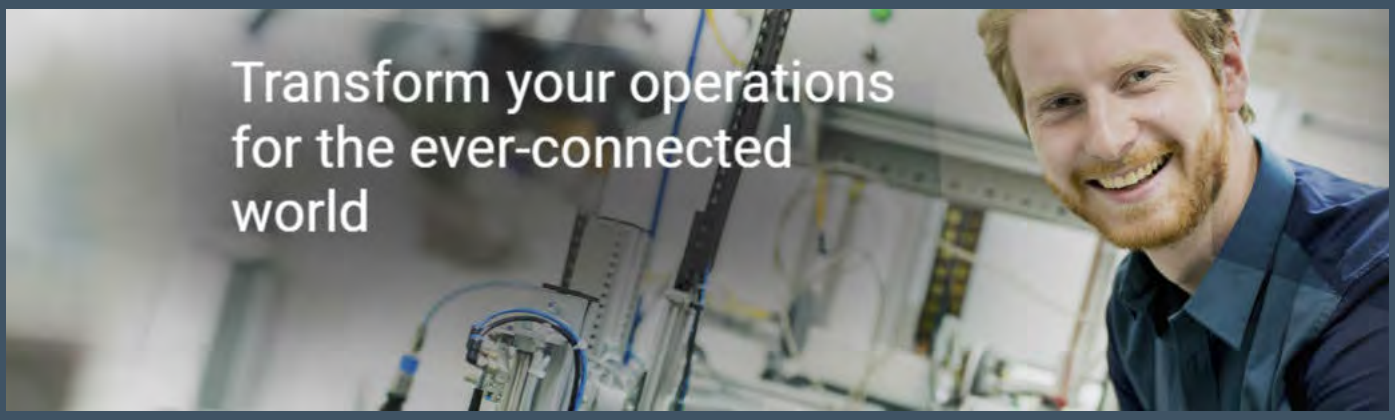
SL Controls



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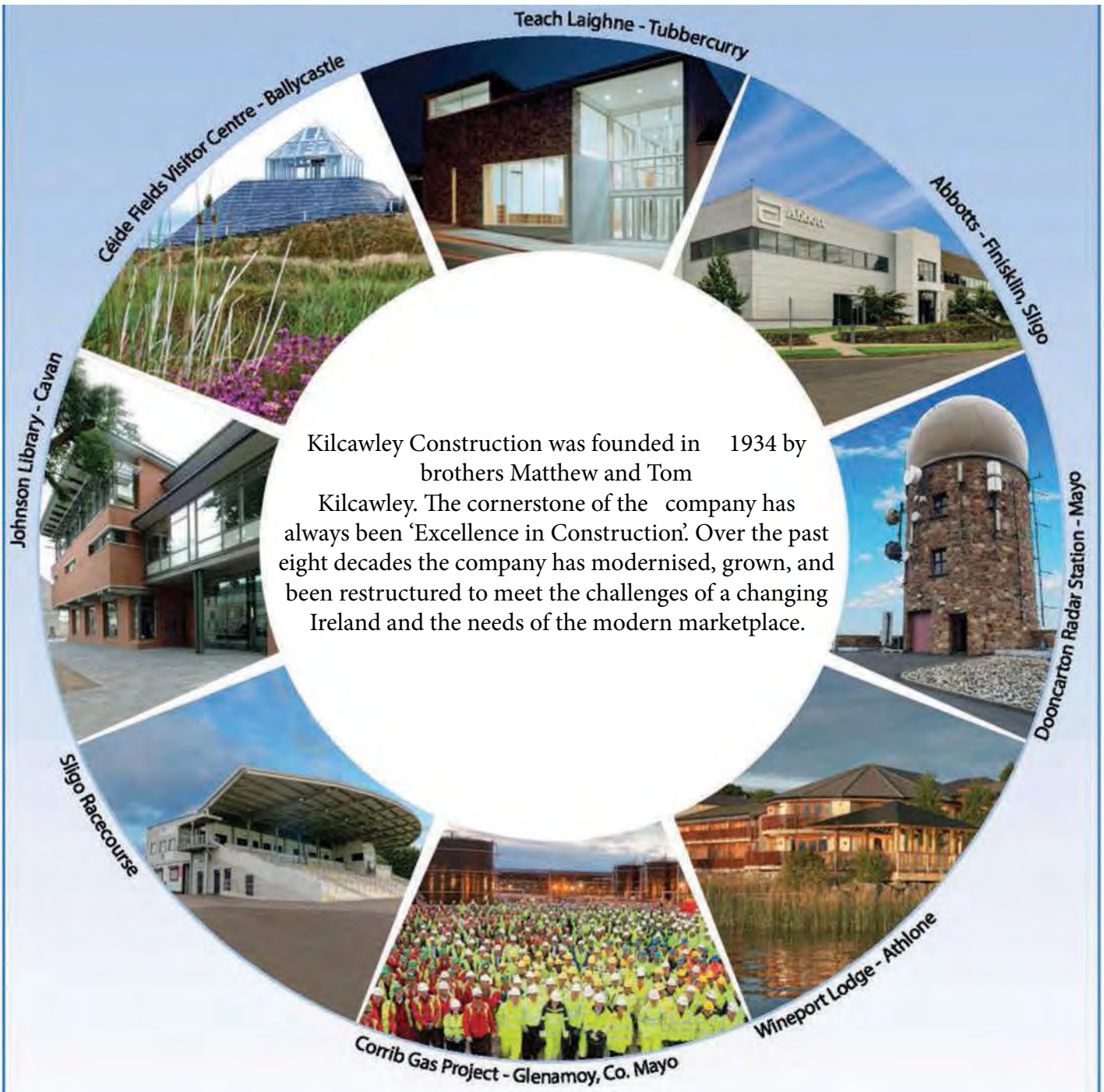
SL CONTROLS
THINKING AHEAD



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Jalmia Solutions

Jalmia is a software development company based in South Sligo in the west of Ireland. We specialize in the development of custom software applications and outsourcing services. We develop solutions using Microsoft technologies.

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Recently completed projects include:

Branch ATM Balancing System
This system takes feeds of payout, ledger and ATM audit history from legacy systems and provides a user interface for branch staff to log cash transferred to device, log physical cash counts weekly and determine daily and weekly balancing outcomes. Differences automatically generate accounting entries to core accounting systems. Users in head office can monitor balancing outcomes across the network.

Customer ATM Refund Processing System
This system takes feeds of ATM data from legacy system and also has workflow to process customer initiated refund claims. All refund claims run through a fraud algorithm to identify suspicious claims and they are processed by an export group. All successful refund claims generate relevant accounting entries and associated communications in an end of day batch process. This systems integrates with card schemes and partner banks.

Interest overcharge case management system
This case management system was developed to review accounts that were potentially overcharged interest. Bulk document upload capabilities were developed to upload large volumes of loan documents. Workflow was developed for case reviewers to review loan documents and identify impacted accounts. Refund calculations were performed on the outputs of the review process and remediation/restitution activities and communications were managed in the case management system.

Mortgage solicitor undertaking fulfilment tracking system
A case management system was developed to log all undertakings provided by solicitors at mortgage drawdown. A predefined automated follow up schedule of activity is executed and evidenced in the case management system. Dashboard provide management with real time progress in relation to outstanding solicitor undertaking and suggest intervention where appropriate. There is integration with the property registration authority to ensure that the process is completed before the case is closed.

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Autonomous Robot for locating people

Joe Dolan
Cavan
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Introduction:

The aim of this project was to design and build a vehicle/robot which will detect a person (in the form of a heat source) and navigate to them either autonomously or through the control of an operator.

This robot can be particularly useful in detecting people in search and rescue situations, such as in the thick smoke of a fire, after an earthquake, or during other such emergency situations, as it can go places where a human cannot go.

The project utilises an Arduino ADK mega to process all the sensor inputs and outputs to the various actuators.

Methodology:

Research:
After investigated it was decided the best method to detect the presence of a person or people would be achieved with the following products:

1. Omron D6T Sensor (Can detect the presence of stationary Human).
2. PIR (Motion Sensor).

Next the rest of the components were identified.
build the Project:

D6T Sensor

1. Robot Chassis from ALS Robots.
2. Sensors for object detection. (HC-SR04 Distance Sensor).
3. Include a camera for real time feedback.
4. A Driver for the wheels (L6227N).
5. Various components.

Design/Planning:
The design process involved:

1. Laying out the I/O so as to make the best use of the Pin functions on the Arduino Controller.
2. Design a PCB board for all the components (not part of the Arduino).
3. Generate a component list.
4. Generate a Flow Chart to help with the programming.
5. Designing a 3D body for the Robot Chassis to protect its components and also to mount the various sensors, components, switches and battery pack on.

Programming:
The Programming of the project was done using the Arduino IDE Software and involved the following steps

1. I/O count.
2. I/O configuration and pin assignment.
3. Write the CPP program.
4. Each component was testing in isolation before adding its functionality to main program
5. Compile and debug using the Serial.print capabilities of the Arduino.
6. Test the program and troubleshoot.

Front view of the first attempt of the body mounted on the chassis.
The shell thickness of just 1mm was insufficient and the body cracked so it required reprinting at a different thickness.
It was increased it to 3mm and this provided a much stronger body.

Methodology(continued):

Quality check:
Each sensor and output device was programmed and tested in isolation before being added to the main program, this allowed any potential bugs in how the sensor and microcontroller interacted to be ironed out prior to introducing it into the more complicated final program.
Each function within the main program was tested and debugged using the serial.print function in order to prove it was completing the tasks it is required to as shown in the figure below.

Safety:
Safety is to the fore in every project, a risk analysis of this concept shows it has minimal associated hazards, the main 1 being a trip hazard.

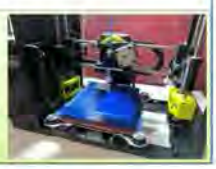
Results:

Design/Planning:
The original design utilised a PIC18 series microcontroller, this had to be changed due to the number of PWM inputs and outputs required. Even with the PIC18F45K22 having 5 CCP (Capture/Compare/PWM) pins this was not sufficient as the project required 9 total (4 inputs for the RC control, 3 inputs for distance sensing and 2 outputs for drive speed control).
The overall design philosophy works very well

The Robot was designed to the following concept:
While in Manual mode
→ Follow all commands from the handheld RC transmitter.
→ It has no collision or obstacle detection while in this mode.
While in Auto mode
→ All manual navigation controls disabled.
→ Wait for Scan_for_life enable.
→ Once enabled scan for life by rotating on the spot.
→ Detect life (in the form of a heat source) and navigate to the life.
→ Avoid obstacles where required.
→ Come to a stop approximately 60cm from the person (at_goal).

The onboard camera is operational all of the time.

A shot of the 3D printer in action, printing the back half of the Body.
Due to its size it had to be printed in 2 parts for the main body itself.
The printer had a limitation of 154mm x 154mm x 150mm.
PLA filament was used as the material for the 3D printing, this is recommended for beginners.



Results(continued):

Control:
The Controls work well and with the change to the Arduino it was possible to add a plug in LCD for fault identification.
The limitations of the sensors means they can only detect a person who is in line of sight, this means the robot would not need to avoid an obstacle as if an obstacle is present it will prevent the detection.
It can navigate over any small obstacles it might encounter.
The onboard Camera provides valuable information to the operator.
Error detection was included for all sensors where possible and an indication LED will alert the operator, this was not in the original design but was added after some debugging operations.
An LDR(light dependent resistor) was also added and some lights for operation in the dark.

This picture is of the Robot in an unfinished state, the front half of the body needed to be reprinted and all the sensors, camera and switches need to be mounted.

Conclusion:

- This project provided an opportunity to display skills and knowledge gained from the course in a practical way.
- Overall the project was a success and the objective was achieved albeit with limitations.

The main limiting factor of the project Included:

- The limitations of the PIC sent me in a different direction than originally planned.
- The nature of the Sensors used means the subject needs to be inline of sight to be detected. It also is susceptible to false triggers as any heat source will trigger a detection. This also means it could not be used in a the case where a building is on fire.
- The RC Control limits its distance range.
- The unit cannot traverse up staircases which also limits its ability.
- The addition of an infrared camera could aid the operator.
- The body and parts used limit the robots ability to work in extreme conditions (ie above 40C for most components) and its also not Ex(e) rated for explosive environments such as mines (this could be corrected however at a cost).

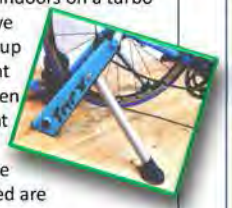
Left: The Fatshark FPV kit for the camera was used.

Right: The Flysky FS-CT6B 6 RC Transmitter was used for the interface with the operator.

Cycling Computer

INTRODUCTION

In Ireland the weather in the winter months Means cycling outdoors is often impossible. The only option is to train indoors on a turbo trainer. As most cyclists have their cycling computers setup with the sensor on the front wheel a problem arises when training indoors as the front wheel is stationery, so information such as average Speed and distance travelled are Lost to the cyclist.



To overcome this issue the cycling computer project is designed to be quickly setup by clipping a hall effect magnetic sensor on to the rear wheel data such as current speed, average speed, distance since last trip, overall distance, time since last trip and current time.

AIMS OF THE STUDY

To demonstrate the theoretical and practical knowledge gained over the course of our study by designing and building an embedded systems based project to overcome a real world issue.

METHODOLOGY

Research:

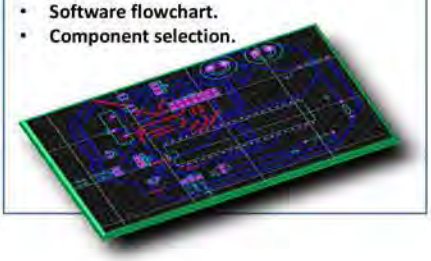
Research began by finding the most relevant data for the cycling computer to display. This was found to be:

- **Current time of day.**
- **Elapsed time of current bike ride.**
- **Current speed.**
- **Average speed.**
- **Total lifetime distance.**
- **Elapsed distance of current bike ride.**

Design / Planning:

The design process Involved:

- **Block diagram.**
- **Schematic.**
- **PCB Layout.**
- **Software flowchart.**
- **Component selection.**

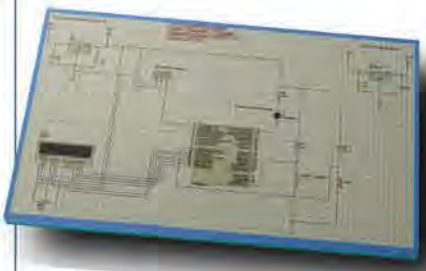


METHODOGOLY (continued)

Testing:

Tests to be completed include:

- **Voltage regulator testing.**
- **Hall effect sensor testing.**
- **Lcd testing.**
- **Finished project testing.**



RESULTS

Design / Planning:

The design and planning process was completed on time and on budget for the project.

- **Block diagram created using Microsoft Word.**
- **Schematic and PCB Layout both done using Proteus.**
- **Software flow chart completed using Microsoft Power Point.**
- **Component list finalised and submitted.**

Testing:

Voltage regulator testing results:

- **9v to 5v voltage regulator circuit tested and working.**
- **9v to 3.3v voltage regulator circuit tested and working.**

Hall effect sensor testing results:

- **Hall effect sensor tested and when magnet passes the sensor the output voltage drops from 3.3v to 0v.**

RESULTS (continued)

Lcd testing results:

- **Test Lcd circuit tested using Proteus.**
- **Test Lcd circuit tested using breadboard.**
- **Test counter program tested using Proteus and on breadboard.**

Finished project testing results:

- **Finished project displaying result for Distance Travelled.**
- **Finished project displaying result for Speed.**
- **Finished project displaying elapsed time.**

Due to issues encountered I did not have enough time to deliver all aspects which were initially intended.

CONCLUSIONS

- Overall the project was an excellent learning curve which gave the opportunity to demonstrate many of the theoretical and practical skills gained from this course.

- The objective to allow the user to cycle indoors on a turbo trainer and still have valuable performance data available without needing to adjust the outdoor cycling computer setup was achieved.

- From completing the project confidence has been gained to take on bigger more complicated projects in the future.

CONTACT INFORMATION

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Object Avoiding Autonomous Homing Robot

Darrell Varney

1 Introduction

This final year project involves building a 4 wheel robot that is able to avoid obstacles and arrive at a home location. The home location is setup by a homing signal using an infrared transmitter and receiver. The robot is controlled by a Raspberry Pi which is the brain. There are 4 DC motors which controls its direction. The robot would need to travel a distance while there are objects in its way, it would require that the robot avoids these objects in getting to its home location

2 Project Objectives

The main objectives for this project are:

- Have done enough research on components so that the most efficient and cost effective solutions are used in the project.
- Have done more research on autonomous robots to get a better understanding of how motor controllers are interfaced with a Raspberry Pi.
- Have a complete Bill of Materials for the project.
- Have a PCB design and Schematics done up in Proteus design software.
- Have a working prototype that would avoid obstacles in its way and get to a set home location.

3 Background

The author took this project up as a challenge to himself so that he could use his knowledge and understanding of various components used. The autonomous meaning is that the robot/vehicle should be able to carry out its duties without outside influence or control. There are many ways and possibilities that a robot of this nature can help in real world situations. In the not so distant future robots/robotics will interact with humans both physically and cognitively using advanced communications and information processing in all parts of their lives. This project by the author would help in the understanding of that interaction in a smaller scale but would be able to expand into bigger, better and more intelligent models in the future.

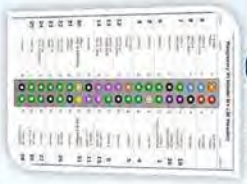
4 Methodology

The author researched various different robots and there weren't many robots that would be autonomous as well as homing. This project uses the Raspberry Pi 2 Model B as the main controller and uses 1 L298N DC motor controller to control 4 motors. The Raspberry Pi needed an operating system installed on it so that it was able to be used as part of this project. The Operating system the author installed was called Raspbian which is a Debian based operating system for the Pi. The author used one ultrasonic sensor as the eyes of the robot along with a servo motor which scans for objects in front of it while it moves forward. The homing beacon is called the Pololu IR beacon, they come in pairs one is connected to the Pi so that it can detect the other at its home location.

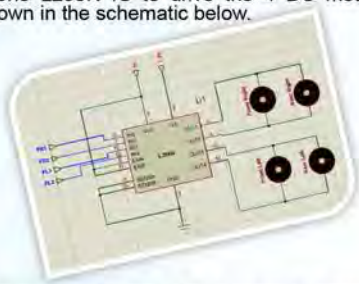
5 Methodology (Continued)

The original design was designed around the Arduino microcontroller but was requested to use a PIC microcontroller or Raspberry Pi. The author designed the prototype using the PIC but at the same time was working with the Raspberry Pi as well. The author ran into issues using the PIC when trying to control the servo motor using Pulse Width Modulation (PWM) along with the motors. The eventual solution was to use the Raspberry Pi as the author was able to use PWM without any issues.

The raspberry pi is a mini PC which has General Purpose Input Output (GPIO) pins which can be controlled by programming. Shown below are the Pi and the GPIO pin setup.



The DC motors were controlled using a L298N DC motor controller. The author connected two motors on the same side in parallel, and used only one L298N IC to drive the 4 DC motors as shown in the schematic below.



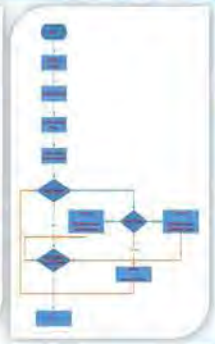
The raspberry Pi and the ultrasonic sensors were powered using a Ywrobot power supply board. As the raspberry pi could only handle 3.3v at its GPIO pins the author made up a simple voltage divider to reduce the voltage from 5v to 3.3v volts from the Echo pin of the ultrasonic sensor..

Ywrobot power Board

Voltage divider

The eyes of the robot was the ultrasonic sensor, as the robot needed to look for objects in front of it the author used a servo motor where it was able to look left to right. The ultrasonic sensor was attached to a bread board and in turn attached to the servo as shown below.

6 Block Diagram & Flow Chart



7 Build Test

The author of this project was expected to build and test the unit, at this stage the author is working on the homing part of the robot. The testing of the object avoidance part is complete and there is some tuning to be done on the system. The completed prototype is shown below and is operational.

8 Conclusions

By completing this project the author was able to use the knowledge he gained in IT Sligo in a practical way. The project schedule ran according to plan for most part, as there were issues encountered the author was able to overcome them and complete the project in the given time with the help of my mentor Shane Gilroy. Time was a constraint to this project as the author was completing his study at the same time.

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Project Supervisor: Shane Gilroy

Darrell Varney, Navan, Co. Meath
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Automated Gate System

Student Number : S00158311
Project Supervisor Fergal Henry

Matthew McGovern

Introduction:

Why This Project:
This project is to allow the user to open and close a gate remotely without having to leave their vehicle. The Reason that the author has chosen this project is to help meet the needs of modern farmers. This is by helping to make certain tasks preformed easier, such as moving machinery in and out of a field a safer operation and also providing security feature to prevent the accessing farm gates.

Aim of this project:

The Aim of the project was to develop a Automated gate system which could easily be fitted to a standard farm gate. The author's aim was to make certain tasks on the average farm easier and safer to completed by a single person. The increasing trend in farming is one man part time operations . There are always number of incidents of accidents on farms relating to gates where a farmer is crushed in the process of opening or closing a gate. The author hopes to address this issue in this project. There has also been a number of traffic accidents where a vehicle has collided with farm machinery while a farmer was opening or closing a gate to enter or exit a field. The number of thefts on farm is increasing year on year . The Author aim was to increase the security on the gate to prevent access .

Benefits of this project:

1. To provide a safe and easy automated gate system.
2. To Reduce the number of incidents of Accidents.
3. To reduce the number of thefts on farms by providing a security system which can only be activated by the key holder .
4. To provide a cheaper and easy method of Automating an farm gate

Research:
The author researched the different types of automated gate systems on the market. The majority of systems had to be fitted to the gate at the manufacturing stage. There were a number of systems on the market, mainly in the USA and Australia where a linear actuator could be fitted to a existing gate and controlled using an RF controller. These system did not have any safety system to prevent crushing.

This projects was broken into a number of sections:
1. The opening and closing of the gate
2. Safety systems
3. Remote Activation system

In this project the Author used a Pic 18F45K20 microcontroller to control the peripheral devices The Author wrote the software code using MPLAX and the XC8 Complier to program the Pic Microcontroller. The software program is used to active both linear Actuators to open and close the gate. There is also a hardware interrupt to stop the gate during the closing operation.

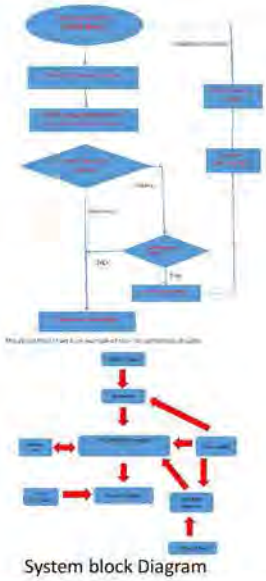
Methodology (Continued):

The interrupt is activated by a infrared beam detector.

An Sharpe GP2Y0A41SK0F infrared beam detector across the front of the gate will provide the safety feature in the Automatic Gate System which once activated will cause the gate to stop moving. The gate can only begin its operation again once a new signal has been sent to the PIC microcontroller.
During both the opening and closing operation a flashing warning light will also be activated to indicate that the system is active. To control the linear actuators I am using Relay modules as a switch to activate 12v battery which will power the linear Actuators and the warning light. In the circuit diagrams shown below is the circuit for the transistor used as a switch to control a motor. The instruction to activate the software is done by means of a smart phone which will send an instruction to the HC -06 Bluetooth module which is connected to the Pic Microcontroller.

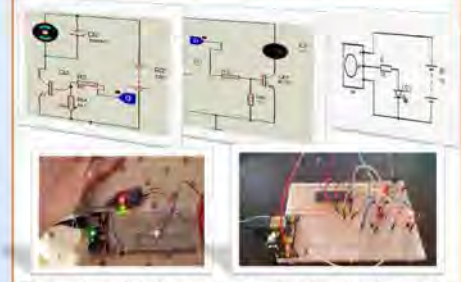
Build and Test :

After deciding on the concept of the project the Author then developed the basic design. For both the hardware and software of the project the author developed an flow char and Block diagram (as shown below) to help clarify all the steps involved in the process.



System block Diagram

Build and Test (Continued):



The author did a lot of the testing by simulating the different blocks of the project in Proteus which was found to be very useful as the circuits could be built and test very easily without having to build it on a bread board. Some of the circuits were built on a breadboard and were only used to test different components and were not part of the final project.
The breadboard was also used for learning to program the PIC Microcontroller as well as testing different modules within the project.
One of the circuits that were built and tested on the breadboard, was the infrared beam detector circuit. A circuit was built to test and verify that the chip had been programed correctly and to verify that the program could activate transistors which would turn on and off a number of LED`s in sequence for a set amount of time.
To test the linear Actuator the author connected them to a 12 volt battery to verify that they worked correctly and also to measure the time they took to open and close to measure the correct timing delay for the software program which would be used to activate both Actuators. Both the linear Actuators were then fitted on the gate to find the correct position to be able to open and close the gate correctly.

Final Build and Testing :

All the different modules of the project that has been built and tested and has achieved the results that were expected. The infrared beam detector has been tested that its output signal activated a 5 volt relay which will stop the operation of the Linear Actuator. The next part of the testing of the project was to connect all the different parts of the project and get them working as one. This was done by running the system on a loop which verified all component in the system worked correctly. The last part involves the testing and verification of the Bluetooth module.

Conclusions:

- Working on the project has been a very positive experience. Some aspects of the project have been difficult such as the coding of the code and the Bluetooth module.
- All the different aspects of the project have come together .I have learned a lot of new skills and worked with a lot of new technology .

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Baby Monitoring Bracelet

Introduction:

The purpose of this project is the ability to monitor the vital signs of a baby in the first year of their life.
This is done by monitoring the heartrate and temperature, checking they are within normal range.

Background

With this project first time parents will be able to keep track of their child's temperature and heart rate in real time with access to it at all times.
If the child's temperature/heart rate was to spike or drop suddenly then they would be alerted automatically through their phones.

SIDS

Sudden infant death syndrome (SIDS) is also known as cot death. It is the sudden unexpected death of an apparently well infant, for which there is no explanation.
Many infants who died of SIDS had recently had a cold, which may contribute to breathing problems.

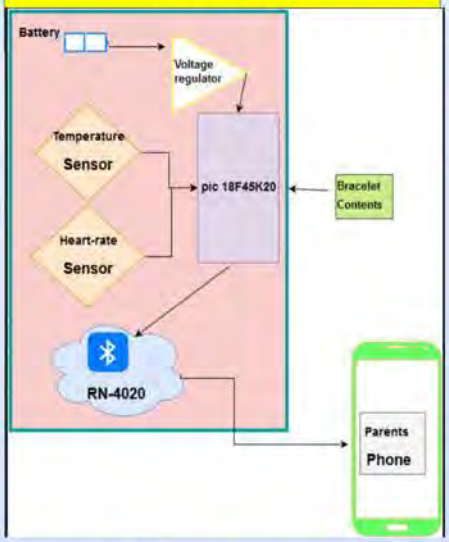
Some common symptoms associated with SIDS are:

- Male children are more susceptible
- Born with a low birth weight
- Born prematurely
- Respiratory infection.

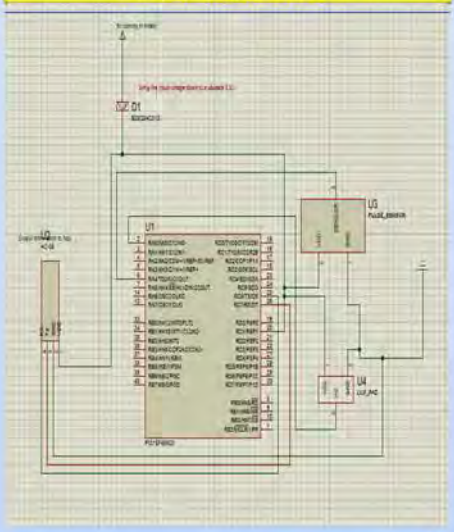
• Cot deaths in the UK* (babies aged birth to one year):

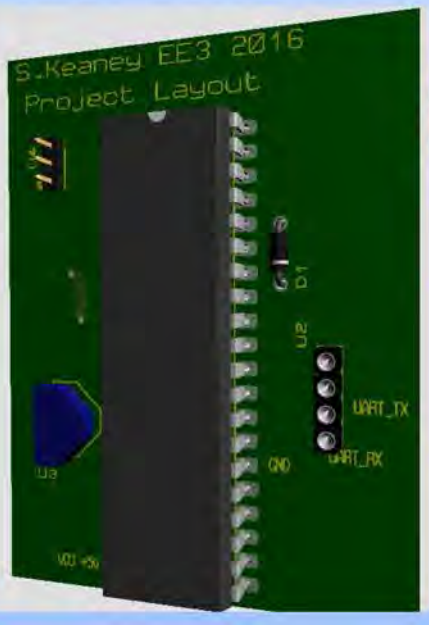
	England & Wales	Scotland	N. Ireland	UK Total	UK rate (per 1000 live births)
2010	254	26	7	287	0.36
2009	283	24	13	320	0.40
2008	287	22	9	318	0.40
2007	273	31	10	314	0.41
2006	285	29	11	325	0.43
2005	325	20	10	355	0.49
2004	317	31	17	365	0.51
2003	315	44	5	364	0.52
2002	298	34	4	336	0.5
2001	330	35	12	377	0.56
2000	334	35	5	374	0.55

Block Diagram



Schematic & 3D View





Procedures

Step 1	Step 2	Step 3
		
This pulse sensor will monitor the pulse of the child and warn the parent if there is a change in the normal range	This temperature sensor will monitor the child's temperature and warn the parent if it gets too high/low.	This Bluetooth module along with an app will transmit the vital information to the parents phone where they can monitor it.

Expected result

When this project is finished, the expectations from it will be a very comfortable, wearable device that will give parents that extra peace of mind throughout the day that their child is safe.
Whether it is their first or fifth child the fear that something will happen the child is always there.
Therefore, because of the peace of mind they can get from this project they will get some extra sleep, which in turn will help them function that bit better in society and at home.

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Smart Thermostat

Introduction:

The Smart Thermostat is a device the automatically adjusts a heating cycle in order to reach a desired temperature by a specific time.

The user inputs a desired temperature set point and end time, based on these values and current room variables, the devices calculates a specific start time in order to meet the request.

The device will recalculate to compensate for changes in ambient room temperature.

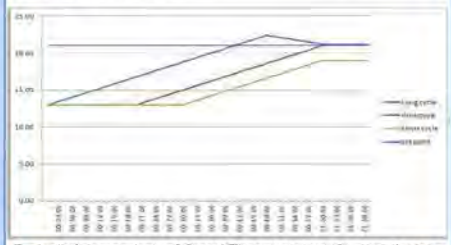
The idea for this project came whilst fault finding a storage heating based system that used a weather compensator.
The need to adjust a heating cycle duration based upon an external temperature that may not influence room temperature, seemed unnecessary.

Aims of Study:

To demonstrate the knowledge gained over the duration of study with regard to circuit design and PIC microcontrollers.

Methodology:

Current options:
Current market devices require the user to input a start time, end time an temperature. This requires the user to *estimate* the duration to reach the specific temperature.
Too long a cycle and the heating could deactivate early, too short a cycle and it may not reach the required set point.
The Smart Thermostat works on what you want, when you want it.



Projected comparison of Smart Thermostat vs. Current devices.

Research:
Research began with a formula to calculate the length of time to heat a specific volume of air.

$$Q=mC\Delta T$$

Where:
- Q is the energy required in Joules.
- M is the weight of air in the space.
- C is the specific heat capacity of air.
- ΔT is the temperature change.

Methodology (Continued):

The weight of air in the space is the volume multiplied by the density of air which is *1275g / M³*.
The specific heat capacity for basic calculations can be taken as 1.

A 1000 Watt heater outputs 1000 joules per second.
Therefore:

Q / Heater Output = duration (S).

Design:
The Smart Thermostat is designed to be a basic market product.
It is hoped the thermostat would:
1. Increase user comfort levels by being more precise than current models.
2. Reduce unnecessary runtime on heating appliances.
3. Reduce energy consumption.

Operation:
During initial setup, the operator inputs the room dimensions and heater output.
When the timer is enabled, the device periodically recalculates the start time based on current room temperature and checks if it is time to enable the heater.

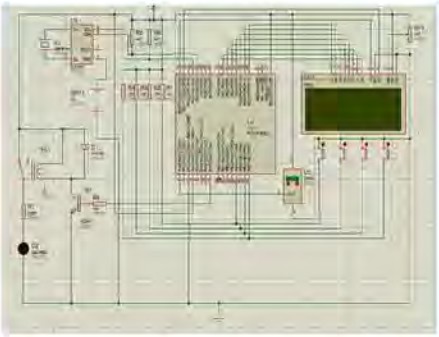
This recalculation is disabled if the timer function is not active or if the user is configuring the device, and is re-enabled upon exiting to the home screen.

User Interaction:
The device required a means for the user to interact and program. This was designed to be simple to follow with as few buttons as possible. A large 4X20 character display is used to display instructions and current info while a mere four buttons correspond to functions that are displayed on the bottom line of the display.

Menu:
The device menu is navigated using a menu tracking variable that is incremented or decremented according to what ever buttons are pressed.
The device then displays the relevant information on screen and waits in a loop for a button to be pressed.

The menu allows the user to edit settings such as time, program and room variables, and also to reset the device to factory settings.

Results:



Simulation using Proteus software show the device to function as intended with regards to menu traversal, reading and display of time and temperature and the calculation of the start time based on altering current temperature.

Build:
The circuit prototype was built using a breadboard.
Initial attempts to interface the LCD with the PIC microcontroller proved difficult.

The device incorporates the following:
- A PIC 18F45K20 Microcontroller.
- A real time clock (RTC) that interfaces with the PIC using an I2C interface.
- An LCD interfaced in 8 bit parallel mode.
- An LM35 temperature sensor whose output is linear to the temperature range.

Conclusions:

- This project provided an opportunity to display skills and knowledge gained from the course in a practical way and was an excellent learning experience.
- The objective to calculate a heating cycle based on current room temperature was achieved.

The main stumbling blocks of the project:
- The project schedule did not go according to plan mainly due to issues with LCD Compatibility. This had a knock on effect in relation to time management, writing of code and testing of device.

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Remote Control Vehicle

Iolanda Nilluti Collis
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Introduction:

The remote control vehicle is designed to move over an uneven terrain, such as a field. The purpose of this project is to provide a machine to help people during the time of harvesting grapes for wine production. The work itself consists of lifting heavy buckets full of grapes as the worker moves along the grapevines. To avoid strains, the vehicle carries the bucket for the worker and is manoeuvred along the vineyard by using android. This vehicle has been improved by adding a safety procedure such as an object avoidance system, in case an animal or human obstructs its path.

Methodology:

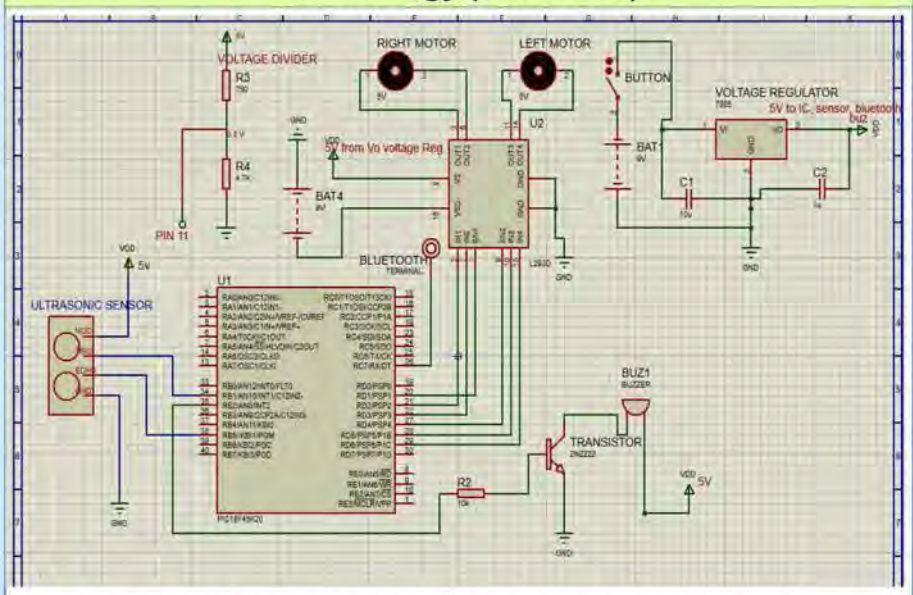
The workload is divided into sections:

The first section deals with the motion of the 2 motors and the wheels ability to move forward, backward, turn and stop. The speed is given by a pulse with modulation in order to achieve a smoother acceleration. The code is embedded in the Pic 18 series through MPLabx and simulated with Proteus.

The second section deals with Bluetooth and the sensors frequencies. In order to manoeuvre the vehicle in the desired direction with a mobile phone and at the same time to detect obstacles, the proximity sensor and Bluetooth should operate at the same frequencies.

The third section deals with assembling all parts of the vehicle and placing together the various pieces of code.

Methodology (Continued):



The software used for the project are MPLABX IDE for embedded systems and Proteus for the simulation of the circuit operation, as shown in the schematic above

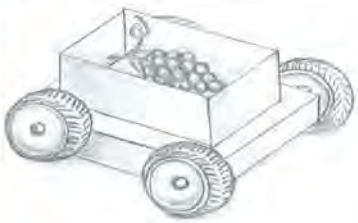
Components employed:

The transmission between android and Bluetooth occurs via an UART communication.

Two 9 volt batteries are utilized to guarantee a continuous operation of the 2 motors without voltage dropping in transporting a load and in acceleration. However, the PIC operates at 3.3Volts and the motors work at higher voltage, namely 5Volts; therefore a voltage regulator to lower the voltage to 5 volts is applied and a voltage divider to further drop the voltage to 3.3Volts is utilized. The presence of an object in the vicinity is detected by an ultrasonic sensor and identified by a buzzer's beep. All the components are mounted on breadboards.

Results:

The circuit is tested on a breadboard and the code for the motors is embedded on the Pic 18F45F20. The rover goes forward, backward, turns right and left. The direction of the vehicle is controlled by sending the commands through android. The speed is regulated by a delay. Two breadboards are employed: one for the pic, IC, voltage regulator, etc. and a second one for the sensor and buzzer.



Conclusions:

The aim of the project is to construct a prototype designed to carry different types of weights over a distance.

Issues encountered:

- The time for its realization was an issue as the components ordered never arrived, and some of them had to be reordered again.
- The chassis was too small to contain the breadboard so other alternative pieces had to be sourced.
- The chassis is not perfectly straight therefore the front wheels are a bit tilted and, as a result, when the vehicle goes forward it turns a bit.
- The voltage divider had to be changed 3 times before finding the right size for the second circuit.

Android Controlled Home Automation System

Name: Philip Barry
Course: BEng in Electronic Engineering
Project: Android Controlled Home Automation System

Introduction

By the end of 2016 the number of smartphone and handheld device users is predicted to reach just under three billion worldwide. For the average person, a smart phone replaces other such devices as: alarm clock, calculator, laptop, health/lifestyle devices and GPS navigation systems.
This project aims to control household electrics i.e. lighting, heating or air conditioning remotely via Bluetooth using an Android Application.

Aims of Study

To bring this idea from the concept stage to a fully functioning prototype, demonstrating theoretical and practical skills and gaining valuable experience in the research and development process.

Methodology

Research
This involved a reading and viewing of related materials - articles, websites and projects, to gain a better insight and understanding of this area before proceeding to the next stage. A number of questions helped to focus the area of research, and also helped to gain a better vision for further development. Some of these questions are as follows:

- Are there similar products on the market?
- What are the price ranges?
- What could this project do differently?
- How much would it cost to build a working prototype?

Background:

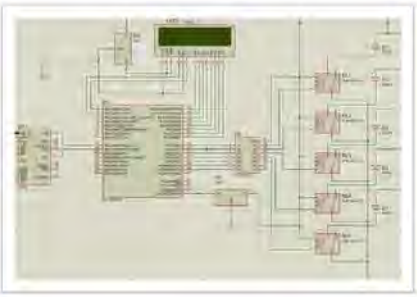
- At the start of the 20th century early home automation started with labour saving machines such as: washing machines, refrigerators and sewing machines.
- The first home automated system "Echo IV" was developed in 1966. This system used a series of switches and circuitry to enable user input, and in turn perform household tasks such as the switching of electrical devices.
- Today, with concepts like the Internet of Things, a lot of devices and appliances are wirelessly connected and communicating with each other to set and complete tasks. This can be very helpful in a number of areas including: In the household, emergency services and the manufacturing industry.

Methodology (Continued)

Design
During this stage it was important to stay focused on the overall project scope. Planning and time management were very important for staying on track. The design stage consisted of the following:

- Weekly log
- Gantt chart
- Test plan
- Schematic
- Block diagram
- Software flowchart
- Component list

Meeting each goal ensured an even spread of the workload and helped in preparing for the final build.



Components:
A list of components including their prices and quantities was put together during this stage. All components were ordered together and as early in the process as possible to ensure on time arrival for build stage.

All components were obtained from ie.Farnell.com

Health & safety
This project abides by the regulations and standards set out by Irish and European governing bodies. All components in this project were sourced from companies with a high level of ethical practice.
For the purpose of demonstration, this project will be powered by battery as opposed to mains electricity.

Methodology (Continued)

Building & testing

- Each component was tested separately to ensure correct working order.
- Calculations for power supply and resistor values were carried out before building and testing components on a breadboard.
- LEDs were used in place of larger electrical loads to allow for earlier testing before components arrived.
- An electrical relay was interfaced with the microcontroller and tested for switching via received signal.

- The HC-06 Bluetooth module was interfaced with the Pic Microcontroller.
- The EUSART module on the microcontroller was configured to receive a transmission.
- An android application was created using Android Studio software package and a successful transmission was sent to the microcontroller to activate the relay.
- The LCD is currently being programmed and tested using MPLABX integrated development environment.

Conclusions

- So far the project is functioning as expected and a number of problems have been solved.
- The experience overall has been positive and valuable transferrable skills have been gained.
- There is still a lot of work to do so there will be a heavy focus on completing the final build in the coming weeks.

EXPO Day plans

- Have a fully functioning and portable build ready to showcase
- Build a wooden unit to house the system in an interesting and presentable way.
- Make sure the system is easy to understand for both technical and non-technical people alike.

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Driver Alcohol Detection System

BEng Electronic L7 Project by

Amin Shaikh

Introduction

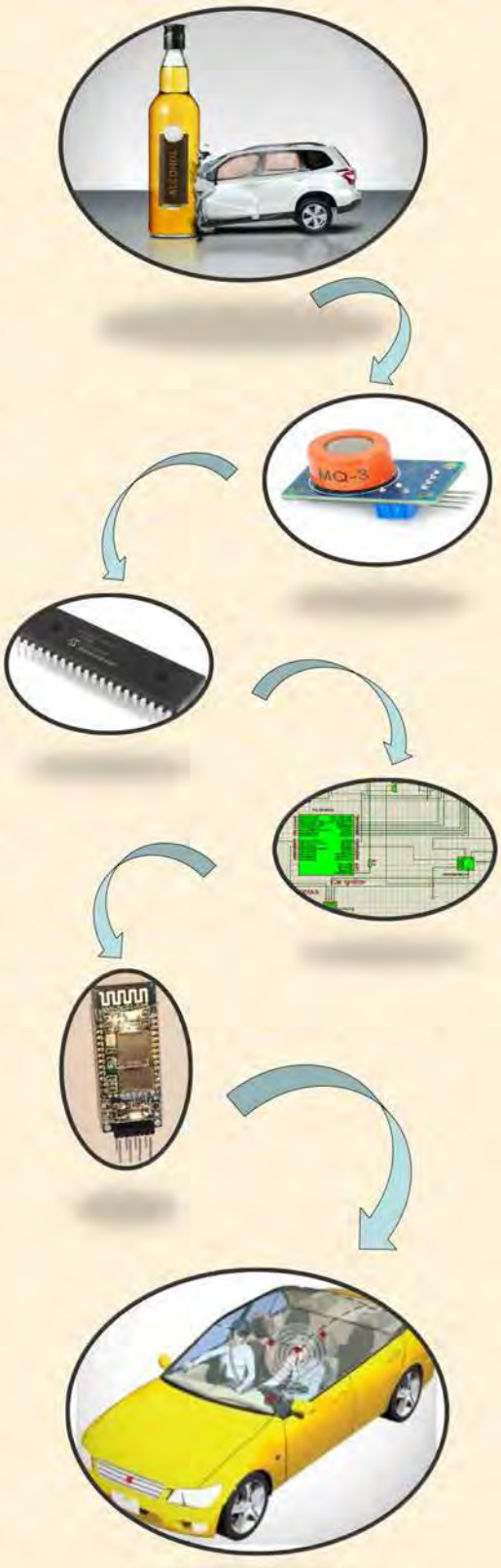
As per the report published by Road Safety Authority (RSA) in June 2016, two out of five fatal road collisions on Irish roads are alcohol related. The report also revealed that between 2008 and 2012, alcohol was a contributory factor in the 983 serious road accidents which claimed 1,077 lives. That is 38% of all the fatal collisions over that period. Having these stats in mind and with the prevalence of alcohol consumption in the Irish culture and indeed around the globe, for the final year project the aim is to design and build a Driver Alcohol Detection System.

Background

With all the information and evidence available on alcohol related road fatalities, curiosity came about and so did the decision to conduct an in depth research on what devices are already out there to prevent these ever increasing incidents. In conclusion of that research, it has been observed that there is a niche in the market for this type of integrated device, and that has now become the aim. This device could be a great help in preventing fatal alcohol related incidents/accidents on the roads. It can also be used by haulage/transportation companies. Government can use this tool for Drink and Drive offenders after their license being reinstated or simply can be used by sensible citizens of the country as a prevention tool in their cars.

Device Operation

This system should check for the presence of alcohol on the breath of a driver and on detection of alcohol, the alarm will sound, the warning light will go off, the engine will be disabled automatically and a notification will be sent via Bluetooth to a mobile phone application which will be installed in a nominated party's smart phone with an option to remotely disable/enable the engine of the vehicle.



Objectives

- Convert the analogue signal received by the alcohol sensor to digital for PIC microcontroller.
- Connect up the relay to the PIC microcontroller & Bluetooth module which controls motor, allowing it to shut down on alcohol detection.
- Have a buzzer and LED light on the circuit which goes off on alcohol detection for demonstration purposes.
- Design and build the mobile phone application for the project.
- Have the ignition interlock working remotely with the user interface of the mobile phone App.

Impact On Society

- Firstly it will act as a deterrent to many who regularly drink and drive, and therefore it will aid in the prevention of unnecessary injuries and fatalities on roads including vehicles, pedestrians and cyclists. It will save many families to have to endure the devastation of a death of a loved one.
- Secondly, it has been reported on RTE news that each road fatality costs the state on average €2 million (Garda Resources, Fire Brigade Units, Paramedics, road closures etc.). With the stats showing that drink drivers are responsible for 38% of road collisions/deaths every year, using this particular device will lower the numbers of incidents therefore cut down public spending in this area, allowing funds to be used in a more resourceful and useful way to benefit the people.

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Platoon

Self-driving Vehicles for the motorway

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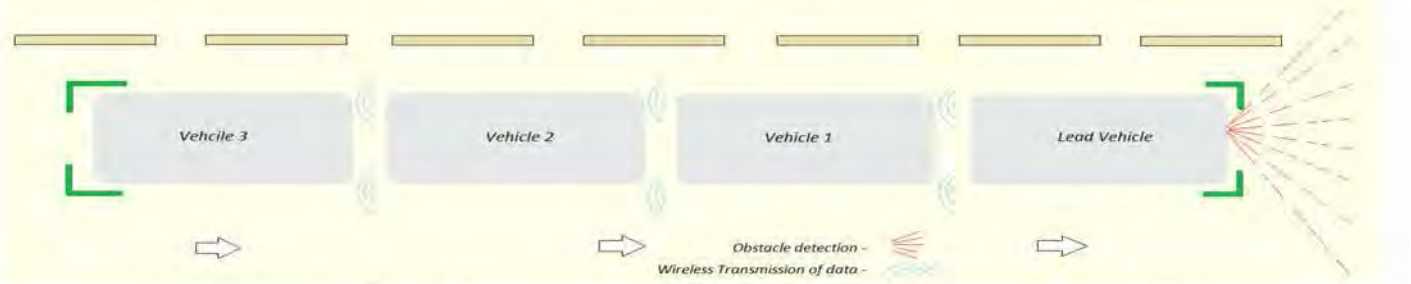
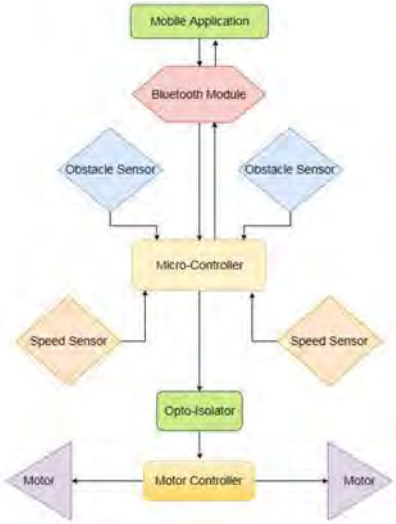


Introduction

Platoon describes a compact set of vehicles travelling on a motorway which are connected wirelessly to a lead vehicle. The lead vehicle is equipped with an array of sensors to monitor its surrounding environment and record parameters such as speed, steering angles, brake inputs, etc.

The acquired information is transmitted to guide the following vehicles in the platoon.
The following vehicles in the platoon require no driver input until the driver wishes to leave the platoon. Effectively while travelling in a platoon the vehicle is self-driving.

Platoon Block Diagram



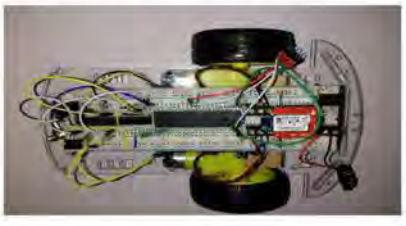
There are numerous benefits to this concept including, reduced aerodynamic forces, reduced fuel consumption and a reduction in harmful emissions. The most attractive benefit from a drivers perspective is that of comfort and convenience while travelling in the Platoon.

Methodology

The Platoon concept has been demonstrated in this project by two small model cars each driven by two DC motors.

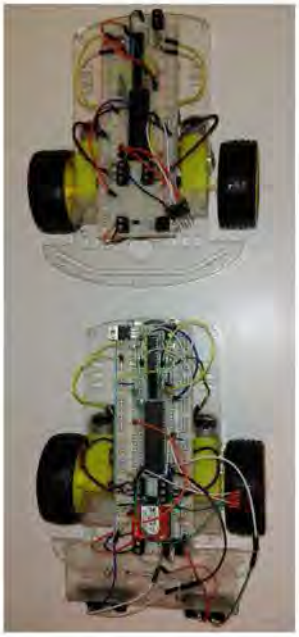
The first model car used will represent the lead vehicle, this will have on-board infra-red sensors for detection of obstacles in its path and also wheel speed/position sensors. The lead car will continuously send the acquired information from the sensors to the follower model car via wireless Bluetooth transmission.

Pulse Width Modulation has been implemented to control the speed of the cars and also to provide the required turning angles. The follower car relies completely on the lead car for its navigation. A mobile application has been designed using Android Studio to interact with the lead car.



Results

This project has demonstrated a follower car which is fully reliant on information sent from the lead car. The two cars have a successful wireless communication link by means of the Bluetooth protocol.



A mobile application can communicate with the lead vehicle to stop, pause or reset the demonstration while in the process displaying the Platoon speed.

Conclusions

Technology based around self-driving vehicles involves a tremendous amount of data collection from a vast array of sensors and then processing this information to perform the correct actions necessary to steer the vehicle safely.

The Platoon project has given an insight into this technology and demonstrated engineering skills such as, circuit design and build, embedded programming and implementing software algorithms.

Distance Measurement Using Stereo Images

Introduction:

Humans perceive the world in 3-D. Our eyes, using binocular vision, perceive the depth of the objects that surround us. Technology uses the same principle to do the same task. Instead of two human eyes, two cameras are used. This project aims to apply the principles of binocular vision and stereoscopy in order to calculate distance to an object from two cameras on a horizontal plane.

Aims of Study:

To apply the skills and knowledge gained through various modules of this course to a real world application.

Methodology:

Research:
Research began by researching existing distance measurement systems using stereo images. The next stage was to investigate different image processing techniques, programming languages, and mathematical algorithms that would carry out the tasks in this project.

Design:
The design process involved:
- Develop project schedule
- Develop initial concepts
- Reviewing available resources
- Construct test rig
- Selecting hardware/Software
- Develop algorithm

Hardware:
- Single Board Computer – Raspberry Pi B+
- IVMECH Camera Multiplexor
- 2 x Raspberry Pi camera modules
- Object for distance measurement

Software:
- Python & OpenCV

Methodology (Continued):

Image Processing Steps

Converts the image from RGB color space to HSV

↓

Image passed through Gaussian filter for smoothing

↓

Threshold the HSV image to get specific colors

↓

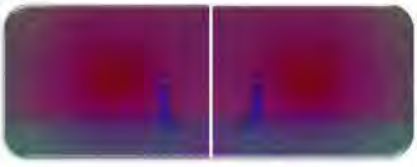
Erode and dilate the image to remove noise.

↓

Return array of the pixel values above a threshold

↓

Compute the horizontal location of the object in the left & right image in pixels

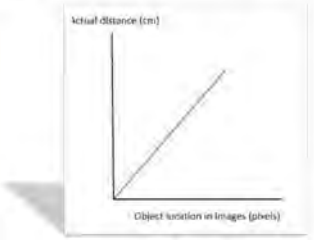


Methodology(Continued):

Mathematics/Algorithm:

The mathematical concept used in this project was based on the 'Equation of a Straight line'

$$y = mx + c$$



Results:

The table below show some results from tests carried out on the system.

Actual Distance	Calculated distance
20cm	22.61cm
30cm	25.24cm
40cm	41.46cm
50cm	49.51cm

Average percentage error = 8.35%

Safety:
Safety was paramount in the design of the project. There were no safety incidents in construction of the test rig. Possible ergonomic safety issues were addressed by use of an adjustable workstation throughout the project.

Conclusions:

This project provided an opportunity to display skills and knowledge gained from the course in a practical way. Overall the project was a success and was an excellent learning experience. The objective to calculate distance from stereo images within a reasonable percentage error was achieved.

Limiting factors of the project Included:
- Time and the amount of testing for the code required
- Budget and resources available e.g. The Raspberry Pi latest version would allow for a more accurate and faster system.

Area for development of this system
- Design an algorithm capable of measuring distance to a specific object shape using object detection.

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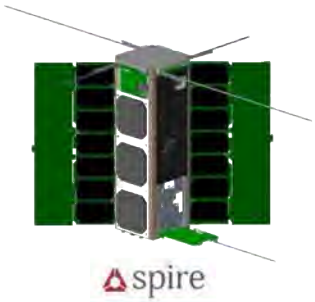
Synthetic Aperture Radar for CubeSats Digital Board

BEng Honours in Electronics Engineering Project
Tomasz Chanusiak

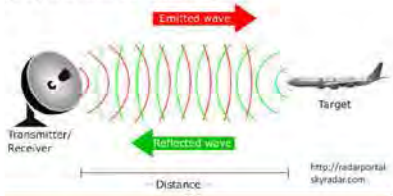
ABSTRACT

Collecting information about the Earth from space has been a topic of interest in the science and research world for many years. Data collected from space provides unique information that helps to solve many societal challenges of global dimension like climate change, tracking of moving objects, monitoring natural resources and give early warning about environmentaldisasters. This is why this development of Synthetic Aperture Radar System for CubeSat satellites. CubeSats are a miniature satellites that operate in constellations on Low Earth Orbit what significantly decreases satellite orbit period and gives us better revisit time.



BACKGROUND

Across a period of more than 50 million years, the echo locating bat has perfected the technique of transmitting a sequence of pulses and interrogating echoes. Using the same principle of echolocation the pilot of super-sonic fighter is able to detect an enemy vehicle hidden behind cloud cover from a distance of 200km. This is possible thanks to a simple principle of detecting objects and determining their distance from reflected echo. In its simplest form radar consists of five elements, radio transmitter, radio receiver tuned to the transmitter frequency and two radio antennas. . In order to detect the presence of the object, the transmitter generates radio waves and radiates them using the transmitter antenna in a form of focused beam. Meanwhile the receiver listens for the backscattered signal (echoes) which are picked up by the receiver antenna.



OBJECTIVES

- Understand basic principles of RADAR
- Select prototyping hardware
- Design Software Defined Radio
- Simulate prototype
- Process received signal

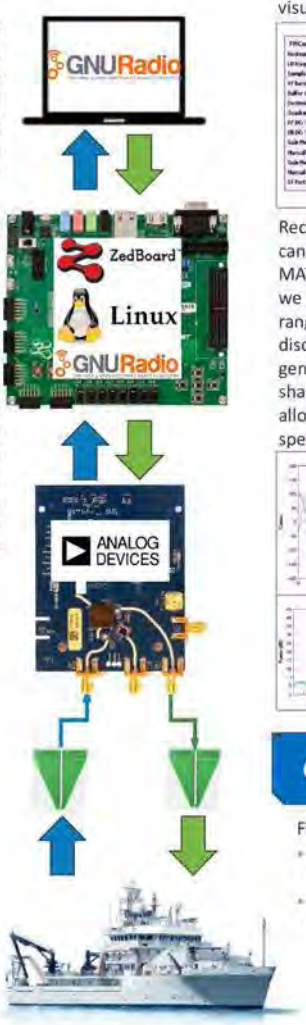
METHODS

The main host machine is running free open-source GNU Radio Companion application which allows to configure Software Define Radios. This is where Digital Signal Processing takes place.
Ethernet communication protocol is used to transfer data between host machine and the development board.
Avnet ZedBoard is a powerful Field Programmable Gate Array development board. To allow communication between host machine and the board, Embedded Linux operating system is installed and also GNU Radio Companion application is loaded on to the system. This is where digital waveforms are generated.

AXI SPI communication protocol is used to communicate between boards. Analog Devices FM-COMMS4 is a front-end Radio Frequency board which can be software configured for wideband tuning as well as for narrow band. For the purpose of this project AD-FMCOMMS4 is configured to transmit and receive signal at frequency of 2.4GHz.

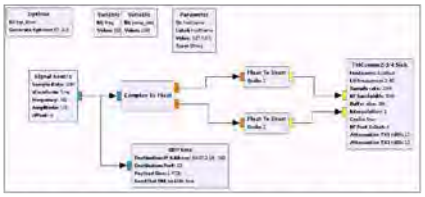
2 x 50 ohm Radio Frequency coax cables are used to connect the transmitting and receiving WA5VJB Log Periodic antennas with the AD-FMCOMMS4 board.
Electromagnetic signals are being transmitted from one antenna and the target reflected backscatter is received by second antenna.

Target shape, size and material will have a great impact on reflected power. Due to electrical permittivity, steel target will reflect Electromagnetic waves better than plastic or wooden target.

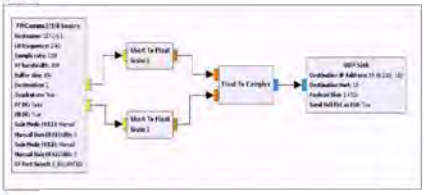


RESULTS

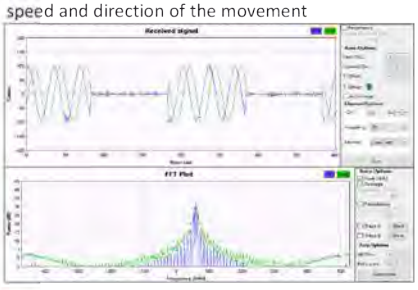
Using GNU Radio Companion the Software Defined Radio transmitter is designed. This transmitter allows to tune the frequency of transmitted signal and carrier frequency. UDP Sink Block is used to transmit generated waveform from the digital board onto the host machine where we it is visualised using GUIs.



Software defined receiver flow graph allows us to tune hardware receiver to look for a backscattered signals in specified frequency range. Also we are able to configure at what frequency the received signal is going to be sampled. UDP Sink block allows us to stream all received data back to host machine for further Digital Signal Processing and visualisation.



Received signal is saved into .wsdr file format and can be processed in third party software like MATLAB or OpenCV. From received information we can identify if there is any target in the radar range. Continuous or pulsed signal returns discretely in time, Fourier Analysis are used to generate spectrum of the signal what results in *sinc* shaped response. Doppler frequency calculations allow to determine how far away is the object, speed and direction of the movement



CONCLUSIONS

Further development requirements:

- Increase transmitter power amplification for better range.
- Develop phased array transceiver antenna for higher resolution.

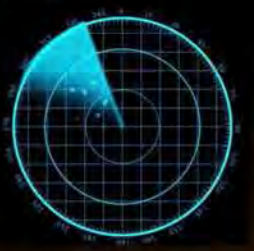
BENG
ELECTRONIC
ENGINEERING L8
(HONS)

TRANSCEIVER DESIGN FOR SYNTHETIC APERTURE RADAR

Sean McGarvey
Spacecraft Manufacturing
Engineer
Spire Global

ABSTRACT

For the last decade there has been a growing market for companies that have the ability to gather various types of data from space. This growth has been accelerated by the nano-satellite industry. Nano-satellites are small cheap satellites that can be launched in numbers from tens to hundreds in a single rocket. The ability to fly large constellations spreading across earth's orbit gives an improved coverage and therefore more data at better re-visit times. These small satellites fly in Low Earth Orbit (LEO) which means they only have a lifespan of around 2 years on average. This sounds bad for business, however it is actually a benefit to these companies. Replacing the satellite's every 2 years ensures they are updated with the latest technology which in turn lets them meet the needs of an advancing industry. A technology which has not yet established itself in the nanosatellite industry is Radar. This technology has the ability to take high resolution images of Earth's surface and, unlike optical options, it is not restricted by weather conditions.

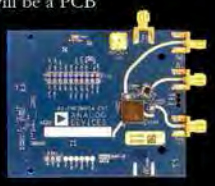


RADAR THEORY

Reflection of electromagnetic waves is the basis of radar. These waves are reflected if they meet an electrically leading surface. By receiving these waves again at their origin the location of objects can be determined along with other characteristics. The waves travel through air at approximately the speed of light. Using this constant the distance that electromagnetic waves have traveled can be calculated. The energy should travel in a straight line through space but can be varied slightly by atmospheric conditions. Using special radar antennas this energy can be focused onto a target.

PROJECT GOAL

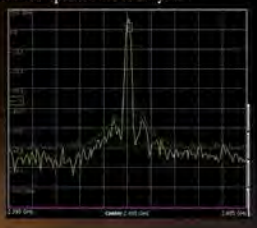
The result of this project will be a PCB front end design capable of transmitting a stable and suitable signal for radar and receive a similar signal converting it into raw SAR data. The method will be demonstrated with the analog devices FCOMMS4 evaluation board.



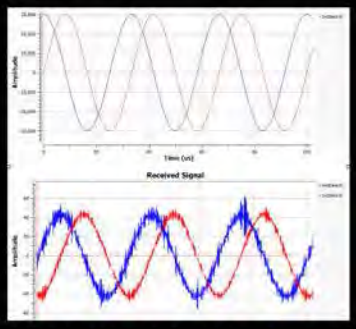
RESULTS

Shown below is the PULSAR RF v1.0. A PCB capable of interfacing with a Zedboard or similar. The board can transmit and receive signals at a carrier frequency of 5.8Ghz with a 30Mhz bandwidth. It has a max transmit peak power of 9W.

Using the FCOMMS4 and Zedboard a signal was transmitted with a power of ~6dBm. This signal was measured with a spectrum analyser as shown. The environment was Controlled Inside a RF chamber. The Signal Frequency and bandwidth were as expected.



A signal was transmitted from the FCOMMS4 through a directional antenna, received through a similar antenna and demodulated. A comparison between the transmitted signal and received signal can be seen below. The phase and frequency of both signals looks consistent with the only drastic change being an expected drop in amplitude caused by free space path loss. This demonstrates a capability which can be transferred to the PULSAR RF board.



CONCLUSIONS

The PULSAR RF v1.0 is a highly stable and agile transceiver suitable for radar implementation. It can be interfaced with a variety of control systems but particularly suitable for implementation with the Zedboard or other boards based on the ZYNC. With the addition of a suitable power amplifier module, duplexer module and antenna this transceiver would be capable of collecting high resolution images from low earth orbit. Unfortunately due to PCB and component manufacturer lead times and cost a prototype was unachievable for this project, it would have been desirable to test the hardware in the same way that the FCOMMS4 was tested. An improvement for this project would be to account for the long lead times and schedule goals to suit. Overall the project was very successful and looks certain to progress into a deeper test of the designed hardware. Future aspirations include the design of a power amp module, duplexer module and deployable antenna.

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spire ITSligo

Cow Activity Monitor for Heat Detection

Brendan Fitzgerald Hall Moate Co Westmeath 0876333460

Introduction

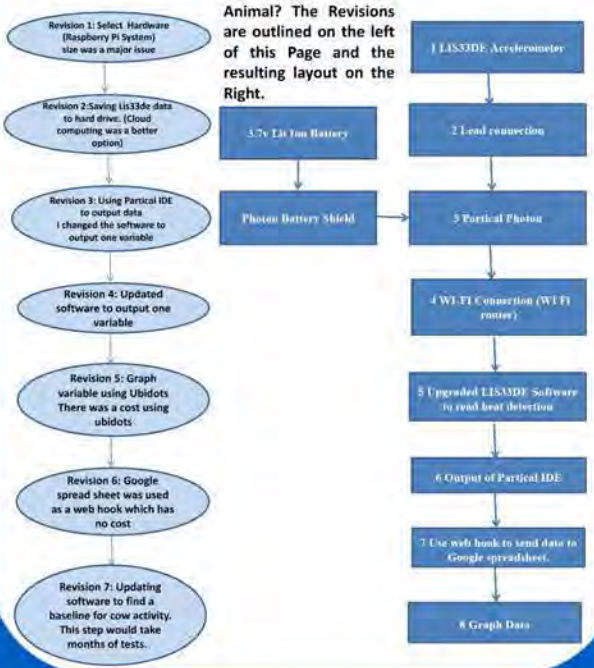
- Based on Department of Agriculture official figures (Agriculture, 2017) there are 39,605 Suckler herds in Ireland with 53% of them having less than 10 cows. If we take an average farm and apply the following: We have two identical cows. Both are in heat at the same time, but the farmer misses one of the cows. Cow A is impregnated, cow B is not impregnated until the following cycle. The cow A has a calf 21 days before cow B. A well performing calf will achieve 1kg weight gain per day. Based on the calf B being 21 days the junior there is a 21kg live weight difference. The live weight cost per kilo of a weanling at sale is generally 2.60kg. On the date of sale the net value of the calf A is €54.10 more that calf B. Based on these basic calculation each missed heat costs the farmer €54.10 per cow.
- There are products on the market today for heat detection but are aimed at large herd numbers. One such system costs 24k Euro inc vat for 100 cows. Teagas trials have shown that on set of heat (time of ovulation) generally occurs between 8pm and 6am, due to these unsocial hours there is a large potential for "missed Heats" This project was driven by the high cost of missed heat in suckler herds and the high cost of heat detection systems.
- The project centres around accelerometer based sensor to measure cow's activity for the purpose of detecting heat. It was decided to develop a miniature sensing system based on the Particle Photon which has an ARM Cortex M3 micro-controller with a Broadcom Wi-Fi chip in a tiny thumb nail sized module which is designed for wireless applications. It was coupled with The LIS33DE which is an ultra compact low-power three axis linear accelerometer belonging to the family of ST motion sensors.

Method

Revision process to develop System layout on the right

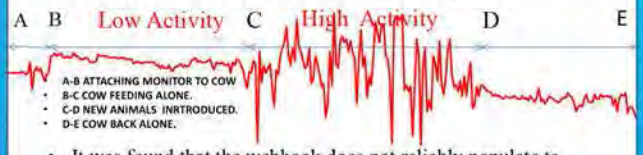
The fundamental issue to solve in this project was: How can I monitor the activity of the Animal? The Revisions are outlined on the left of this Page and the resulting layout on the Right.

System Layout



Results

- Base on comparisons with leading equivalent Wi-Fi chips it was found that the smaller, more compact more efficient Partical Photon is more suitable for the cow activity monitor.
- Output pins of the photons can be controlled remotely through an APP if additional control is needed.
- Freeware is available to control the accelerometer from a web site called GitHUB.
- It is more beneficial to store data on cloud computing than local Storage because of remote assess. It is possible to access the data once internet access is available.
- Using IDE (Integrated development environments) remote compiling of software is possible. Changing the freeware while attached to the animal makes testing much easier.
- Web hooks make it possible to pull data from your device and store them in cloud computing. (Google spreadsheet was used).
- The graph below shown data which was stored to a google spread sheet from the cow activity monitor. It can be clearly seen that from B to C has low activity and from C to D has high activity. The graph is motion varying over time.



- It was found that the webhook does not reliably populate to the spread sheet for the duration of the monitoring process.
- Battery needs to be charged every 5 days.

Conclusion

- It is possible to monitor the activity of the cow for low cost. As shown in the results above the activity of the animal changes when other animals are introduced. Cost of all components was less than 50 euro. This would give a ROI(return on investment) of only one use.
- The Activity of the cow needs to be monitored for over a month so a longer lasting battery needs to be used. The battery stopped after 1 day of use.
- There were numerous tests carried out and in some cases data was missing. In other tests the 10 second interval between data points changed. This could be due to the accelerometer, The Photon, The Partical IDE or the google Webhook. Further tests need to be carried out to see if this problem persists.
- The Partical IDE provides you with advanced features that make managing the cow monitoring system fast, easy, and efficient from a remote position.
- A webhook is a very effective way to getting data pulled from a web Partical application and storing it in the cloud.
- A devise like the partical Electron has a data sim attached, this gives more flexibility by allowing the cow in a field to be monitored using mobile data. This could be an upgraded system

Car Alarm System with GSM Module

Shane Hilley Electronic Engineering 3rd Year

Introduction

The idea of this project is to provide a new safety feature for vehicles when the vehicle has been stolen from the owner. This means the owner will receive a text and be able to notify Gardai.

Background

The background area of this project is to mainly to reduce the amount of vehicles stolen due to flawed security systems.

The amount of vehicles that have been stolen over the past 6 years has decreased and suddenly increased and this is down to thieves knowing how the security systems work and using that to their advantage.

This includes breaking the tumble codes used by newer cars by resetting the codes to a basic pattern i.e.0000000.

The Car Alarm System

The Car Alarm System originated in 1913 and was triggered when someone tried to crank the engine of a car. In 1916, a remote was made to increase security but was hugely flawed. This progressed until the 1990's and 2000's when car makers would introduce security feature such as alarms and immobilizers by a key fob. The Alarm that is being focused on here is the remote or key fob which can be violated and which then sends a text message to the owner.

Stolen Vehicle Stats 2007-2016

Theft/taking of vehicle and related offences:

- 2016: 9651
- 2015: 6452
- 2014: 7763
- 2013: 7368
- 2012: 8448
- 2011: 10393
- 2010: 11410
- 2009: 13129
- 2008: 14307
- 2007: 13531

Procedure

Step 1	Step 2	Step 3	Step 4
			
The key fob locks the car and turns on the alarm	The door is then opened	The Alarm sounds through a buzzer	A text is sent to the owner to alert them

Problems and Errors

In the system, there is a key fob, a text message service and an alarm. Within these three, the key fob and the text message service were the hardest to interpret due to the modules being fairly complex. This meant that the internal coding was difficult as many things had to happen at the same time. Apart from this, the system works perfectly every time due to a high level of testing.

Results

When completed, the final product will be a fully working Alarm System that can notify the owner straight away and if needs be, notify the Gardai via a text message. This should improve the security of the vehicle and also reduce the number of thefts over the next few years when in full production. It can also be marketed as an aftermarket product or to car companies.

Contact

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SMART DOOR LOCK WITH CAMERA

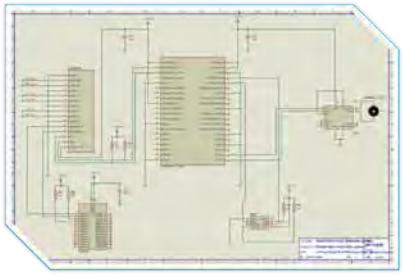
Introduction:

Smart door lock with camera it is a door lock which through WIFI and the smartphone can lock or unlock the door and check the view from a camera installed outside the doors.
Smart door lock with camera can be used to:
- simplify and modernize the door opening
- quickly view in real time what is happen outside.
- improve home security
- better protection against robbers
- faster opening of the door

Methodology:

Research:
Research began by observing the standard door opening process and idea to simplify this process by using a new technology. Also protection against robbers, burglars, faster opening of the door and a quicker view in real time of what is happening outside. This system could be used to improve home security.

Design/Planning:
The design process involved:
- Develop criteria
- Selecting technology
- Completing components
- Develop android application
- Building prototype



Results:

Criteria:
- Microcontroller able to streaming video
- Wi-Fi
- Components availability
- Ease of use
- Safety
- Financial

Technology:
- Raspberry Pi 3 model B
- Raspberry Pi Camera module v2
- Motor drive module L293D
- Electromechanical lock
- MicroSD card

Android Application:
This application is streaming a video and control lock or unlock a door.
It is a simple application with three buttons to see the view from camera and lock and unlock door. There is also a PHP script to control Input, Output pins on the Raspberry Pi and a website for control those pins.

Prototype:
A small door prototype with electromechanical lock.

Conclusions:

This smart door lock with camera is for everyone who has a smartphone and do not want to use a keys to opening a door. For everyone who would like to use a smartphone to check what happen outside their homes . For parents who want to check whether the children closed the doors. For all forgetful people who would like to check that they closed the doors. For all people who likes gadgets. For practical people who would like to use their smartphone for most connectivity to everyday objects.
The smart door lock with camera will facilitate control of open closed doors. It will let you to open the doors without keys and it will show you a view from the camera installed outside doors.
The benefits from this project can provide better protection against robbers, faster opening of the door and will provide a quicker view in real time of what is happening outside. Through WIFI on the smartphone, the smart door lock can lock or unlock the door without having to be at home. Keys are not needed, which can get lost. A quick look at the smartphone can tell who is knocking on the door.
This smart door lock with camera is for everyone who has a smartphone and do not want to use keys when opening a door. It is for all people who likes gadgets. It will also be useful for practical people who wish to use their smartphone for connectivity to everyday devices.

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Kinect RC Car

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E-mail: mooneyb16@gmail.com

Introduction:

Kinect is a motion sensing input device by Microsoft for the Xbox video game console and Windows PCs. Based around a webcam-style add-on peripheral for the Xbox console, it enables users to control and interact with the Xbox without the need to touch a game controller, through a natural user interface using gestures.

Most electronic devices have sensors and an output. The Kinect will serve as a sensor in this project and output to an Arduino through Bluetooth which will move a small car corresponding to the hand gestures taken in by the kinect.

There are many ways this technology can be used across all industries. Reasons for choosing this project is because the components are mostly all new technologies it will also challenge programming skills , however the outcome will be an entertaining piece of kit for the user as not many people will have experienced this sort of camera technology.

It will have uses in education as it would teach college students and younger pupils in secondary and primary schools what can be achieved through studying engineering and programming.

Methodology:

Research:
Research began with the main component of the project that being the Kinect for Xbox 360. There are many official resources available for it online. The software development kit is needed to be able to change the code in the Kinect along with Visual Studio IDE.

- The Kinect has an RGB camera, infrared emitter and infrared depth sensor.
- The RGB camera makes capturing 640x480 colour images possible.
- The infrared depth and emitter is what will be used in this project. The emitter sends out infrared dots which then is picked up by the infrared depth sensor. This makes capturing shapes and depth possible.

The next component researched was to be the microcontroller to be used. Since the Arduino is somewhat more powerful than an IC it was used.
A HC-06 Bluetooth module to communicate with a PC, Along with a L298N dual H-bridge driver will move the wheels of The model car chassis which has 4 DC motors on it.

Design:
The project consists of a model car chassis that has 4 DC motors on it, a Kinect for Xbox 360 and a Laptop. The model car chassis has two Arduino Nanos, Motor Driver and a Bluetooth module mounted upon it.

Results:

After trying to use a Raspberry Pi to control the Kinect data to be sent to the Arduino and realising it would not be feasible as the Pi is not powerful enough to handle the Kinects' image data a Laptop running visual studio would have to be used instead.

This skeletal program is then opened in Visual Studio where thresholds are set to indicate where the users hand is, this data is then used along with an Arduino sketch that is imported to Visual Studio that will take in the commands of the Kinect. It will then be sent over Bluetooth from the laptop to the HC-06 which will then indicate to the Arduino Nano and L298N driver which motors on the chassis will move.

Conclusion:

This project utilised many skills that were already covered in the college course especially coding. Mainly PWM and Bluetooth communication which has been covered vigorously in previous modules.

- Communication between Arduino, Bluetooth and a Laptop was successful after a lot of troubleshooting.
- Kinect skeletal tracking was also achieved along with motor movement on the car chassis.

Limiting factors included:

- Time management was not executed well.
- Troubleshooting components was cumbersome.
- Using the superior technology of the Kinect V2 would have been very educational and the fact that it is a modern technology rather than the somewhat dated Kinect V1.

Prediction Accuracy of Convolutional Neural Networks on Images with Increasing levels of Radial Distortion.

Denis O'Regan

Introduction

An exciting development in the Automotive sector recently, is self driving car technology. Deep Learning using Convolutional Neural Networks (CNN's) is currently being utilised to enable this technology.

Typically, a number of cameras with Fish-eye lenses provide a surround view of the vehicle, in real-time a Neural Network performs object identification on the captured frames. This information is sent to the piloting system which decides on the best course of action for the vehicle.

Neural Networks require training and training is carried out on Rectilinear Images. What we do not know is how robust pre-trained CNN's are to distorted images and in particular radial or fisheye distortion which applies to the Automotive Industry.

Aims

The aim of the project will be to test how robust 4 state of the art Convolutional Neural Networks are to images with radial distortion.

Methodology :

- Images selected from ImageNet Validation Dataset and Fisheye Dataset.
- Fisheye Distortion artificially introduced incrementally using ACDSee image processing software to ImageNet images.
- Inference ran on four networks Inceptionv3, Resnet50, VGG16 and VGG19.
- Fisheye Dataset -Top 5 predictions recorded and analysed.
- ImageNet Dataset - Top 1 prediction score recorded for image with incremental distortion, data was normalised and plotted graphically.

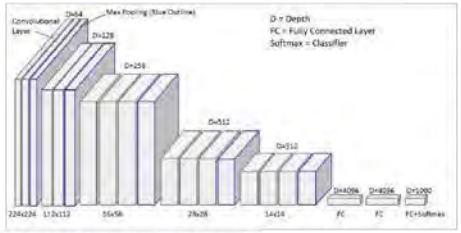

Fig1. VGG16 CNN Architecture

Results : ImageNet Dataset

Pic3. ILSVRC2012_val_00009085 0% Distortion

Pic4. ILSVRC2012_val_00009085 100% Distortion

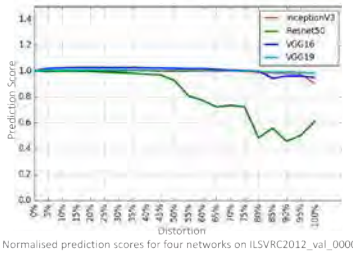

Fig2. Normalised prediction scores for four networks on ILSVRC2012_val_00009085

Pic5. ILSVRC2012_val_00000570 0% Distortion

Pic6. ILSVRC2012_val_00000570 100% Distortion

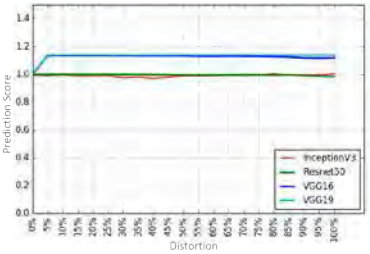

Fig3. Normalised prediction scores for four networks on ILSVRC2012_val_00000570

Pic7. ILSVRC2012_val_00000573 0% Distortion

Pic8. ILSVRC2012_val_00000573 100% Distortion

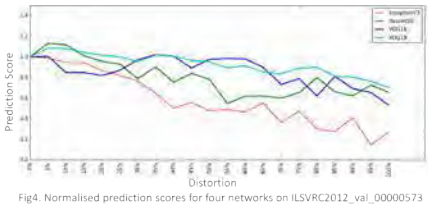

Fig4. Normalised prediction scores for four networks on ILSVRC2012_val_00000573

Results : Fisheye Dataset

Pic.1 DriveD_0790 from Fisheye Dataset

Top 5 -position	Node	Classified Label	Prediction score
1	n04285008	Sports car	0.37841365
2	n02974003	Car wheel	0.22224055
3	n03770679	Minivan	0.10579535
4	n03100240	convertible	0.049895804
5	n02965783	Car mirror	0.038994893

Table1 InceptionV3 top prediction results on DriveD_0790

Top 5 -position	Node	Classified Label	Prediction score
1	n03770679	Minivan	0.58744085
2	n02965783	Car mirror	0.22837402
3	n03891332	Parking meter	0.039124701
4	n04355933	sunglass	0.020872995
5	n03769881	minibus	0.017383549

Table2 Resnet50 top prediction results on DriveD_0790

Top 5 -position	Node	Classified Label	Prediction score
1	n03770679	Minivan	0.36512884
2	n02965783	Car mirror	0.27546105
3	n02974003	Car wheel	0.051445503
4	n04065272	Recreational vehicle	0.026888158
5	n03670208	limousine	0.026790034

Table3 VGG16 top prediction results on DriveD_0790

Top 5 -position	Node	Classified Label	Prediction score
1	n02965783	Car mirror	0.47407439
2	n03770679	Minivan	0.20661536
3	n02974003	car wheel	0.027822245
4	n03670208	limousine	0.021714551
5	n03769881	minibus	0.016850743

Table4 VGG19 top prediction results on DriveD_0790

Pic.2 DriveB_0217 from Fisheye Dataset

Top 5 -position	Node	Classified Label	Prediction score
1	n04285008	Sports car	0.47280014
2	n02930766	cab/Taxi	0.039401062
3	n03459775	grille	0.035469003
4	n04461696	Tow truck	0.032624576
5	n02974003	Car wheel	0.03017509

Table5 Inceptionv3 top prediction results on DriveB_0217

Top 5 -position	Node	Classified Label	Prediction score
1	n02965783	car mirror	0.28760344
2	n03895866	Passenger car	0.19381562
3	n03891332	parking meter	0.075368196
4	n03710193	mailbox	0.029171826
5	n03000134	Chainlink fence	0.027979553

Table6 Resnet50 top prediction results on DriveB_0217

Top 5 -position	Node	Classified Label	Prediction score
1	n02965783	Car mirror	0.36396769
2	n03891332	parking meter	0.11059716
3	n03791053	Motor scooter	0.031298991
4	n03127747	crash helmet	0.029809989
5	n02930766	cab/Taxi	0.019168202

Table7 VGG16 top prediction results on DriveB_0217

Top 5 -position	Node	Classified Label	Prediction score
1	n02965783	car mirror	0.42135134
2	n03891332	parking meter	0.097607896
3	n03770679	minivan	0.042398572
4	n02974003	Car wheel	0.029986974
5	n04285008	sports car	0.028260512

Table8 VGG19 top prediction results on DriveB_0217

Conclusions :

Networks performed well on both Fisheye and ImageNet datasets. Refer pic1., pic2. A vehicle prediction was present for all four networks, although not always in the Top 1 prediction. It is noted that prediction scores were low for the Top1 prediction(Ideally as close to 1 as possible).

ImageNet Dataset : Refer pic3., pic4 and fig2. Circular objects which maintained shape with incremental distortion were accurately predicted throughout distortion levels.

Refer pic5.,pic6. and fig3. Size of object is an important factor in prediction accuracy, at 0% distortion object in pic5. is small/at a distance, with increasing distortion object became larger with resulting prediction score increasing. VGG16 and VGG19 scores increased.

Refer pic7,pic8. and fig4. – objects with linear shape – prediction scores decreased as the original shape was distorted. Note at higher distortion object sections cut-off causing rapid decrease in prediction score.

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Safe Security System

Introduction

- Safe security system is a project that uses a ultrasonic sensor to detect movement of an object in front of it.
- When a object is detected the accompanied microcontroller then indicates the user through LCD to input their numeric code into the keypad once the conditions are met the system is complete.

Background

- This projects intention is to detect the movement of an object like a human body or just a hand once something is present the system will enable and ask for users input through a alphanumeric keypad.
- When all the satisfactory conditions have been met the user will be granted access and the system will unlock
- The project uses a 40 pin PIC18F4520 microcontroller which is responsible for controlling all the components of the project and acts as the heart of the project
- Initially it was intended to use a fingerprint sensor instead of a ultrasonic sensor but the component proved difficult to get working especially on a PIC microcontroller and instead a ultrasonic sensor was replaced.

PIC18F4520 Microcontroller

LCD

Keypad

HC-SR04 Ultrasonic sensor

GT-511C3 Fingerprint Sensor

Methodology

Research

- All projects begin with research this project was no different plenty of research began into the suitable components that can be used to construct and make the project
- Extensive research also had to be done on how each component works and how they could be implemented in the project
- There being 3 main components:

1. Ultrasonic Sensor
2. Numeric Keypad
3. LCD (Liquid crystal display)

Project Design/Planning

- Design and planning process involved:
  - Choosing parts
  - Organizing components list
  - Creating schedule (Gantt chart)
  - Create simulations and schematics using software (MPLabX,Proteus8)
  - Prioritizing work

Methodology (Continued)

Project Build

- Project build processes involved:
  - Materials and components received for build
  - Ultrasonic sensor working appropriately
  - Programming LCD and keypad components
  - Assembling the project together

Results

- The Ultrasonic sensor identifies when a object is present in front of it and the LCD indeed does tell the user to input data through keypad.
- Although the fingerprint part of the project did not succeed to work in this project I still learned a lot from the component and with more time might have even got it to work

Conclusions

- The project was a test of knowledge and skill of engineering and problem solving and was both practical and digital work in that programming and wiring needed to be done
- In overall the project was a success and all functions are operational
- **The Limiting factors of the project were:**
  - Time was the main limiting factor
  - Documentation and resources on components

Multi-Spread

Introduction:

We are team eight and our group consist of three level seven mechanical engineering students. Our reason for the chosen concept is we all share a strong interest in farming and equine and would love to contribute something useful to these sectors.
The aim of our project is to design and build a machine that can be used on the back of a tractor to spread multiple materials. Farmers are the main aim of the project as they can use this to make road networks around the farm using gravel or could be used for resurfacing of a horse arena using sand.

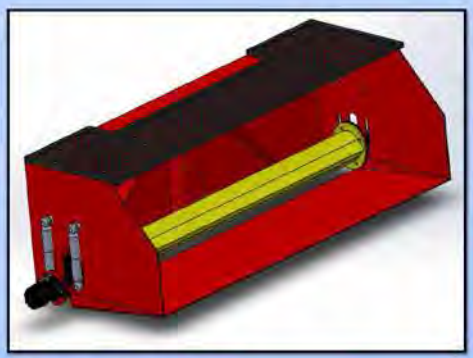
Methodology:

Research:
Research began by looking into the machines already available. We then looked at the cheapest and the easiest form of machine which could replace its expensive and complicated predecessors.
This is split in three sections
- Loading
- Drive system
- Pricing

Design/Planning:
The design process was where a lot of the problems we encountered were solved.
The process involved:
- Selecting drive system
- Develop initial concepts
- Develop project schedule
- Exploring available sources
- Assign tasks to all project members
- Model design in solid works

Fabrication:
- Most of the parts were fabricated in the GEW
- Parts were sourced from local suppliers and machinery breakers.
- Fabricated parts include the roller and floor and drive plates.

Safety:
Safety was of the upmost importance throughout the building of this project.
The project includes shear bolts and can safely be controlled from the cab of a tractor. As this project will be to used to put out gravel among other things we decided that the roller needed to be able to move up and down in case a blockage occurred or something like a big stone went through so the roller wouldn't break completely. Guards were placed on top of the box to help reduce throwback from the roller.



Results:

After reviewing the available solutions a concept was developed and we found that it would be cheaper and easier to use. The reasons for the project being cheaper and easier to use are as follows
- Unlike other solutions this is a self loading machine
- The drive system is basic and easily serviced
- Initial cost of purchase will be significantly lower than that of other solutions available at present
- Much lighter than other similar machines which means it is suitable for smaller tractors
- Wearing parts are very few unlike large muck spreaders which have chains and beaters and must be replaced frequently

To test the projects spreading capacity we designed a few different variations of the roller which helped us decide which roller design to go with in the end. When testing the prototypes we used gravel as the material to spread which work well and seemed to spread consistently which was important to the project.

Manufacturing:
70% of the project was manufactured in the GEW and the other 30% was done at a members workshop.

Conclusions:

- This project gave our group and opportunity to display our skills and knowledge gained from the course.
- The project itself was a huge success and hosted an array of learning experiences.
- The project was on schedule and the fabrication process ran smoothly.
- **The main limiting factors of the project:**
- The project was big and bulky making it hard to transport.
- Building a project to handle a wide array of materials proved harder than we expected. To spread other materials there would need to be a different shaped roller.

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Automated Welder




Anthony Lee Hugh Glancy Keith Conlon Jamie Murray

Introduction:

- The need for this project arose when a member of the group spent a summer working in his local Engineering firm (PQE).
- During his time in PQE whilst operating a rotating semi-CNC welder he noticed that the process was very time consuming.
- Our aim was to completely change this to fully-CNC process. The aim of this project was to try and keep it as simple and efficient as possible while still completing the task with as little input from the user as possible. Also to considerably speed up production rates and meeting product and demand requirements.
- This project also gave the team a great scope of what it takes to part-take in a group project from design right through to fabrication and testing.

Aims of Study:

- To design and build a prototype of a fully functional automated welder that is designed to work in an industrial environment.
- Gain an understanding of what it takes to participate in a group project, deal with deadlines, overcome mechanical problems and develop an understanding of what it takes to be an Engineer.

Project Overview:

Research:

- Research began by observing the semi-CNC process, then breaking it down to its simplest form, taking theses steps and developing them in the most efficient way possible.

Design:

- The breakdown of the Automatic that we based our project around consists of a chuck that can by clamped by hand via a lever.
- The operator inserts a steel solid bar E.G 30mm diameter into the chuck which will sit on a platform at a predetermined height.
- The user then slides a steel cap onto the solid steel tube which lies in the chuck that leaves a small shoulder between the top of the cap and the top of the tube. Approximately 5mm that will allow a sufficient amount of clearance to have a seam of weld.
- Anti-splatter is sprayed onto the piece and the operator closes the door. A switched is activated and a welding torch moves in a straight line motion operated by a electronic ram. When the torch has reached the end of its stroke, the chuck has rotated a full 360 degrees allowing a perfect seam of weld every time. The torch retracts to its home position and the operator releases the chuck and removes the finished piece. The process is then repeated.

Methodology:

Our Product:

- Our product consist of a frame made out of box section fully transportable with a circular disc rotating in the centre. The circular disc has a 4 holes laser cut out and bushings welded in to have mild steel chucks slotted in their place which will be fully rotational.
- The circular plate sits on a steel shaft which was turned on a lathe to allow it to rotate. This shaft slots into a bushing that allows the plate to rest at a set height. On the end of the shaft a Geneva wheel lies powered via a motor and a housing to support the mechanism. Which allows the circular plate to rotate. Through a series of sensors when chuck A rests at position A it will engage with a motor allowing the chuck to rotate and a electric ram extends out only to rest 5mm from the shoulder of the shaft and cap the chuck will then rotate a full 360degress resulting in a perfect seam of weld around the cap. The pneumatic ram the retracts and the process is repeated. The user can constantly load and unload the products resulting in 24/7 production.


Results:

Design/Planning:

- After reviewing existing solutions, a concept was developed for the automated solution. It comprised of the following steps using electro PLC system:
- Acquire PLC for the automation process
- Acquire the appropriate sensors (Capacitive)
- Load Chuck with pin, start programme
- Wait for programme to cycle through stages and load/unload pins
- Geneva wheel mechanism working perfectly

Results (Continued):

PLC/Control:

- OM-ROM had 8 DI and 4 DO connections
- 5 inputs and 3 outputs were required
- Capacitive sensors were connected in parallel using the same input
- 9 states were created in the state transition diagram
- Code was written in Simatic Manager using ladder logic.
- Simulation was really helpful. Coding started early parallel with other tasks. Provided confidence with quick & safe trouble shooting..

Fabrication:

- 70% of fabrication was completed in GEW
- 30% bought-in parts
- Industrial standard components and materials were used throughout
- Numerous bushings and bearings were used for rotation of chucks and circular table
- Perspex screens were used for Safety
- Circular table was laser cut in McAree Eng ltd
- Unique Geneva wheel design made on CNC Mill
- Cycle start switch disables all outputs




Conclusions:

- This product provided an opportunity to display skills and knowledge gained from the course in a practical way. Overall the project was a success and a brilliant learning curve.
- Our objective was completed by converting the process from semi-CNC to fully-CNC
- It was a really testing project time was a big factor in it too.

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DISABILITY HOIST

BEng In Mechanical Engineering Level 7
BEng in Precision Engineering and Design Level 7

Introduction

To design, build and test a working prototype of a disability hoist/ standing frame. The purpose of this machine is to aid those in wheelchairs to stand up for periods of time, to help with blood circulation to their legs. It can also be used by physiotherapists to help those who were in accidents to learn to walk again The group chose this project as all members shared a keen interest in manufacturing a medical/disability project and also because one member of the team has a family member that is disabled.

Aim of Study

- To build a fully functional disability hoist .
- To demonstrate the communication, practical and managerial skills obtained at IT Sligo over the last 3 years

Methodology/Approach

Research:
The team visited Irish Wheelchair Association, Co Sligo and Co Cavan and also the Holy Family School, Cootehill, Co Cavan. We interviewed the nurses, doctors and patients about their opinion of our design and the standing frames they have and use. These rehabilitation centers thought our idea was very good, unique, innovative and were keen to see the finished product.
The manufacture was broken down into these main parts

1. Frame Manufacture
2. Seat Manufacture
3. Movement of Hoist
4. Electrical

Methodology/Approach (Cont.)

Fabrication:

- Most the parts were manufactured in GEW,
- Most electrical parts was sourced from internet
- Materials sourced from College GEW
- Fabricated parts include, frame, leadscrew block, armrests

Electrics/controls:

- Select motor with high torque
- Select switches and wires
- Power source

Results

- The selected motor had sufficient torque and was more than capable of lifting a person.
- A faster motor would be desirable, however as this is only a prototype, the motor used is sufficient for demonstration purposes.
- This device operates smoothly and quietly as desired.
- This device is safe for the user.

Conclusion

- This project provided an opportunity to display skills and knowledge gained from the course in a practical way. Overall the project was a success and was an excellent learning experience

The main limiting factor of the project Included:

- Time and the amount of fabrication required
- Budget and resources available, e.g. a DC motor with high torque and use of relays instead of plc due to a high dc amperage.

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An Institiúid Teicneolaío ita, Sligeach




Manual Water Pump

Introduction

Nowadays standards are moving toward an eco-friendly approach and urging companies to be more environmental friendly. Thus, it was agreed to build and test a prototype of a fully mechanical project that would be eco-friendly and demonstrate the skills and knowledge gained in the last three years with the IT Sligo.

Aim

The aim of the project is to build and test a prototype that can be used for the aid of the village of Jalan-Oman. Hence electricity cut-off frequently and villager uses wells as water source. However, the use of petrol pumps is expansive and damaged the village environment.

Methodology

Research:
Previous water pumps were researched, observed and evaluated. Thus by understanding the scope, culture and background. It has been decided to build a prototype to these standards:

- Cost.
- Portability.
- Mechanical and environmental friendly.

Designing / Planning:

- Project plan and timeline.
- Concepts and hand sketching.
- Environment and climate research.
- Ideas improving.
- Construct a project to ISO standards.
- Splitting into three sub-assemblies.
- Available technologies.
- Materials selection.
- SolidWork designing and drawings.

Fabrication:

- Some parts were collected from waste materials such as; shaft, sprocket, chain, bicycle stand.
- Materials were supplied by GEW and local suppliers.
- Technologies available such as milling and lathe machines to fabricates; Cams, connecting rod, base, etc.


Methodology (Continue)

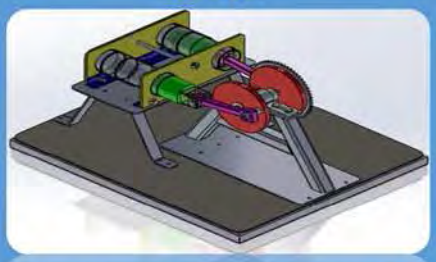
Quality / Specification:

- Equipment required were ordered such as; saw hole drill.
- Precision between Cam, connecting rod and cylinder were critical for the project to operate.
- Use of different materials and experiments.

Safety:

- H&S environment were in place.
- Use of PPE and following safety standards in GEW.
- Supervision were in place at all time.
- All sharp edges were removed.
- Testing under strict safety regulations.

Results

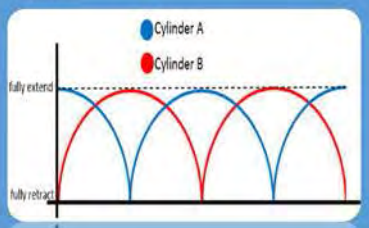


As different concepts were developed and evaluated to the specified standards. However, with the current technologies and materials the project were able to be fabricated in a generous manner regardless of the cost. The manual water pump was designed to operate via a friction rod connected with the bicycle.


Results (Continue)

Fabrication:
By the high revelation and speed provided by the rear wheel bicycle. The friction rod was unable to maintain it and creep. Due to that the efficiency and torque of the pump reduced.

Quality:
By selecting a pedal method of transmitting torque to the pump via chain that is connected to the rear wheel of a bicycle. Furthermore, connected to the shaft and sprocket. that would transmit it and create the pump.



The manual water pump delivered:

- Five litters per minute.
- Ability to draw water from 3m deep to a height of 3m.
- Torque of 7Nm.
- Produces a pressure of 4.9 bar.

Conclusion

- The objective to fabricate a manual water pump was achieved with it's standards except for the cost.
- The project provided a practical and theoretical gain of experience.
- The project exceeded the specifications outcome with a high pressure and outcome.

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Electro-Kinetic Road Ramp

(scaled model of the actual size)

BEng In Mechanical Engineering (Level 7)

Team Members: Khalid Alasmari, Ghulam Dastgir, Khaliq Rehman,

Introduction

The need for this project arose when the group members noticed the huge amount of mechanical energy being wasted by vehicles on the roads every day.
This proved inefficient system to save energy on the roads.
The aim was to design and build a machine to save this mechanical energy and convert it by means of specially designed mechanism to electrical energy.
The main idea behind the design is to keep it efficient as well as simple and minimize the need for an operator as possible.

Aim of Study

To demonstrate the theoretical knowledge and practical skills gained over the course of our study in a project in terms of research, planning, design, fabrication etc.

Methodology

Research began by collecting data for the main dimensions of the ramp (L x W x H) using 15 different sizes of cars. After that, the whole process was broken down to 3 steps:
Mechanical energy from the ramp.

RPM is generated and converted to electrical energy by the generator
Energy is stored in battery

The design and planning process involved:
Develop initial concepts.
Develop project schedule (Grant Chart).
Assign tasks among group members.
Reviewing available material and budget
Model design in solid works

Fabrication

75% of fabrication was completed in GEW.
5% of fabrication was completed outside college.
1. Generator casting
2. 3 prototypes
20% of bought in parts.
1. Pillow block bearings.
2. Flange bearings.
3. Sprockets.
4. Spur gears.
5. Generator materials

Results

Gantt Chart

Prototype

Actual Machine

Research

Car Name	Length (mm) (Between centers of front and rear wheel)	Width (mm) (Width of a standard car parking lot)	Height (mm) (From the ground to underneath of a car)
Ford Transit	4300	2530	300
VW Passat	3360		150
Hondi Getz	2500		210
Toyota Land Cruiser	3260		310
Micra	2750		240
BMW	3440		165
Toyota Aygo	2660		215
Mitsubishi Grandis	3400		220
Land Rover Jeep	2740		505
Toyota Corolla	2940		100
Ford Focus	3160		180

Results:

1:1 Scale Power Ramp dimensions are:

	Length (mm) (Lowest length)	Width (mm)	Height (mm) (Lowest height)
Scale 1:1 Power Ramp	2750	2530	150

1:5 Scale Power Ramp dimensions are: (The current project)

	Length (mm) (Lowest length)	Width (mm)	Height (mm) (Lowest height)
Scale 1:5 Power Ramp	2750	500	150

Analysis

$$\omega c = \sqrt{\frac{g\Sigma W_y}{\Sigma W y^2}}$$

$$\omega c = \sqrt{[illegible]}$$

$$\omega c = \sqrt{\frac{(9.81)((274.65\times10^{-3})+(257.9\times10^{-3})+(374.1\times10^{-3}))}{(5.03\times10^{-3})+(6.65\times10^{-3})+(9.33\times10^{-3})}}$$

$$\omega c = \sqrt{\frac{(9.81)(906.65\times10^{-3})}{21.01\times10^{-3}}}$$

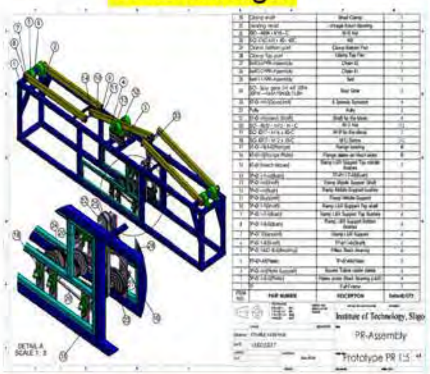
$$\omega c = \sqrt{\frac{8.89\times10^{-3}}{21.01\times10^{-3}}}$$

$$\omega c = \sqrt{423.13}$$

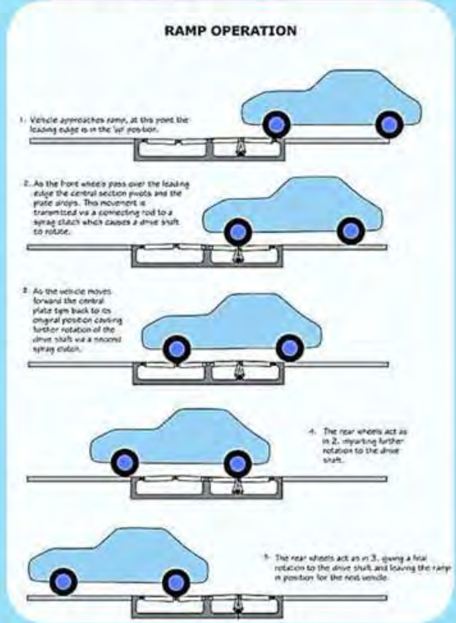
$$\omega c = 20.57 rads/s$$

$$\omega c = 196.4 rpm$$

CAD Design



How does it operate?



Conclusion

Limiting Factor:

- Time available to fabricate such a machine. E.g. A flywheel and a 1:80 ratio gear box could have been fabricated if time permitted.
- Materials available in GEW.
- Budget limitation.
- Order delays.

Overall:

The project was a success and was an excellent learning experience in terms of providing an opportunity to demonstrate the knowledge and skills gained over the course of study.
The objective to design and build a machine to save the mechanical energy and convert it by means of specially designed mechanism to electrical energy was achieved.
The project schedule ran according to plan.

Automated Crown Capping Machine

Introduction:

The automated crown capping machine is designed to make capping glass bottles less labour intensive and save time while also improving safety. It will incorporate quality control to ensure the caps are on correctly.

Aims of Study:

- To demonstrate the skills learned during our time at IT Sligo.
- To improve our knowledge of PLC (Programmable logic controller) systems
- To gain experience working as part of a team

Approach:

During the research phase of this project, the team visited The White Hag Brewery in Ballymote, Co. Sligo. The company were experiencing a problem with their bottle capping method. As a result of this visit the team began forming ideas for an alternative method of bottle capping.

Design Requirements:

1. System for continuous bottle delivery
2. Automated solution for placing of caps on to each bottle
3. A safe method of effectively sealing the caps onto the bottles
4. Rejection system for uncapped bottles

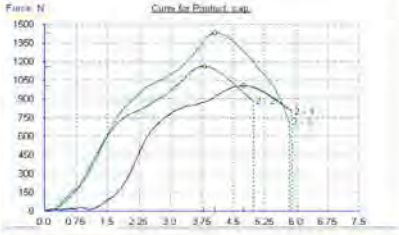
Planning:

- Initial concept development/ design sketches
- Project schedule
- Review of materials available at IT Sligo
- Assigning of tasks to each team member

Research:

- Suitable method to achieve each of the design requirements
- Costing of parts and materials that may need to be ordered
- Research of force required to seal crown cap to bottle, tests carried out in materials lab
- Research of different conveyor methods
- Research of feeder bowls to orientate caps

Max Force N	Displacement	Force at Break N	Elongation %	Yield MPa	Yield Force N
1008.75	11.85	798.75	14.76	1.90	1008.75
1163.75	9.52	883.75	12.45	2.19	1163.75
1431	10.14	715.50	14.63	2.69	1431

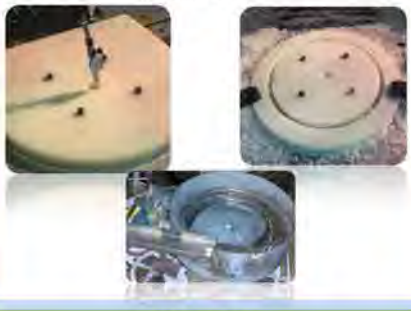


Approach (Continued):

Safety:
The use of compressed air in this project would mean that safety would need to be a key factor to consider during the design and build. There will be an emergency stop fitted to the machine. The machine will also have PVC guarding fitted to it.

Manufacture:

All non standard parts were manufactured in the GEW using the machinery available. This included the lathes and milling machines. The indexing table and the guide rail for the bottles was manufactured on the CNC milling machine.



Results:

Design:
After considering all the concept ideas a final design was chosen for the automated capping process.

Results (Continued):

Conveyors:

The decision to use conveyors proved a successful method to supply bottles to the indexing table. The use of a second conveyor was also successful in the removal of bottles from the machine

Cap Wiper:

The use of a cap wiper mechanism instead of a pick and place proved successful. This required less fabrication and allowed for a simpler programme to be written.

Programmable logic controller:

The use of a PLC meant that the operation of the machine could be easily controlled once the sensors and valves were set up. The speed of operation can be easily modified. A Siemens S7-300 PLC was used.

Quality check

A quality control system was incorporated into the design of the machine. This consisted of two sensors. One detected if the bottle was in place and the other detected if the cap was in place.

A pneumatic cylinder was used to push the reject bottles off the conveyor.

Conclusions:

- The project allowed us to learn how to work as part of a team from the initial stages of design to the manufacturing and assembly.
- Working as a team we improved our communication skills and learned how to delegate work.
- The project allowed us to apply the knowledge we learned over the last three years and display the skills we learned.
- The objective to make the bottle capping process less labour intensive was achieved.
- A large amount of experience was gained on incorporating a programmable logic controller into an automated machine.

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Mimicking Hand Movements with Image Processing and Vision Systems

Introduction:

Prosthetic limbs today are generally mechanical devices, unable to make decisions based on real-time events, can be sometimes cumbersome and the operation and aesthetics can look unnatural. The aim of the project is to overcome these limitations by investigating the feasibility of controlling a bionic hand by mimicking a human hand.

The concept of the project is to build a programme which can track the movement of human fingers, and to have robotic hand mimic those movements in real-time. The objective is to show that the concept has the potential to be used in real life situations, in the designing of prosthetic hands. The project when complete will give a visual demonstration to how the software and technology works and give people a better understanding to how technology can enhance people's lives.

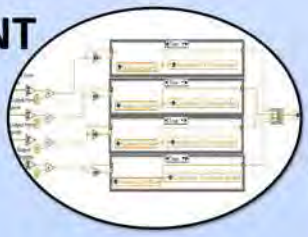
Aims of Study:

To demonstrate the theoretical knowledge gained over the course and apply it to a project which gave further learning of new technologies and concepts.

INPUT

PARALLAX

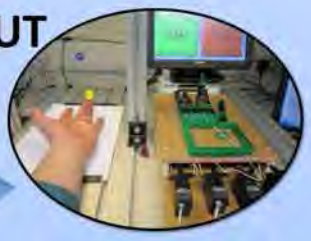
MEASUREMENT



CONTROL

NATIONAL INSTRUMENTS LabVIEW

OUTPUT



Methodology:

Research:
Research was undertaken studying the history of prosthetic limbs as well as modern day advanced prosthetics. The majority of time spent on research was in Learning various programming techniques within LabView. Motor control and Pulse Width Modulation (PWM) was an important element to the whole project and time was allocated to learning and testing this control method to better understand its operation.

Main research elements

1. Existing products
2. Possible technologies
3. programming techniques
4. Motor control – Pulse Width Modulation

Design/Planning:

- Selecting technology /software to be used
- Project management
- Develop project schedule– (Gantt Chart)
- Develop initial concepts and ideas
- Allocation of resources
- Dividing the project into 3 main elements
- Self learning of the programming components required

LabView Programming:

- Vision acquisition
- Image processing with Vision Assistant
- Colour detection
- Data conversion
- Servo motor control

The Robotic Hand
The main objectives and work involved in the project was based around programming and image processing. The decision was made to buy a premade hand and modify as required.

Results:

Debugging and Errors

Time was spent working to resolve problems in the operation of the device. The colours of the finger tips created an issue for the image processing software. The software had problems detecting the correct location of certain colours. lighting issues were overcome by adding constant artificial light to improve consistency. Many errors and glitches had to be overcome to get the programme to run smoothly and remove jitter.

Assignment of resources

The main components of the final project which required the most attention were.

- Labview programming
- Labview Vision Assistant for image processing
- Labview Image Acquisition
- User interface/HMI

Summary

The quick advancement of the project meant that more time and attention could be spent improving the operation of the system and adding a few extra elements to improve the overall functionality and aid in further learning.

Conclusions:

The finished project has been a success and performs far better than had been originally hoped. The aims of the project have been met and it demonstrates the feasibility of such a device being brought to market. Solutions to many problems had to be solved and new skills have been acquired through the duration of the project. As well as technical skills, personal skills have also been developed throughout the duration of the project.

"Results! Why, man, I have gotten lots of results! I know several thousand things that won't work!"

Thomas A. Edison

Andrew Blackwell – Co, Leitrim

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Quality and Colour Inspection System

Introduction:

The sorting and inspection of objects coming off a production line is very important nowadays. We have decided to build a quality and colour inspection system that would capture an image of the object that is transported using a conveyor and carry out a comparison in LabVIEW. Depending on the outcome of the LabVIEW programme, the part would be pushed off the conveyor belt into an appropriate box or sent down to the rejection box.

Research:

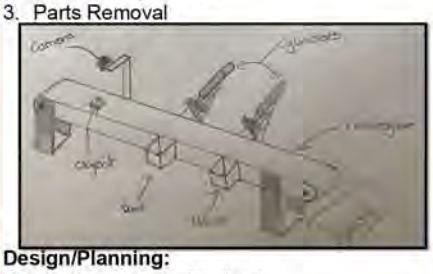
Before the project has been started it had to be planned, Therefore quite a few things had to be researched.
Below is a list of the main factors that had to be researched:

- PLC Programming
- Vision Systems
- Pneumatics
- OPC Server
- Cameras
- Sensors
- Motors

Methodology:

Once the following have been researched and the appropriate solutions have been found, the project was broken down into the following sections:

1. Quality and Colour Check
2. Parts Transportation
3. Parts Removal



Design/Planning:
The design process involved:

- Develop initial concept
- Technology Selection
- Gant Chart Development
- Model parts in Solidworks
- Development of detailed plans for the sections outlined above.
- Dividing the tasks equally among the team members

Methodology(Continued):

Fabrication:

- Most of the parts were fabricated in the GEW
- Materials were sourced from GEW and local suppliers
- Fabricated parts included the door frames, sensor brackets, cylinder brackets etc.

PLC/Control:

- I/O count of processes for Siemens S7-300
- Selection of sensors, switches and indicators
- Creation of a main document including state transition diagram and symbolic table
- Creation of PLC code in Simatic Manager
- Testing of the PLC code using FluidSim
- Program Testing/Trouble Shoot

Comparison/HMI:

- Comparison between the templates and the actual shape and colour of the object and the result being displayed.
- HMI contains the live image from the camera, results from the comparison and conveyor status.

Safety:
Safety was also included in the design stages of the project. It contains an emergency stop and the main control and electric wiring are enclosed for safety of the user.

Results:

After reviewing the existing solutions, a concept has been developed. It comprised of the following steps using PLC system and LabVIEW.

Design/Planning:

- Place an object on the conveyor and it starts.
- Sensor detects the object, stops the conveyor.
- An image of the object is compared against the templates in LabVIEW.
- LabVIEW activates appropriate cylinder and conveyor starts.
- Object reaches the cylinder and slides off or continues to the end.
- Cylinder retract and the conveyor stop waiting for another part.

Results(Continued):

Comparison/Control:

- 12 inputs and 10 outputs were required with 16 DI and 16 DO connections available
- 10 states were created in the state transition using parallel branching for the entire project. I/O symbol list was created.
- Code in the Simatic Manager was written using ladder logic. FC1 contained the main code of the process cycle. OB1 executed by the PLC called up FC1 and included additional important functions.
- Emergency Stop disables all the outputs.

Comparison/HMI:

- Image of the object present under the camera using DAQ Assistant.
- HMI contains the current count of the good/bad parts.
- The user is notified using an indicator if the conveyor is running or not.
- The comparison output is displayed to the user.

Fabrication:

- The main frame and the conveyor were already manufactured and assembled by past student therefore our job included manufacturing the enclosure and the required brackets etc. for our concept.
- Festo Pneumatic components have been used.
- Enclosure from Perspex and aluminium was used for safety.

Conclusions:

- This project has provided us with the opportunity to show our skills and knowledge gained over the course in practical way. The project was a success and was a very good experience.
- The objective to carryout a quality and control inspection process has been successfully achieved.
- The project schedule ran according to the plan.

The limiting factors of the project included:

- Some of the parts that were required were outside the price range due to the budget available.
- The amount of time that has been spent assembling the entire project has left us with a short amount of time to trouble shoot the assembled project.

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Automated Pick and Place Machine/CNC

Introduction:

The Concept of this project is to design and build an efficient, lightweight, durable and cost effective pick and place machine.
The Build will consist of 3 linear actuators to create the X,Y and Z axis of motion as required, as well as a gripper for the picking of an item. As automation becoming an ever growing factor of life Pick and place machines are of huge importance in the manufacturing industry of often when we are simply ordering a coke from a common vending machine.

Aims of Study:

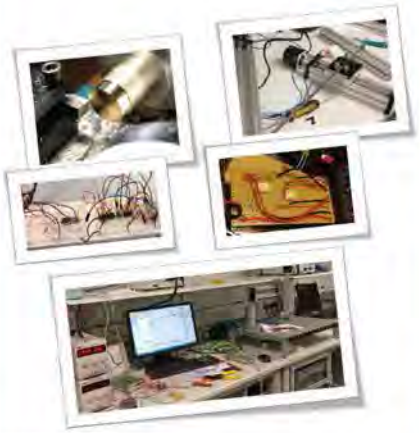
To demonstrate the theoretical knowledge gained over the course of our study in a practical, real world application.

Methodology:

Research:
Research began by reviewing industrial pick & place techniques and mechanisms available and devising a practical solution while keeping the overall project within scope.

Design/Planning:
The design process involved:
- Selecting technology
- Develop project schedule
- Develop initial concepts
- Reviewing available resources
- Assign tasks among project members
- Develop detailed plans for three main sections outlined above
- Model design in Solid works

Fabrication:
- Parts for the main actuators have been sourced online from the U.S and later assembled. parts were fabricated in the GEW
- Many crucial parts were fabricated in the GEW
- Materials sourced from GEW and local suppliers, Radionics (IRE) and Open Build (USA)
- Fabricated parts include actuator connection plates, limit switch brackets, subject parts and shelving units etc...



LabVIEW (DAQ)/Control:
- National Instruments Motion assistant connected through The NI PXI-1033 and MID-7604/7602 2 Axis stepper motor drive.
- Design and test all movement/positions required.
- Create master document including state transition diagram and symbolic table
- Crete opto isolators to control 24v solenoid's.
- Write/Design LabVIEW program through LabVIEW.
- Test program/Trouble Shoot

Project Transition

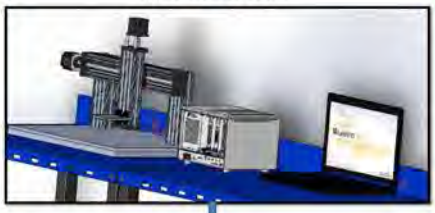
Initial brainstorm

Concept 1

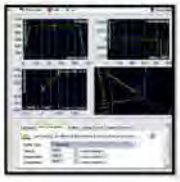
Concept 2

Time management/Planning (Gant Chart)

Solid works Model



Programming and control



(Over 200 Sub Vis)

Finished Product

Results

Design/Planning:
After reviewing existing solutions, a concept was developed for the automated solution. It comprised three linear actuators and a pneumatic gripper.
- Two linear actuators using stepper motors driving lead screws are used for the X,Y axis. This provideds a great deal of accuracy with each step a of the motor being only 1.8 degrees of a rotation.
- A Festo guided pneumatic cylinder is used for the Z axis with a 150mm stroke.
- A Pneumatic Gripper is used to secure the item.
- The system has the ability to sketch(CNC) included as an extra display of control and posable uses.

LabVIEW/Control:
- LabVIEW program has over 200 sub VIs to implement control
- A series of data acquisition techniques are used to sent out the desired pulse to the pneumatic solenoid valve that triggers the cylinder to extend or retract.
- Two (425N) opto-isolators are used to switch the 24V on and off from the 5V output from the DAQ card.
- Code was written in Simatic Manager using ladder logic. FC1 included main code of process cycle. OB1 executed by the PLC called up FC1
  and included additional important functions
- Simulation was really helpful. Coding started early parallel with other tasks. Provided confidence with quick & safe trouble shooting.

HMI/Front panel
- Option to pick/place any selected item and deliver it to or fro the handout area.
- Option to manually operate components
- Option to select and draw selected item.
- Positional and operating status feedback

Fabrication:
- 30% of fabrication was completed in GEW
- 70% bought-in parts
- Industrial standard components and materials were used throughout
- Mainly Festo Pneumatic components used

Conclusions:

- This project provided an excellent opportunity to display skills and knowledge gained from the course in a practical way. Overall the project was a success and was an excellent learning experience.
- The objective to automate the manual process was achieved
- The project schedule ran past schedule due to a lot of troubleshooting through out the project on top of anticipated fabrication needs. This

The main limiting factor of the project Included:
- Time and the amount of learning, research and fabrication required
- Budget and resources available
- Removal of finished product from machine could have been automated if time permitted.
- The Finished product could quiet easily be adapted to become a C&C machine or even a 3D printer.

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Engineering

Two Automated Cars in a Maze

Introduction

As a main part of Mechatronics Engineering, programming electronic components is needed nowadays as it works as controlling systems. An autonomous car (driverless car, self-driving car, robotic car) is a vehicle that is capable of sensing its environment and navigating without human input. the project was chosen due to the rise in demand for replacing human operations with automated machines. So, the need for this project is that, how do robotic cars read, map and move in paths of a maze by using microcontroller chips, sensors, motors and Bluetooth connection.


Aim of project

To build two automated cars, the first one will be worked as a self-learning pattern organiser. The second car will be worked as pattern investigator to follow the shortest way from the bingeing to the end of a maze. Finally, build the maze.

Methodology

Research: -
Research began by observing the processes of building , designing ,programming and controlling the two automated cars and the maze. This processes were broken into some main sections:

- ❖Software used in this kind of projects and matched with what is required programmes to use.
- ❖Cars kit.
- ❖Micro-controlling boards, sensors (electronic components).
- ❖Maze design.

Methodology (Continued)

Design/Planning: -
The design processes involved:

- Selecting sketches.
- Develop project schedule using Gantt chart.
- Improve concepts.
- Looking for resources.
- Divide work between team members.
- Develop detailed plans for four main sections outlined above.
- Model design in Solidworks.
- Test designs if suitable to go forward.

Fabrication: -

- ❖The maze was fabricated in the GEW and it is made of timbers.
- ❖Two cars were built and programmed in the mechatronics project room.
- ❖Maze Materials were supplied from GEW and local suppliers.
- ❖Electronic components were supplied by mechatronics store.

Electronic Components: -

- Selecting the micro-controller.
- Choosing an appropriate smart motor shield.
- Ultrasonic and line track sensors are chosen to drive and avoid cars from maze walls.
- Bluetooth module is connected to transmit data.



Software:-

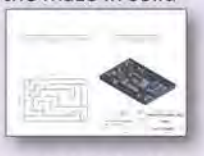
1)Arduino software is used to code the cars movement and sensors measurements.
2)LabVIEW is used to control the speed of motors in a car.

Safety: -

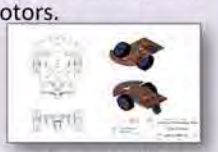
- ✓Reset button in the controller chips.
- ✓Stop button in LabVIEW programme, it works as emergency stop button.
- ✓ Red LED and Buzzer if the car is passed the limit distance applied.

Results

Design:
After choosing the main idea, concepts were designed for the maze in solid works.



And by viewing the main hits for the cars designed, the cars have been designed in solidworks. The design was picked, so each car has enough space and light to be driven by the motors.



Actual build:

- Cars and Components were ordered.
- Cars were sampled.
- Motors and other parts were connected to Arduino in an appropriate way.
- The maze was built.


Programming: -
Arduino chip was used to provide the communication between the used components with the LabVIEW program. Arduino sketch code was used to allow the Arduino chip understand the LabVIEW programs. Arduino codes were involved to control the cars.



Conclusions

The project's object is to solve the maze using building and programming skills. The project provided a wild learning environment.
Also, it gave the members the experience of solving the problems from engineering prospective.

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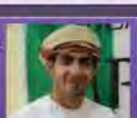

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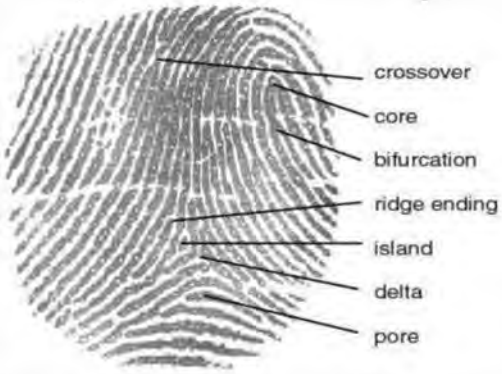
Using Biometrics as a method of security

Level 8 Mechatronics

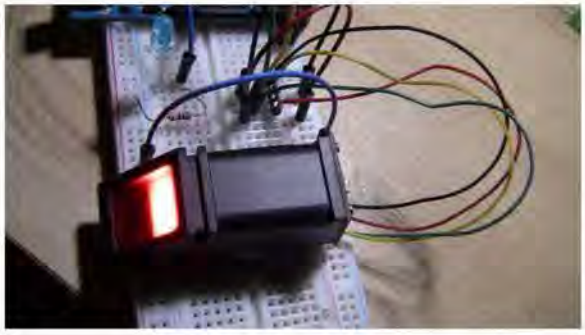
To investigate Biometric systems as a means of increasing security of entry into private or restricted area.

The project was designed as an alternative for a key lock in a door. The purpose of this project is to show how using biometrics can increase the security of a restricted room and how it can be incorporated into everyday life. This project uses components such as Arduino Uno, fingerprint sensor, LCD screen, matrix keypad and lock style solenoid.



This fingerprint shows what the fingerprint scanner is looking for when running a scan. No two fingerprints are fully identical; This is why when the finger is scanned; the scanner picks up on multiple parts of the finger to make that sample unique.

The grove fingerprint scanner has a high powered DSP (Digital Signal Processor) chip that renders the image and works out calculations, With an incorporated flash memory this allows storage of up to 162 fingerprints. It is compatible with the Arduino software which is being used in this project.



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ECG Heart Rate Monitoring System

Mechatronics
Level 8
2017

To Investigate the monitoring and visual display of the human heart rate.

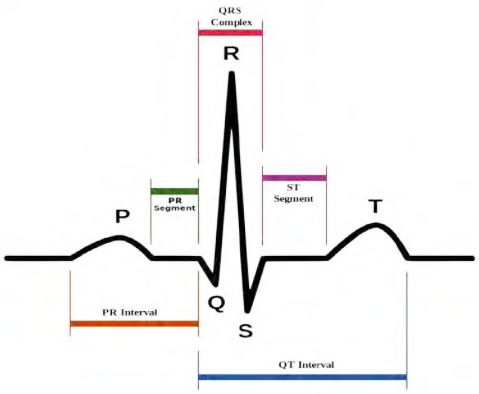
Backround:

Electrocardiography is the process of recording the electrical activity of the heart over a period of time using electrodes placed on the skin. The spikes and dips in the tracings are called waves. The heart is a muscular pump made up of four chambers .

These electrodes detect the tiny electrical changes on the skin that arise from the heart muscles electric pattern during each heartbeat.

Objectives:

- To design and build a low cost and economical ECG Heart Rate Monitoring System.
- To give a real time simulation of the patient's heart rate.
- To reduce on running costs of every day uses of ECG machines.



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Motorised Electromyography Controlled Hand

With Further Research into Electroencephalography and the use for the Control of Prosthetic Limbs

Introduction

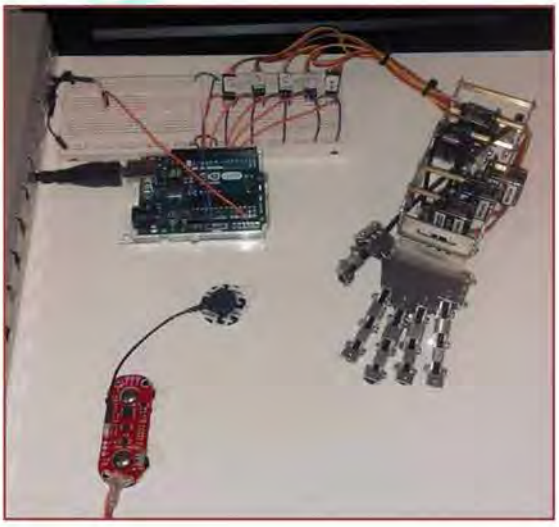
This project involves the research into electroencephalography, the monitoring of electrical activity of the brain with the use of an EEG headset. This is looked at in detail with the examination of the various waves produced from the output signals of the brain and the connection they have with the various parts of the body and movements. The headset used in this research was not of great significance as it was quite unreliable.

The research was then broadened into electromyography, the monitoring of the electrical activity of the muscles. The monitoring of the electroactivity of the muscle, it detects the potential difference produced between a relaxed and a contracted muscle. In this case, the arm muscles are monitored with the use of an electromyography sensor consisting of electrodes which is placed on the arm was used.

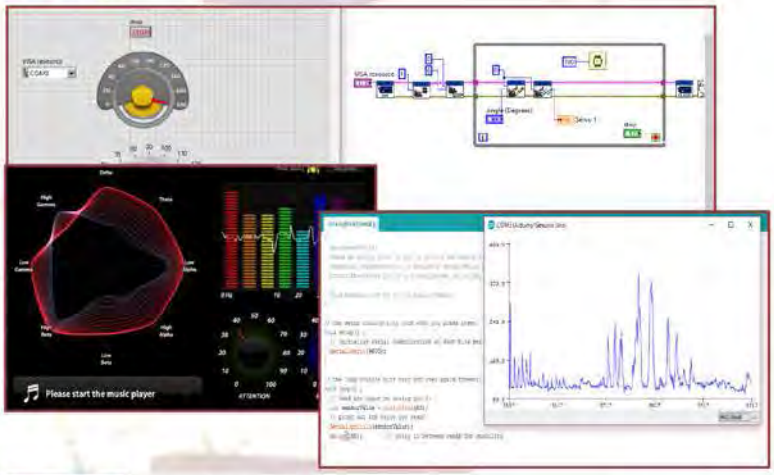
The output data is then used to power a servo motor controlled hand.

Methodology

- An EEG sensor brain band was researched and then connected to the head for testing stages. This was completed and the design was made to change the sensor to an EMG muscle sensor for a more accurate result.
- The EMG muscle sensor was researched along with the anatomy of the arm and hands. The sensor was used to take in voltage readings that all differ, depending on the movement of the muscle.
- A robotic style servo motorised hand was assembled, consisting of five micro-servo's.
- The servo motors were connected to an Arduino and the Arduino was interfaced with the software LabVIEW.
- LabVIEW and the Arduino were used to control the servo motors and also read in a voltage signal through the Arduino from the EMG muscle sensor.
- The data that was received from the sensor was monitored and analysed to allow for the correct control over the servo motors that allow for the movement of each of the fingers.



Testing



Conclusion

An electromyography muscle sensor was used to take in the electrical activity of the muscle and control the servo motorised hand. The analog signals from the sensor were all closely monitored and had to be distinguished to each of the different movements to replicate the finger movements of the hand. Overall, this research project with the demonstration model has allowed for the research into various areas all related to mechatronics and the engineering industry. The use of taking in measurements and monitoring and analysing to control a device is of great benefit, as this is all a part of what happens daily in the engineering industry.

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Automatic Tool Changer

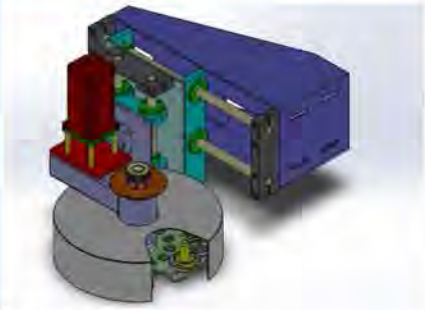
Introduction:

An Automatic tool changer or ATC is used in computerized numerical control (CNC) machine tools to improve the production and tool carrying capacity of the machine. ATC changes the tool very quickly, reducing the non-productive time. Generally, it is used to improve the capacity of the machine to work with a number of tools. It is also used to change worn out or broken tools. It is one more step towards complete automation.

Aims of Project:

The use of automatic changers increases the productive time and reduces the unproductive time to a large extent. It provides the storage of the tools which are returned automatically to the machine tool after carrying out the required operations, increases the flexibility of the machine tool. makes it easier to change heavy and large tools, and permits the automatic renewal of cutting edges.

Methodology:



Research:
Research began by observing the manual process, then breaking it down to the simplest steps and automating these steps in the most efficient way possible. This process was broken into three main sections:

1. X-axis movement
2. Z-axis movement
3. Wheel Rotation

Design/Planning:
The design process involved:

- Selecting concept
- Organising a project schedule
- Selecting the right technology for the chosen concept
- Reviewing available resources
- Assign tasks among project members
- Develop detailed plans for three main sections outlined above
- Complete drawings in Solid-works for fabrication

Fabrication:

- 80% of parts were fabricated in the workshop
- Mild steel was used for majority of parts
- Materials were sourced from local suppliers and the workshop.

Methodology (Continued):

PLC/Control:

- The PLC used for the project was an Allen Bradley MicroLogix 1100 series C with mixed transistor and relay outputs. Extra cards were added to the base unit to give more inputs and outputs as the base unit did not have enough. Also an analogue card was added to control the spindle inverter unit (Speed).
- To control the stepper motors a pulse output was required to generate the pulse. A built in feature was used called Pulse Train Output (PTO). This feature is designed to be used with stepper motors and has acceleration and deceleration built into the control.

Safety:

- Safety was paramount in the design of the project. The project includes an emergency stop and has guards on all moving parts for safety of the user.

Results:

Design/Planning:
Looking at the operation of the manual milling machine it soon became apparent that the longest and none productive operation was changing the tooling. After reviewing existing solutions, a concept was developed for the automated solution. It comprised of the following steps using electro pneumatic PLC system and a stepper motor:

- Rotate to empty holder position
- Move X-axis over under the quill
- Move Z-axis up to Tool
- Collect Tool from quill
- Move Z-axis down from the quill
- Rotate wheel to next Tool
- Move Z-axis up to quill inserting Tool
- Move Z-axis down away from quill
- Move X-axis away from machining position

Specification:

- Tool Change to take no longer than 12 Seconds.
- Air Pressure 6 bar@ a minimum of 0.5 cubic meters per minute.
- Electrical supply 220 VAC at 20 amps.
- Control voltage to be 24 VDC.
- X Axis Travel to be between 150mm and 200mm (adjustable).
- Z Axis Travel to be between 50mm and 60mm (adjustable).
- Radius positioning of tooling to be within 0.5 degree.
- Clamping force on collet to be 3000 Newtons minimum
- Main control to be by Allen Bradley Micrologix 1100 PLC.
- Human interface to be through Visual basic program on a Laptop computer.
- PLC to control all sequencing and positioning.
- X Axis controlled by pneumatic cylinder (25mm bore x 200mm stroke)
- Z Axis controlled by pneumatic cylinder (63mm bore x 70mm stroke)
- Rotation of tooling controlled by stepper motor (Nema 34 1600 oz/in)

Schedule:

- The schedule started on 15/9/16 and was jam packed with various different jobs and aspects of the project to be completed at certain stages to keep the project on track for a finish date of 07/05/17. Thankfully there was a small bit of time to spare to iron out the few kinks in the programming and timing of moving parts.

Conclusions:

- Overall the project was an excellent learning experience and was a great success. This Project provided the opportunity to showcase knowledge and skills acquired from the course in a practical and theory way.
- The objective of the project to automate the changing of Tools on a Bridgeport mill was achieved.
- The project ran according to plan and the designed schedule.
- The main limiting factors of the project was time and the amount of fabrication needed.

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Injection Moulding & Sprue Picker Simulation Model

INTRODUCTION

As Mould Design and Plastic Processing module is part of our course of study, lecturers were finding it difficult to explain the process of Injection Moulding as there are very little visual aids available. A miniature simulated model would be a very beneficial educational aid for future students.

AIMS OF PROJECT

- To design and manufacture a beneficial visual teaching aid to give future students a better view of the Injection Moulding process.
- To demonstrate all skills learned throughout the duration of the course.

SKILLS USED

- Manual Machining – Turning, Milling, etc.
- Fabrication – Cutting, Welding, etc.
- PLC Programming – Simatic Manager
- Automated Circuits – Pneumatics, Electronics.
- Project Management – Microsoft Project

METHODOLOGY

Research

Research began by learning about the process of Injection Moulding and then splitting it into 3 steps:

1. Injection (Clamp closes)
2. Ejection (Clamp opens and ejects)
3. Sprue Picking (Picks sprue for disposal)

Planning/Design

The planning/design process involved:

- Producing project schedule
- Discussing possible concepts
- Produce concept sketches
- Evaluating chosen concepts
- Develop detailed drawings and 3D model of final design on Solidworks

Fabrication

- Fabricated parts included frame, platen holders, tiebars, brackets etc.
- Materials sourced from IT Sligo and local suppliers.
- Mild steel used for majority of parts.
- All parts fabricated in GEW.

Automation / PLC

- Pneumatic cylinders, valves etc. provided by IT Sligo.
- I/O count for PLC and sensor selection.
- Write PLC program and create flowcharts and symbol tables.
- Test program / Troubleshoot

3D MODEL

CONCLUSIONS

The objective to design and build a functioning model of an Injection Moulding Clamp and Sprue Picker was achieved.

Many skills learned throughout the course of study were demonstrated which is evident from the finished project.

Some problematic factors included:

- Large amount of parts to manufacture in short amount of time.
- Sourcing important parts such as mould, PLC, planetary gear system etc.

SAFETY

Safety was very important throughout the entire project from the design to the manufacturing and assembling as it would ultimately be used as a teaching aid.

Appropriate personal protective equipment was used at all times in the workshop to ensure the safety of the entire team and others around.

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Vacuum Monitoring System

Student Number: S00166322
Project Supervisor: Shane Gilroy

Peter Murphy

Introduction

The author works in a semi-conductor company as a maintenance technician. The primary reason for selecting a vacuum monitoring system is that it can have a significant impact on Analog Devices (employer) reducing the risk of product scrap on at least one system. The effects of a non-functioning vacuum system can result in quite substantial production line down-time.

Due to pin-hole leaks in a vacuum line supplying a handling arm silicon wafers get dropped into an overflow bin and are scrapped as a result.

Issues like this pinhole leak highlighted the fact that the vacuum levels were not monitored by some toolsets and it has a very high risk of re-occurring not only at the unload side but also at the load side which would also cause product scrap. This is where the idea for the project came about and the ADI Engineers gave the green light to support the student in this project.

Project Objectives

The main objections of this project are to

•Devise a method for monitoring vacuum of wafer handling systems

•Provide an alert or preventative mechanism for Maintenance Technicians before a vacuum failure occurs.

•Create a standalone unit that can be retrofitted to current production devices without any interference to existing electronics.

•Demonstrate the knowledge gained over the course of the authors study in a real world manufacturing environment.

Project Benefits

Expected Benefits for Analog Devices are to

•Minimize scrap relating to handling.

•Generate less tool downtime related to vacuum faults.

• Generate less fault-finding required for technicians.

•Highlight the benefits of college projects that focus on current manufacturing maintenance and preventative maintenance issues.

Methodology

Research: Research began with a study of a system that had a vacuum related fault resulting in product scrap.

This was the Watkins Johnson toolset which is a conveyor based system that has a load and unload roller with a shuttle arm using vacuum to transport silicon wafers to and from its load and unload stations.

Design: The early design concept for the project was to tee-off the current vacuum supply into a MP4115 pressure transducer.
It outputs an analog voltage that is proportional to an absolute pressure. The PIC18F45K20 reads these voltages and displays live readings on an LCD screen.

Methodology

These readings are monitored by the microprocessor to activate ports if and when pre-defined limits are hit. These ports would be linked to a module or interface that could activate LEDS to indicate a problem with the vacuum system.

Design Revisions: Since the initial concept idea and block diagram the system has developed now to have several features and components as shown below in the final system schematic. (Fig 2.). Part of this revision was thanks to interviews with technicians/engineers with requests for certain features.

Some of these include:
1. Two pressure Transducer Inputs (One for Load Side of tool and One for Unload side).

2.Potentiometers to set High/Low thresholds and Ideal set-points

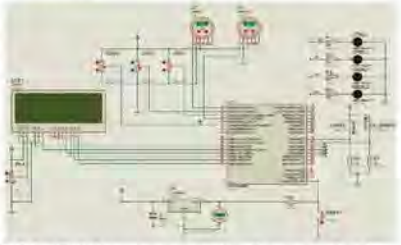
.
3. 'Unit Change' push button.

4. 'Calibration' Push Button.

5. Mains/5V supply to power module.

6. 3.3V Regulator for PIC Power.

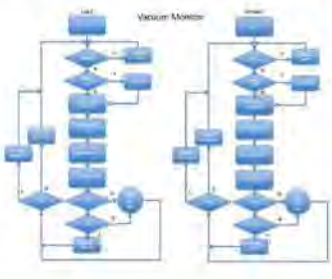
7. Warning LEDS and 'Ideal' 'Setup' LEDS for both transducers



Safety: Safety was paramount in the concept and design phase of the project. The author aimed to use knowledge picked up in the HRPD sections of the course. This included adherence to all safety standards, related to devices of this nature. It has been agreed that the company H&S department will carry out a full audit of the equipment before installation.

BOM: A bill of materials was used to order parts based on the final system schematic above (Fig2.). This included two pressure transducers, a 3.3v voltage regulator to power the PIC and several LEDS and trim potentiometers.

Software: With the extra features in the system the device needed a software flowchart to reflect the more



Build/Test Progress

Build & Testing: The first stage of this project was to get the system working using the simulation software Proteus. This proved the system would work in its simplest form using the original one sensor design. This design was then built out on breadboards and made operational by programming the onboard PIC. The system measured the pressure in inches mercury but the final design included other units as an option for the user. A major part of this was in the coding and programming of the PIC to add on all the extra features.

The final system features two sensors both monitoring simultaneously. A high/low limit is adjustable by two pots. The unit of measure displayed on the LCD can be changed. This was achieved by using different calculations like this in the C program to calculate kiloPascals
pValue[0] = vRead[0]*24.718;
The other units selected by push button will have similar formulas.

Challenges faced in the build and test phases included: The initial programming of the PIC was difficulty mainly due to bad breadboard connections and poor programming.

The author's project mentor helped out with some teething issues and gave some good advice during live lectures and presentations that eventually helped to progress the build. Working fulltime with project deadlines was always tough but with some focus on time management and by using a Gantt chart the author focussed efforts to get this system operational.

The next phase for this project would be to build it out on PCB to ensure reliability and to allow a possible install into a live industrial application for the purpose of its design. This is something the author is keen to do and also the authors employer would see the benefits too.

Conclusions

This project provided an opportunity for the author to show knowledge and skills gained in Sligo IT over the last two years . The project management ideas and templates provided by the mentors definitely contributed to the success of this project when it came to important things like project design, safety concerns, time and cost management. Analog Devices (Employer) is impressed with the final project and is keen to integrate the monitor into its current tool health initiative which is being integrated into its clean room fabs.

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Automated Assembly Machine

B.Eng. Mechanical Engineering Level 7

Introduction

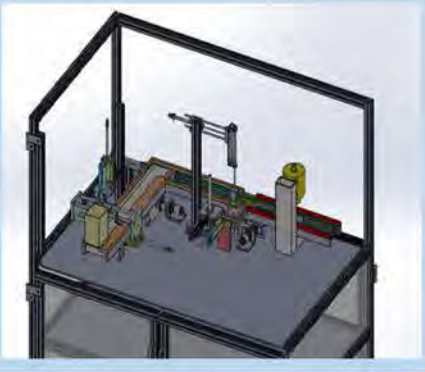
The team has chosen this project due to their personal interest in automation as well as to demonstrate the diverse and expanding role automation has in the manufacturing industry as well to demonstrate how automation can replace repetitive manual labour and reduce working cost and time.

Aim

The aim of the project is to design and build a prototype Automated assembly machine that assembles two components: a nylon block and an M6 brass threaded insert. The machine will feed the nylon block along a conveyor to a drilling station where the block is drilled it will then be fed to the pick and place station where the threaded insert will be placed in the drilled hole, The two components will then arrive at the pressing station where a pneumatic cylinder will press the threaded insert into the block. The two components are assembled and move off the conveyor.

Design

The deign process started with freehand sketches followed by detailed solidworks models and drawings.



Electrics

The machine consists of two separate power supplies, the main power supply is 220 volts which is broken down to 24 volts, this supply is wired through two relays and powers motors A and B, a second power supply powers the PLC and in-turn powers the reed switches and sensors and the valve block.

Safety

The machine is contained within an aluminium frame with doors and persprex windows and includes an Emergency stop, An electric breaker to significantly lower voltage in the machines electrics, and a pressure gauge. A dump valve will be fitted to dump compressed air for safety

Fabrication

- Majority of parts were manufactured in the General Engineering Workshop with centre lathes and vertical milling machines, 3D printing was also used
- Materials include aluminium, steel and nylon
- Parts manufactured included: plates, brackets, guide rails, feed tube, magazine feeder, slides, frames etc.
- All parts were manufactured according to detailed Solidworks drawings

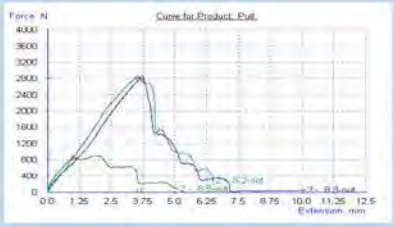
Drilling Station

Testing

- A Cylinder rated with a 10,000N pressing force was also used during testing it pressed the insert in with ease
- The testing for the pressing phase was done was the use 3 different hole sizes 8.1, 8.2 and 8.5, it was decided that 8.5 that would be the correct diameter that would be used because it reduced the pressing in force and still required a high force to remove the component

- The instron machine recorded a pressing force of 1200N to fully press the insert in the base component
- We also used a cylinder that used mechanical advantage to press the insert into the block although it did not produce the required force

- The force required to remove the part was 800 Newton's on the instron machine



Results of the extraction test

Stations

Transferring mechanism

This will push the nylon block off the conveyor and will clamp the block. It will be pushed on the drilling table where there is locations button to make sure that there in the correct place each time.

Drill Rig

This is pneumatic drill that will drill 8.5 hole in the nylon block. The transferring mechanism will clamp the block so it will move during the drilling stage

Transferring Cylinder

This station will push the nylon blocks from conveyor A to conveyor B.

Feeding Station

This is where the threaded insert will be fed down a feed tube where they will be pushed into position by an additional cylinder.

Pick and Place station

This is where the threaded insert will be picked up from the feeding station and placed into the nylon block that is located on the pick and place table. A cylinder will move the blocks on and off the conveyor to the pick and place table. The pick and place table ensure that the block is in the correct location each time

Pressing Station

This is done at the end of conveyor B where the brass insert is completely pressed into the nylon block using a pneumatic press.

Programming

The machine is run using a Siemens S700 PLC. The machine is programmed using a flow chart and State transition programming. The machine has 33 inputs and 12 outputs

Conclusion

This project is to help improve our practical skills and to put all of the skills that have been gained over the past 3 years into practice and to demonstrate these skills by designing, building and testing the automated assembly machine.

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Automated Sandblaster

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Introduction

Sandblasting is the process of propelling abrasive material against a surface under high pressure. This process can be an essential operation to achieve a specific finish. Sandblast is also versatile in its capabilities such as removing oxidation, paint and tool marks. Sandblasting can result in a lot of cleanup and setup requirements, having an enclosed cabinet will allow sandblasting to be carried out anywhere given electricity and a constant supply of compressed air. Integration of automation has huge advantages in production times and cost. We have designed, built and tested an automated sandblasting unit

Aim of study:

- To design, fabricate and a test an automated sandblasting unit aimed towards the medical device industry.

Methodology

Research: The process of sandblasting was thoroughly researched and concepts were designed to where the process could become automated. We tried to keep the process as simple as possible and fabricate a unit to enclose automated sandblasting heads.

Design: The design was heavily focused on 3 main aspects

- Sandblasting nozzles fixed to an oscillating z axis
- Rotary table which held/fixed the components being sandblasted
- Hopper which would reclaim grit media

The design of the automated sandblaster would be designed, modelled and assembled in Solid works. Concept designed were discussed and the pro's and cons were outlined. A project schedule was developed and tasks were assigned to project members. There were lots of different aspects to take into consideration when designing the machine. We came up with three different possible design options and ended up incorporating some aspects of each into our final design. We had to develop a project schedule and get in contact with companies to try and source some of the required parts.

Fabrication: Majority of the parts were fabricated in the GEW and the toolmakers room. The materials were sourced through the GEW. Some parts were sourced through external contacts. The majority of parts were fabricated in the GEW with materials sourced in the GEW.

Controls: We had to build the model on FluidSim and then the I/O count for the PLC. We then wrote the PLC code in Simatic Manager and created master document which included state transitions diagram and the symbolic table.

Methodology

Safety:

- Safety was key with this project. The cabinet is completely closed and the machine is fitted with an appropriate E stop.
- Once the start button is pressed the door cannot be opened until the cycle time has finished or else unless the emergency stop button has been pressed.
- The cabinet was completely sealed to ensure that no sand was to come out of the cabinet and cause harm to the user when the machine is in use.

Maintenance:

- After every 40 hours of use the leadscrew would have to be greased to prevent any parts from seizing or getting jammed with sand.
- The only thing that should need replacing every so often is the door of the cabinet. It will get scratched in time due to the sand hitting it.

Results

Design/Planning: After considering a number of design options we incorporated ideas from three concepts and came up with our final design. Some of the steps of the machine using an electro pneumatic PLC system is listed below:

- Set a certain cycle time depending on the part
- Leadscrew rotating clockwise and the sandblasting nozzles were to touch a micro-switch
- Leadscrew and rotary table linked under the same operation.
- Once the start button is pressed the door cannot open until the cycle time has finished or else unless the emergency stop button has been pressed.

PLC/Control:

- Omron PLC version 3.0
- 2 12 volt motors
- 2 microswitches
- 8 pin relays

Quality:

- We made sure all fabricated parts were done to a high standard and that all parts made on the Milling machine and Lathe were done to a very good tolerance.
- All welded parts such as the angle iron for the cabinet were all made fully square.

Results

Fabrication:

- All of the parts of the project which were fabricated were all completed between the GEW and the toolmakers room.
- Some of the parts were bought in such as the relays and the sandblasting media.
- Lots of parts were recycled from previous projects and the Hopper, control box and Emergency stop button were recycled from a machine which was on from a Turkey farm.
- The punched steel which the blasting media was filtered down through to get back into the hopper was recycled from a quarry.
- The door was made from a Nylon sheet as it is able to withstand heavy impact of the sand from the blasting nozzles with minimal scratches to it.
- The E stop disables all of the outputs of the PLC.

Conclusion

- This project gave us a good chance to improve our practical and theoretical ability from the course. The project was completed overall and we are happy with what was achieved.
- The objective to make an automated sandblaster suitable to a single domestic user was achieved.
- The schedule of the project went well and we were satisfied with this.

Group Profile

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Bath Water Level & Temperature Detector

Shaun Chambers
S00074131

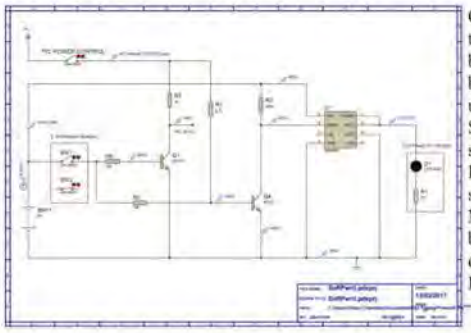
B. Eng. Electronic 2017
Final Year Project

Introduction

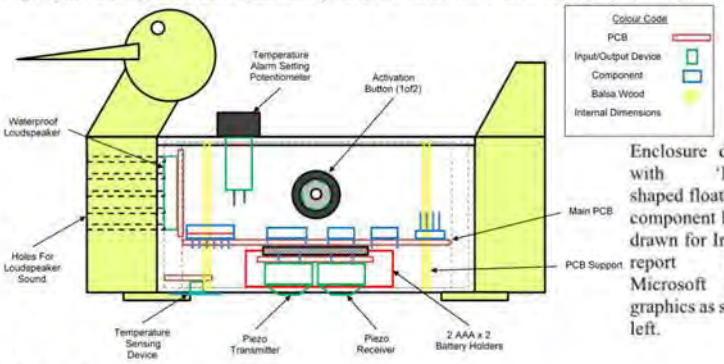
The Bath Water Level & Temperature Detector was part of an enterprising business plan. Chosen from three proposals for project for final year project in third year Electronic Engineering degree course I.T. Sligo. The project is intended to give a student the chance to study a topic in depth & to apply his/her theoretical knowledge to a practical situation. The embedded system presented consists of an 8 bit PIC® 18F4520 micro-controller from Microchip Technology Inc., and interface board housed in a floating enclosure. Representing a solution to a safe & stress-free way to monitor the rising water and varying water temperature in a filling bath.

Methodology & Approach

Project was designed during first semester by: Technical drawings & Sketches; Research; Block Diagram; Flow Chart; Circuit Schematic; PCB Layout; and Enclosure design. All assignments carried out for the project design module came together to facilitate this semesters build.



Circuits built and tested on protobloc breadboard after being simulated using Proteus 8 Soft Power circuit shown left. Program code simulated using MPLAB® X IDE before downloading to the PIC18F



Enclosure design with 'Duck' shaped floats, and component layout drawn for Interim report using Microsoft Word graphics as shown left.

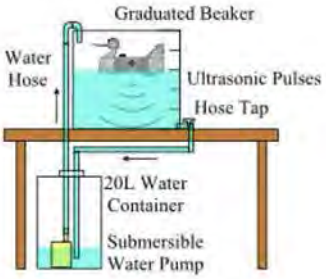
During operation the speed of sound through water and air is part of the microcontroller's calculation of distance travelled of a 40Khz pulse from piezo transmitter; reflected off the bottom of the bath and back to the piezo receiver.

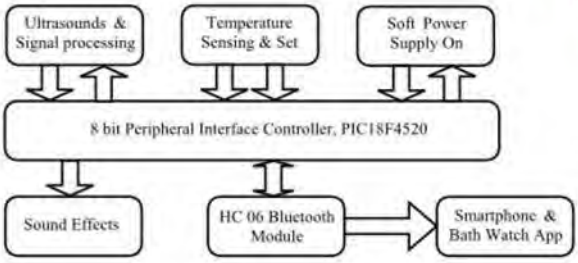
Floating Bath Water Level & Temperature Detector

Volume: 213 x 80 x 59 mm
Weight: 380g

Density: Kg mass / m^3 volume
Relative Density: Detector / Water Density

Expo Day Project Demonstration Apparatus



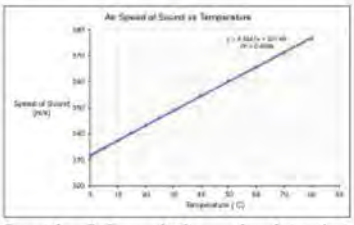


Specifications

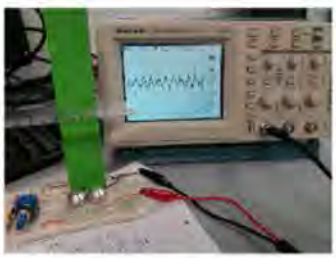
6 Volt Four AAA battery operation; Watertight design; Low indication sound and high alarm sound; 98 db 40Khz ultrasound; Temperature alarm set for 8°C to 66°C, +/- 2.5°C; Bluetooth® to Android phone connectivity; Low power alarm; Soft power 'one press on, one press off, or PIC auto off' activation.

Conclusions & Results

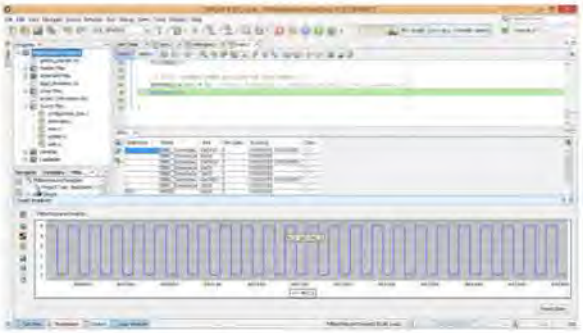
Experiments and tests on project components conducted to date: Enclosure floating level & depth; PIC 18F4520 programming with MPLAB® X IDE and PICKit™3 In circuit programmer; Soft Power supply: simulated by Proteus 8; and built on protobloc breadboard; 40Khz pulse generated by PWM Module; Comparator Module analogue to digital input.



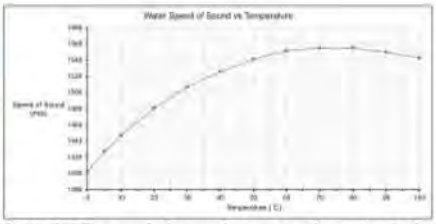
Speed of Sound through changing air temperature is almost constant $c(T) = 0.5641x + 331.86$



Distance to ruler measurement from ultrasonic Transmit & Receive Piezo transducers; 1 mV/30mm (40Khz)



Each program instruction cycle time is accounted for using the Analyser and Special Function Registers view of MPLAB X



Speed of sound through water characteristic for temperature changes is a 3 degree Polynomial curve

Smart Thermostat

Introduction:

The Smart Thermostat is a device the automatically adjusts a heating cycle in order to reach a desired temperature by a specific time.

The user inputs a desired temperature set point and end time, based on these values and current room variables, the devices calculates a specific start time in order to meet the request.

The device will recalculate to compensate for changes in ambient room temperature.

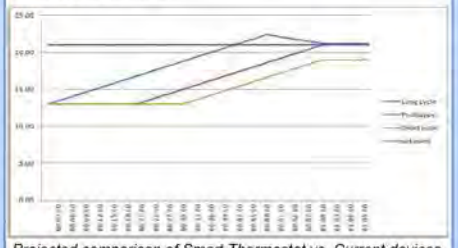
The idea for this project came whilst fault finding a storage heating based system that used a weather compensator.
The need to adjust a heating cycle duration based upon an external temperature that may not influence room temperature, seemed unnecessary.

Aims of Study:

To demonstrate the knowledge gained over the duration of study with regard to circuit design and PIC microcontrollers.

Methodology:

Current options:
Current market devices require the user to input a start time, end time an temperature. This requires the user to *estimate* the duration to reach the specific temperature.
Too long a cycle and the heating could deactivate early, too short a cycle and it may not reach the required set point.
The Smart Thermostat works on what you want, when you want it.



Projected comparison of Smart Thermostat vs. Current devices.

Research:
Research began with a formula to calculate the length of time to heat a specific volume of air.

$$Q=mC\Delta T$$

Where:
- Q is the energy required in Joules.
- M is the weight of air in the space.
- C is the specific heat capacity of air.
- ΔT is the temperature change.

Methodology (Continued):

The weight of air in the space is the volume multiplied by the density of air which is *1275g / M³*.
The specific heat capacity for basic calculations can be taken as 1.

A 1000 Watt heater outputs 1000 joules per second.
Therefore:

Q / Heater Output = duration (S).

Design:
The Smart Thermostat is designed to be a basic market product.
It is hoped the thermostat would:
1. Increase user comfort levels by being more precise than current models.
2. Reduce unnecessary runtime on heating appliances.
3. Reduce energy consumption.

Operation:
During initial setup, the operator inputs the room dimensions and heater output.
When the timer is enabled, the device periodically recalculates the start time based on current room temperature and checks if it is time to enable the heater.

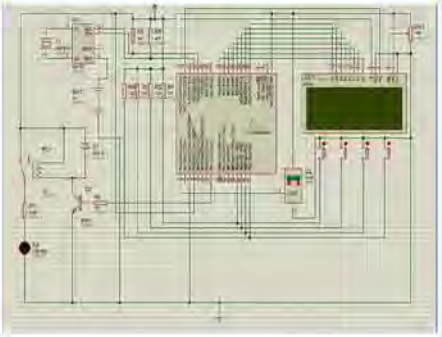
This recalculation is disabled if the timer function is not active or if the user is configuring the device, and is re-enabled upon exiting to the home screen.

User Interaction:
The device required a means for the user to interact and program. This was designed to be simple to follow with as few buttons as possible.
A large 4X20 character display is used to display instructions and current info while a mere four buttons correspond to functions that are displayed on the bottom line of the display.

Menu:
The device menu is navigated using a menu tracking variable that is incremented or decremented according to what ever buttons are pressed.
The device then displays the relevant information on screen and waits in a loop for a button to be pressed.

The menu allows the user to edit settings such as time, program and room variables, and also to reset the device to factory settings.

Results:



Simulation using Proteus software show the device to function as intended with regards to menu traversal, reading and display of time and temperature and the calculation of the start time based on altering current temperature.

Build:
The circuit prototype was built using a breadboard.
Initial attempts to interface the LCD with the PIC microcontroller proved difficult.

The device incorporates the following:
- A PIC 18F45K20 Microcontroller.
- A real time clock (RTC) that interfaces with the PIC using an I2C interface.
- An LCD interfaced in 8 bit parallel mode.
- An LM35 temperature sensor whose output is linear to the temperature range.

Conclusions:

- This project provided an opportunity to display skills and knowledge gained from the course in a practical way and was an excellent learning experience.
- The objective to calculate a heating cycle based on current room temperature was achieved.

The main stumbling blocks of the project:
- The project schedule did not go according to plan mainly due to issues with LCD Compatibility. This had a knock on effect in relation to time management, writing of code and testing of device.

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COLLISION AVOIDANCE SYSTEM (CAS)

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Introduction:

Collision Avoidance System (CAS) is a safety system designed to prevent and/or reduce collision between two or more vehicles or obstacles.

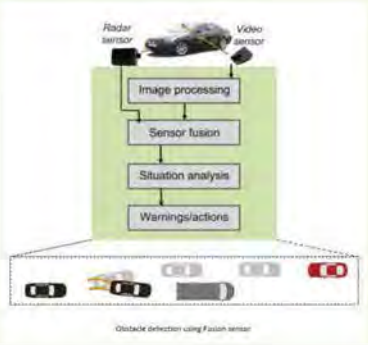
Based on road traffic accident reported accident by the police, there is over a million fatality a year around the world cause by accident. This number can be greatly reduced if a safety system such as Collision Avoidance System was introduced on all new manufactured vehicle as standard.

Literature Review:

Research:
The research on this thesis was conducted by reviewing articles previously published on the CAS by analysing the following:

CAS Sensors:
Different sensors (passive sensor, active sensor and fusion sensor) were analyse in this section to highlight their area of strength and weakness for the CAS.

CAS Accuracy:
The research was done to evaluate how accurate the CAS system was and the area where it can be improved.

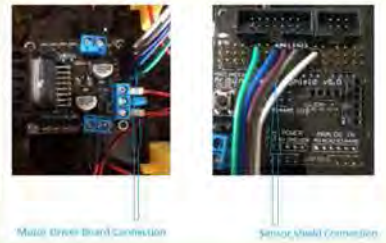


Obstacle detection using Fusion sensor

Semi-Autonomous & Autonomous CAS:
CAS semi-Autonomous system aloud the driver to make the final decision by taking into account the CAS evaluation.
CAS Autonomous system do not require driver input to take evasive action.

L298N connection to the Sensor shield

The L298N is connected to the Arduino board via the Sensor shield using female to female connection.



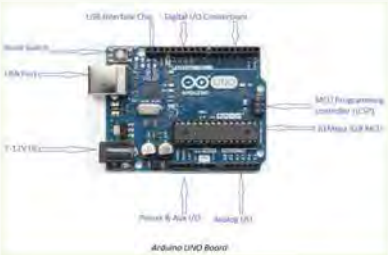
Motor Driver Board Connection Sensor Shield Connection

Project Goals:

The goal of this project was to showcase the skillset acquired from various modules studied while completing Level 8 Mechatronics Degree.
Also to research a topic and evaluate the benefit and areas of improvements.

Arduino Hardware

Arduino module is an open-source prototyping hardware with board design that enable anyone to make a compatible off the shelf components.



Arduino UNO Board

Inputs & Outputs processing Principles

Conclusion:

This Project gave me an opportunity to research the importance of the CAS It also provided me with challenges expected in an industrial setting.

Arduino Software

The Arduino software is an open-source software that use a C programming language to communicate with real-world electronics devices such as sensor, motor drives and relays...
Arduino receives input power through USB and can also be power from a 9V battery

Assembly:

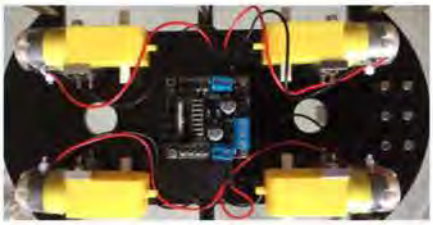


Fig3.10 DC motor connection to the motor driver board

Results:

The resulting Project which was created within the time frame can be seen below.

Vision Measurement with Data Acquisition System

Conor Chambers
Level 8 Mechatronics Project

Introduction

The aim of this project was to design and build a system that can use a vision camera to measure the dimensions of a component passing along a conveyor. This is useful in industries such as medical, where it is important to have high tolerances, but also minimal contamination. The use of a vision measurement system allows the objects dimensions to be measured with out physically touching the object, which can contaminate or damage it. This project also incorporates data collection, which stores the measurements taken in a file for later use.

Objectives

The objectives of this project are:

- To research how vision systems work and find a suitable setup.
- To research suitable cameras to use in the vision system.
- To research suitable software to run and process the images captured by the vision system.
- To build a simple rig to demonstrate the vision system in operation.
- To write a program to run the vision system rig and to process the vision tasks.
- To run tests and prove that the vision system works.

Methodology

Research:
The first part of this project was to carry out the research. This involved researching the following areas:

- Vision Systems
- Vision Cameras
- Vision Software
- Data Acquisition Devices

Planning and Design:
Once the research was completed, the next step was to plan out and design a system that could demonstrate vision measurement and data acquisition.

Physical build and Programming:
Once the planning and design was completed, the next stage was to physically build a rig and a LabVIEW program written that will control the rig and process the vision system. LabVIEW is also used to output the vision measurements and store them in a text file.

NATIONAL INSTRUMENTS LabVIEW™

Final Project Build

LabVIEW Vision Assistant

Process

In this project, LabVIEW is used to run the vision system. LabVIEW Vision Acquisition is used to take images of the component being measured and sends them to LabVIEW's Vision Assistant, which processes the image and outputs dimensional measurements in the form of a pixel count.
This pixel count can be used to get a measurement in millimetres by getting the ratio of pixels to millimetre. This calculation is carried out in LabVIEW and outputted to a text file for storage.

Testing

The testing phase of this project is to find how accurately the vision system can measure objects in its field of vision. This was done by sending the same object of known size through the vision system and recording the data. Then examining the data, it is possible to see how close and consistent the measurements are. From the tests that were ran, on average the system can accurately measure to within 1mm accuracy.
All of the system functions were also tested. This included the e-stop, conveyor control and beam sensor.

Conclusion

The project was successfully researched, planned, built and programmed. The project was tested and worked mechanically and electronically. When testing the accuracy of the vision measurement it was found to be consistently accurate to 1mm. This is not a very high accuracy, but this is due to a webcam being used rather than a dedicated vision camera.

LabVIEW code for Vision Measurement System

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Induction Motor Health Monitoring System

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Introduction:

Assessing the condition of industrial equipment is of optimal importance and makes a huge contribution to the condition of expensive equipment in industry. Induction motors are widely used in industry to drive process equipment such as conveyors, compressors, pumps and fans. There are various mechanical and electrical faults that can occur with induction motors such as bearing, stator and rotor faults. Induction motors would benefit hugely from the creation of a Condition Based Monitoring System that monitors the actual condition of the induction motor to schedule maintenance before failure.

Methodology:

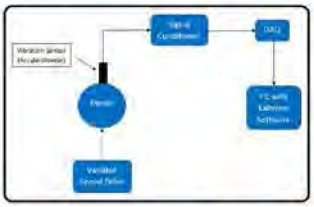
Research:
The research for this project was carried out in three main sections as follows.
- Induction motors background and operation.
- Induction motor faults.
- Condition monitoring techniques.

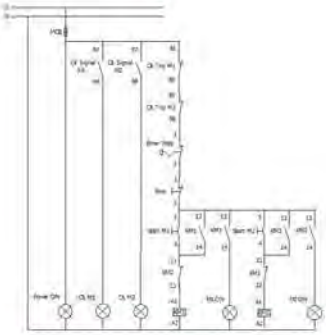
Planning and Design:
Planning the project involved the following
- Designing the testing rig using Solidworks
- Selection of electrical components such as the vibration sensor, signal conditioner and variable frequency drive to run the induction motors.
- Designing an electrical drive circuit to drive the induction motors and an electrical control circuit to control the start and stop operation of the induction motors under test.

Physical Build:
- The system was designed to test two induction motors. A pulley system was used to load the two induction motors under test.
- Adhesive mounts was employed to attach an accelerometer to each motor being tested.
- The final project consisted of various mechanical parts that were made in the GEW and assembled in the project room.

Methodology (Signal Conditioning):

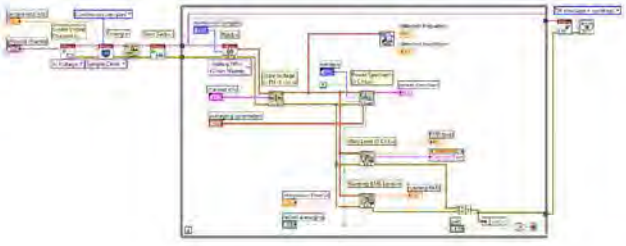
Conditioning the accelerometers output signal
- An ISOTRON signal conditioner was used to condition the accelerometers output signal so that the signal could be acquired properly by the NI myDAQ data acquisition device.
- The NI myDAQ was used to form the interface between the conditioned accelerometers signal and the PC with Labview software.





Methodology (Software):

Labview Condition Monitoring System
A programme was created in Labview to acquire and analyse the vibration signal of each induction motor. To do this the following processes were carried out by the Labview programme.
- Data acquisition
- Conversion of the voltage signal that is proportional to the motors vibration to the frequency domain.
- Extraction of the fault frequencies with their corresponding amplitudes.
- Writing the frequency and amplitude data to a spreadsheet.



Project Goals:

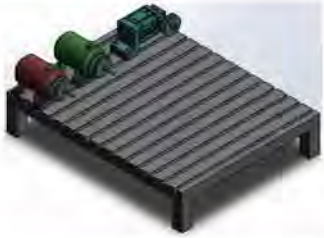
The goal of this project was to showcase the skillset acquired from the various modules studied while completing my Level 8 Mechatronics Degree.
Also to develop a cost effective system that would be beneficial to an industries maintenance strategy..

Safety:

The following safety elements was applied to the Project
- All electrical components and circuitry was enclosed in an electrical consumer unit to mitigate the risks associated with high voltage circuitry.
- A safety guard was made to remove the risks associated with rotating shafts.
- An Emergency stop button is hardwired in the project to stop the process immediately in the case of an Emergency.

Fabrication:

Apart from most of the parts being fabricated in the GEW other parts were bought in such as the pulley mounted to each motor and the Festo components.



Results:

The resulting Project which was created within the time frame can be seen below.

Conclusion:

This Project provided the opportunity to express my theoretical knowledge in a practical way. It also proposed a project that could be carried out in an industrial setting.
The goal set out at the start of this project was accomplished as the completed Project successfully analysed the condition of the induction motors being tested using vibration spectral analysis.
The main challenges faced during this project was completing the fabrication of this Project with the limited time allocated in the General Engineering Workshop.

PID Controlled Chemical Mixing Station

Introduction:

The need for this project arose when mixing smaller volumes of chemicals in an environment outside of the chemical industry. This proved harmful to staff and increased the risk of workplace accidents. The aim was to completely automate this process. The nature of the design was to try to keep it as simple and efficient as possible while still completing the task with a little input from the user as possible.

Aims of Study:

To demonstrate the theoretical knowledge gained over the course of our study in a practical, real world application.

Methodology:

Research:
Research began by observing the manual process, then breaking it down to the simplest steps and automating these steps in the most efficient way possible. This process was broken into three main sections:

1. Chemical Handling
2. Chemical Dispensing
3. Chemical Mixing

Design/Planning:
The design process involved:

- Selecting technology
- Develop project schedule
- Develop initial concepts
- Reviewing available resources
- Assign tasks among project members
- Develop detailed plans for three main sections outlined above
- Model design in Solidworks

Fabrication:

- Most of the parts were fabricated at home in our family workshop
- Food grade 18/10 Stainless steel was used for the frame to Illustrate a clean room environment
- Materials sourced from IT Sligo and local suppliers
- Fabricated parts include the frame & coupling devices.

LabVIEW/Control:

- PID Control for dispensation of fluid
- Pulse Width Modulation to switch on/off motor
- Weighing volume using a Load Cell
- Measuring volume using Ultrasonic Sensors
- Test program/Trouble Shoot

Methodology (Continued):

Quality check/HMI:

- Quality check based on the weight of the filled mixing beaker.
- Strain gauge based Load cell weighs beaker.
- NI myDAQ transmits reading from load cell to LabVIEW VI which decides if beaker weight is within tolerance.
- HMI displays beaker weight and alerts user if beaker is accepted/rejected and also alerts user to fill beaker when empty.

Safety:
Safety was paramount in the design of the project. The project includes an emergency stop and is also completely enclosed for safety of the user.

Results:

Design/Planning:
After reviewing existing solutions, a concept was developed for the automated solution. It comprised of the following steps using LabVIEW Software:

- Check the mixing beaker is empty
- Proportionally dispense chemical dosage
- Beaker starts to fill
- Mixer starts mixing chemical solution
- Weigh beaker using Load cell with LabVIEW
- Use HMI to alert user whether the beaker is within the volume tolerance and switch off dispenser and mixer.
- Ultrasonic Sensor to monitor & alert user when chemical bottle is empty

Results (Continued):

Quality check/HMI:

- Beaker accepted or rejected based on volume tolerance using a load cell and myDAQ.
- Signal required conditioning in LabVIEW .
- HMI provides user with visual interface showing past and current volume readings.
- Also records beaker volumes and status to excel file and sends email with process details.

Fabrication:

- 60% of fabrication was completed in a Workshop
- 40% bought-in parts
- Industrial standard components and materials were used throughout

Conclusions:

- This project provided an opportunity to display skills and knowledge gained from the course in a practical way. Overall the project was a success and was an excellent learning experience.
- The objective to automate the manual process was achieved
- The project schedule ran according to plan

The main limiting factor of the project Included:

- Time and the amount of fabrication required
- Budget and resources available
- Removal of mixed product from machine could have been automated if time permitted

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Four Degrees of Freedom

Control System

Adrian Keaveney

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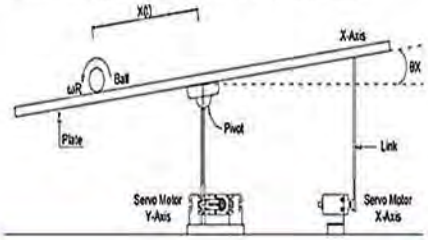
Institute of Technology Sligo, Ash Lane, Sligo, County Sligo, Republic of Ireland

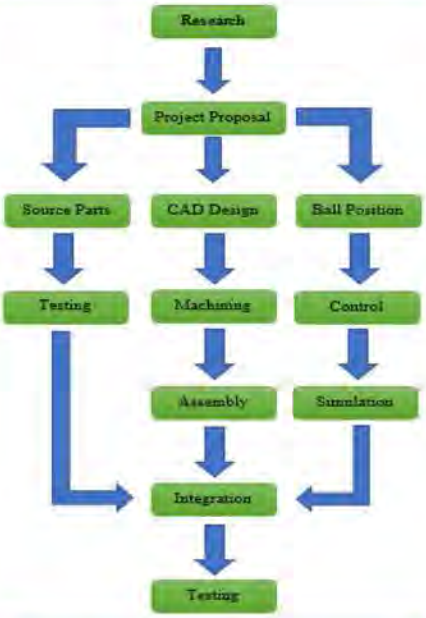
Introduction:

A research and build project, to review the different ways a ball can be balanced on a plate. A Ball on a Plate Balancing System is an upgrade to the Ball on a Beam Balancing System, and incorporates the implementation of control feedback system.

The goal of this project is to control the position of a ball for both static and moving sates. This system can be implemented to demonstrate the efficient use of a control system and the implementation of a PID controller.

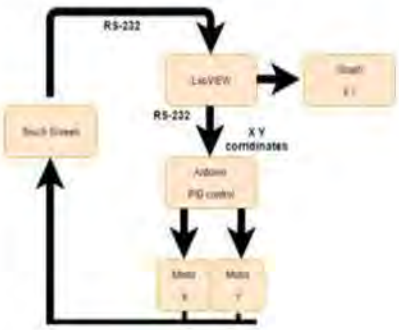


Objectives :



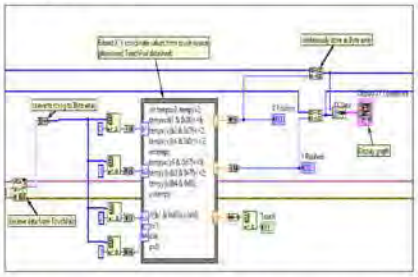
System Design:

A basic block diagram of the hardware for the system is as follows:

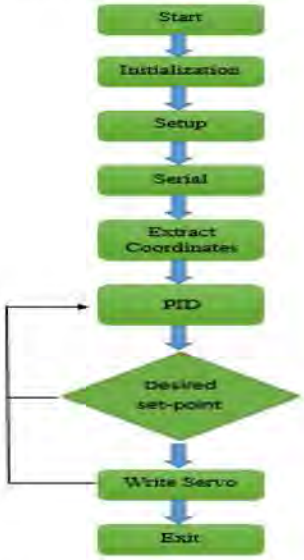


Methodology:

A resistive touch-pad was used to detect the movement of the ball. The data that is collected by the touch-pad was transferred using serial connection RS-232 to LabVIEW. From here the data was processed into X and Y coordinates and graphed on LabVIEW to simulate where touch had been made on the pad. Below details part of LabVIEW VI to extract XY coordinates from touchpad.



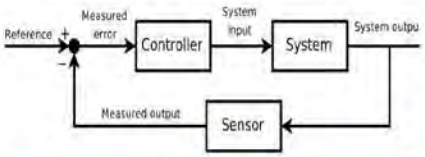
The X and Y coordinates were then passed from LabVIEW to Arduino to control the output of two servo motor. Below details a flow chart of the code implemented by the microcontroller.



The physical build includes working on a design to allow for free movement of a plate around 360 degrees. Designing a bracket which will hold the actuator in place while also bearing the weight of the detection device. Below details the model design created in solid-works.

PID Controller:

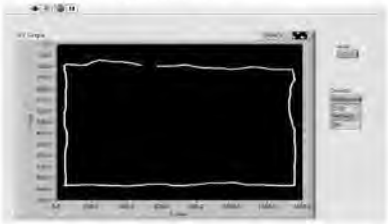
Proportional-Integral-Derivative (PID) was used to control the output of motor. PID is commonly used way of implementing feedback into a close loops response system. It's used widely throughout industry in laboratory equipment and in engineering applications such as, embedded system and distributed control system. A PID controller works by calculating the error value between a measured value to that of a desired set point. The controller will attempt to reduce this error value by adjusting the output



Results:

This type of project for balancing a control system is considered to be, one of the most challenging for engineers within industry today.
Within the time frame the project:

- Extensive research was carried out.
- Successfully Designed and build a physical model.
- LabVIEW VI was successfully created to track the position of the ball.



- PID controller was designed to successfully control the output of the motor.
- Problem the system takes to long to process data

Conclusions:

- Overall objective of the project were met.
- Project uses all the knowledge gained over the duration of the college course which is extremely beneficial.
- Future work on the project would be to change the overall system design. LabVIEW would process the data taken from the touchpad and also control the output to the motor. This would result in the system being able to process data faster.

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Search and Rescue Drone

IT Sligo
An Institiúid Teicneolaíochta, Sligeach
Research

Introduction

The area of search and rescue is one which requires large amounts of man power and time. This project looks to reduce the demands on both by adapting a UAV for human detection within a pre determined GPS grid.

Design

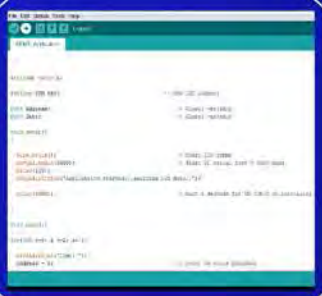
The project uses the drone's on board camera for human detection, Xbee to send GPS co-ordinates to the drone and the drones current GPS co-ordinates to the user

Process

The Xbee were configured on XCTU and powered and managed via Arduino. The drone was modified via LabView.

The Drone

The drone is an AR Drone 2.0 from Parrott. It has an onboard camera, an ultrasonic sensor for altitude detection. It can be controlled via LabView.



The GPS

The DS-GPM was specifically designed for use in robotics to send an unmanned to GPS way points. It has fast 56 channel position acquisition and I2C interface.

Components

The Project used the onboard camera of the AR drone , Xbee series one, a DS-GPM for GPS and Arduino to tie it all together.

Results

The project provide great learning outcomes in terms of research, testing and problem solving. The Arduino were successfully programmed to take in GPS co-ordinates via Xbee from the GPS module and the drone was controlled by LabView.

Conclusions

The area of search and rescue is one that can benefit greatly from the use of UAVs to cut down on manpower and time. UAVs have much to offer in this area as battery life improves and more robust methods of data transfer come into being.

LinkedIn Profile

Obstacle Avoidance Vehicle

Introduction

Obstacle Avoidance Vehicle is a project that detects objects that are approaching closer to the vehicle. An alert will trigger when sensors detect an incoming object, and the vehicle will avoid the object by turning to another direction.

This project is based on Arduino where sensors detect objects, a buzzer will trigger the sound until the object is avoided. A motor driver receives input from the sensor and will move the vehicle away from the object.

Objectives

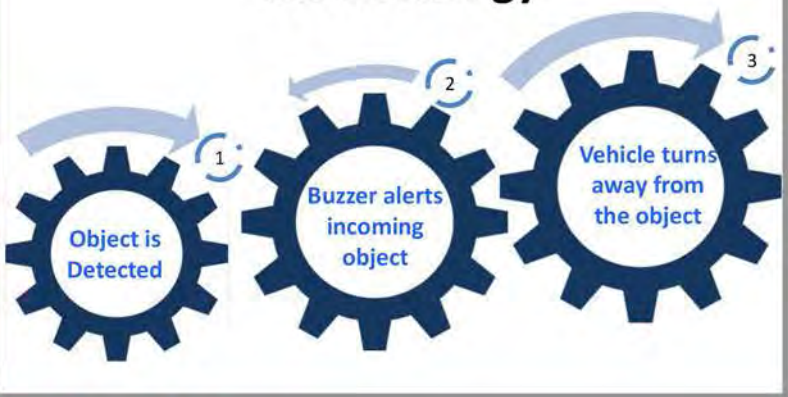
- Detect incoming object to the vehicle
- Alerting the incoming object
- Moves away from the object

Vehicle Body

Ultrasonic Sensor

Circuit & Arduino

Methodology



Results/Conclusion

The vehicle is able to detect objects, trigger an alert of an approaching object, and avoids the object. Getting the vehicle to avoid the object in a specific position near the vehicle is complex as the sensor is unable to detect the size and shape of the object.

This project is beneficial for many motorist as the concept is to avoid collisions and accidents.

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Rubik's Cube Solver

Mechatronic Engineering
2017

Introduction

The Rubik's cube has boggled the minds of millions since its release in 1974. Erno Rubik's invention has since went on to sell more than 350 million units and is one of the best selling toys in history. The beauty of the Rubik's Cube is that when you look at a scrambled one, you know exactly what you need to do without instruction. Yet without instruction it is almost impossible to solve.

This project is intended to take a scrambled Rubik's cube and using a vision system and a series of motors, solve the cube to its "completed" state.

Process

4 3D printed "claws" will hold the Rubik's Cube in place and can rotate the cube in whatever direction is needed. These motors will be mounted on sliders. 2 servo motors will be in place to move the stepper motors in pairs in linear motion towards and away from the cube.

A USB camera was used to take a picture of a side of the cube. Using LabVIEW the colour pattern was then stored into a Rubik's Cube net. The cube was then rotated and a picture taken for the remaining 5 sides of the cube.

With the position of the colours on the cube now known, an algorithm can be devised to solve the cube to its completed state.

Using LabVIEW, the commands for the motor were sent out to an Arduino board which was used as a DAC to control the 4 stepper motors and the 2 servo motors.

Objectives

- To have a fully completed working project for expo day
- To have the USB camera recognising colours
- The motors working in conjunction with LabVIEW
- Fully solve the Rubik's cube using the project
- Improve on skills (transferable and practical)
- To enjoy and learn from designing and making the project

Results

- The machine could not completely solve the cube.
- It had the ability to recognise the colours on the cube, while rotating the cube into position for the camera to pick up the pattern
- The project could also turn the cube in all directions
- The machine could be used as a Rubik's Cube scrambler now instead

Conclusions

- The project's main aspect is on vision systems as well as motor control
- The complexity of the solving algorithm was very advanced
- Some skills gained include problem solving, time management and design
- More time would be desired to complete the project as it would have been enjoyable to complete

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Vision Based Quadcopter Landing System

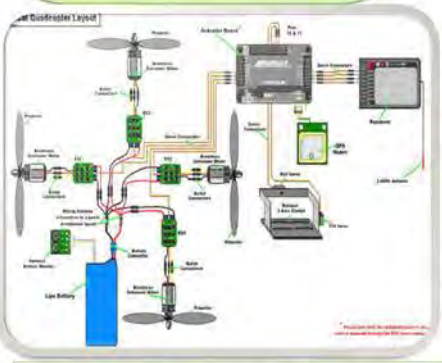
Beng (Hons) Mechatronics

Introduction

A few years ago unmanned aerial vehicle systems (UAVs) were a technology of the future and still in development. Although in recent years with the advances in Lithium-ion polymer batteries and other technology, UAVs have become quite sophisticated and are now widely used in many different applications such as military, agriculture, research and search and rescue. Although there are still some issues to overcome in making UAVs autonomous and because of this most UAVs are still controlled manually. This project is focused on implementing a system to autonomously land a UAV as that is where a lot of problems and crashes occur.

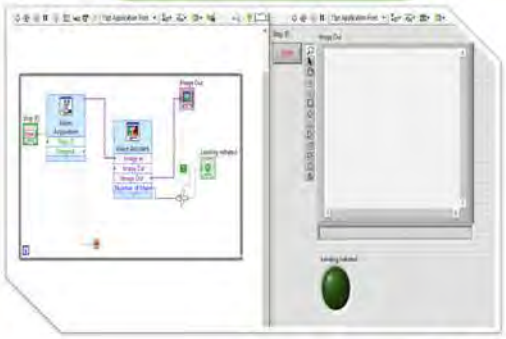
Methodology

As soon as a project proposal was reviewed and signed off, the research and literature review could commence. Throughout the research phase the most suitable components for the project were able to be determined and sourced. An LHI QAV250 quadcopter was purchased as it consisted of a strong and robust carbon-fibre frame, powerful 2200kV brushless DC motors 12A electronic speed controllers and an 11.1V 1500mAh 35C 3S Lithium-ion polymer battery. The flight controller chosen is an Ardupilot Mega 2.8 due to its autonomous flight and open source programming capabilities. A telemetry kit consisting of a GPS module, transmitter and receiver will enable wireless communication between the flight controller and the ground station (laptop) using a MAVlink protocol. All these components are crucial in enabling autonomous flight. Below is a wiring diagram of all the components of the UAV.



Methodology ctd..

Once the UAV was able to fly well and stable the next step is to implement the vision system. This consisted of a Quanum Elite Camera and AV transmitter and receiver. The camera and transmitter are mounted on the UAV and powered by the 11.1V Lipo battery. The receiver is connected to the laptop and feeds the AV stream into a LabView program. The program processes the live AV feed and when a designated landing pad or symbol, (a helipad H in this case) is detected by the program a signal is sent through the telemetry module to initiate a landing sequence and land the UAV on the landing pad.



Results/Conclusions

The UAV was small but strong and robust due to the carbon fibre frame and was able to withstand several crashes during the testing phase. The flight controller performed well and was quite stable after some required tuning to balance out the motors.

As there were several different wireless communications running simultaneously I was worried that there may be some interference between them but fortunately there wasn't and all worked well. The manual control of the drone was on a 2.4GHz frequency, the telemetry module operated on a 433MHz frequency and the AV transmitter and receiver operated on a 5.8GHz frequency.

The LabView vision program worked well at processing the AV feed although it can be affected by lighting and sometimes there was to much vibration due to the movement of the UAV which interfered with the detection of the landing pad symbol. This could have been improved by using a higher quality camera for better image acquisition. The final part was sending a signal to the UAV through the telemetry module to initiate a landing sequence, this was the most challenging part as I had to use Labview and interface it with the MAVLink protocol that was used with the telemetry software Mission Planner which was not without its issues. Overall the different aspects worked well individually but ran into some complications when all were working together.

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Portable DC-DC Power Supply

John O Shea - Electronic Engineering 3rd Year

Introduction

This project came about when the problem of having to deal with inadequate, bulky, or prohibitively expensive and wasteful means to provide reliable DC voltages outside of the lab. Disposable batteries are a poor ethical choice because of the waste generated, benchtop lab power supplies are expensive, bulky, and at times extremely inefficient.

The overriding goals of the project is to design and build a prototype portable DC-DC power supply offering the user an adjustable voltage output ideal for any electronics hobbyists, education scenarios, and remain as reusable and reliable as possible.

Methodology

Research

Research began by looking at what was already available then noting the positives and negatives then weighing each element based on the projects goals. High efficiency was the primary concern.

DC to DC BoostBuck converters known as power management integrated circuit or PMIC

A low energy microcontroller with at least one analogue input was required, as such a PIC 18 series microcontroller was chosen.

Three buttons were used as the control interface with four LEDs serving as the users feedback.

Lithium polymer battery and MCP73831T charge controller serve as primary power supply for the LTC3130-1 boostbuck converter.

Methodology(continued)

A low energy microcontroller with at least one analogue input was required, as such a PIC 18 series microcontroller was chosen.

Three buttons were used as the control interface with four LEDs serving as the users feedback.

Lithium polymer battery and MCP73831T charge controller serve as primary power supply for the LTC3130-1 boostbuck converter.

Process

Planned Process

- First task was to prototype the LTC3130-1.
- Second task is to configure the PIC 18F45K20 to control the LTC3130-1.
- Third task measure and display output voltage using PIC
- Fourth integrate the MCP73831T charge controller and LiPo battery.
- Fifth design and have fabricated PCB to prove concept.

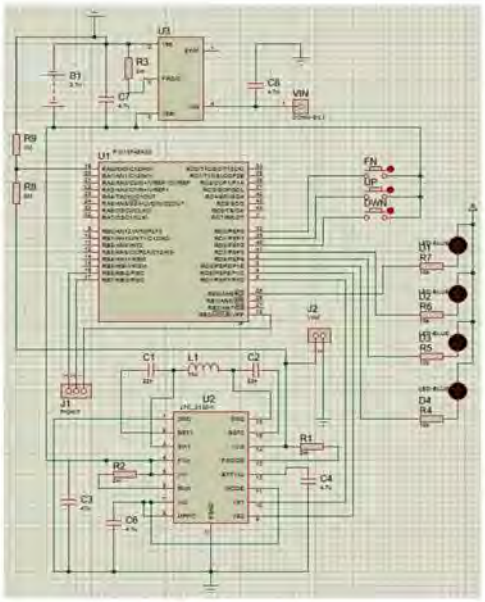
Results

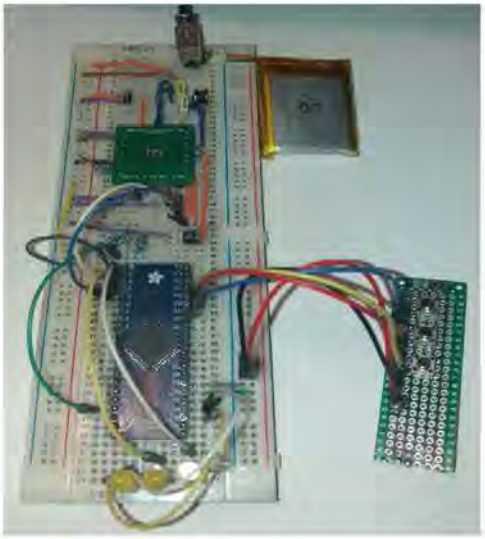
Goals met:

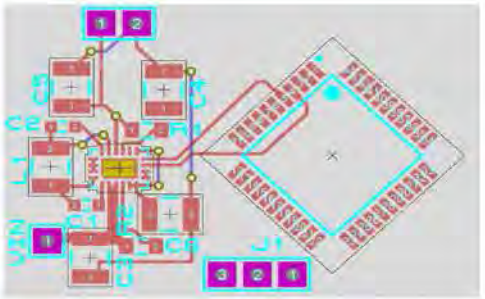
- **LTC3130-1 controlled by PIC microcontroller inputs**
- **PIC measuring and displaying feedback.**
- **PIC controlling LTC3130-1 output via push button user interface.**
- **Integration of Battery and Battery charge circuit.**
- **PIC measuring and displaying battery charge status.**

Goals not met:

- **PCB fabrication was not completed in time.**
- **Output to an LED or LCD screen was intended if time permitted.**







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Talks at the Engineering Expo on the 4th May 2017

•11.00-11.30am
James Chambers, Engineer and Anthony Mannion, Engineer
From Modular Automation

As design engineers James and Anthony will be discussing the roles of an Engineer, with a particular focus on the importance of soft skills along with technical skills required in the workplace.

•11.30-12.00pm **Anthony Blake**
Research & Development Engineer (Renewable Energy & Sustainable Engineering)
From University of Southampton

Anthony is a geotechnical engineer who specialise in research and development. Anthony will discuss Mathematics and R&D with renewable energy and sustainable engineering.

•12.00-12.30pm Patricia McAfee
Research & Development Engineer
From Boston Scientific

Patricia is a mechanical engineer and will be discussing her own career progression and role in engineering as research and development engineer in Boston Scientific.

•12.30-1.00pm Stephen Merriman
Senior Mechanical Engineer
From Google

Stephen is the regional engineering lead for Google, Europe and will be discussing the importance of data and how it will be gathered and stored and the solutions that Google will be offering to industry to collate and share data between sites in real time.

•1.00-1.30pm Prize Giving
There will be a prize for the best student in each category;
- Mechanical engineering
- Precision Engineering & Design engineering,
- Mechatronic engineering
- Electronic engineering.

The "Abbott Student of the Year" prize will be awarded by Tracy Powell and Alan Henry of Abbott, this years event sponsors.

•1.30-2.00pm Conor Murphy
Site Director at Abbott Laboratories Site Director at Abbott Laboratories
From Abbott

Outlining the importance of a major company like Abbott to the area where it is based from employment to social inclusion, Conor will be talking about Abbott's role in the community and their roles as a major employer of engineering and science graduates in Ireland.

•2.00-2.30pm Claire Scanlon
Managing Director
From Canny Futures

Claire will be looking at the strengths required in Engineering and advising people on how to make the most of their natural talents and use them to achieve goals.

•2.30-3.00pm Shane Loughlin
Founder / CTO at SL Controls Ltd
From SL Controls

Hitting the main theme of the discussions for the day Shane is talking about his work with leading multinationals in the development of standards and a path forward for Industry 4.0. the standard of the future which is being rolled out now.

•3.00-3.30pm Brian Cooney
General Manager at KUKA Robotics Ireland
From KUKA Robotics

Brian is talking about the role of Robotics in Industry 4.0, Cobots and more. In what promises to be a most engaging discussion he will set out the vision of automation and AI in the workplace.

•3.30-4.00pm Professor Gerry Byrne
Fraunhofer Senior Advisor UK and Ireland (former College Principal, Dean of Engineering, Prof of Eng, University College Dublin)

Towards and beyond Industry 4.0. Looking at significant developments in Industry 4.0 and what lies ahead.

•4.00-4.30pm Fergal Broder
CEO and Mark Butler, HR Manager
From LotusWorks

Fergal and Mark are talking about LotusWorks and the movement to promote engineering with a strong Sligo focus. Their discussion will focus on how world class standards can be learnt and taught from the north west thus helping the development of the region through engineering.

•4.30-5.00pm Oran Doherty
Regional Skills Forum Manager
From the Regional Skills Forum

The Regional Skills Forum is the conduit to share your business and skills needs. Oran will be out lining the benefits to companies of this one stop shop that will understand companies needs and direct them to a solution to help close the skills gap. Oran is going to launch additional employers services at the event also.

•5.00-5.30pm
Professor Dietrich Rebholz-Schuhmann
Director Insight/Galway, Professor informatics NUIG, Galway
From Insight

Professor Dietrich Rebholz-Schuhmann is talking about data analytics and Industry 4.0 and how the core of this new standard of the future is as much about data and sharing it live as it is about the mechanics that will carry out functions.

•5.30-6.00pm Andrew Lynch
Chief Innovation & Network Officer
From Irish Manufacturing Research

Andrew is talking about Industry 4.0. and how it is being applied to all elements of industry and how this is quickly becoming the 'norm' for any manufacturing company.

•6.30 -6.45pm Una Parsons,
Head of School of Engineering & Design IT Sligo
From IT Sligo

Concluding the day with a round up of all we have heard and outlining the commitment that IT Sligo has to helping grow and develop the Engineering Sector in the north west.

Workshops

1. Coder Dojo with Keith McManus from IT Sligo School of Computing

2. Little Bits with David Mulligan from IT Sligo school of Engineering

3. Button Dash Game with David Mulligan

4. Electronic Engineering Students Workshops x 3

5. CV Clinics with Debs and Antionette from IT Sligo

6. CV Clinics with Collins McNicholas

7. CV Clinics with Career Wise

ENGINEERING EXPO

IN ASSOCIATION WITH ABBOTT