

Dr Andrew Ambrose-Thurman MEng PhD MIET

CONTACT INFORMATION

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I am an R&D Electronic Engineer based in North East England. I have particular interest in autonomous technology and designing for harsh environments. I have strong embedded systems design and implementation experience. I am a competent programmer in several languages, and can acquire new ones quickly.

For examples of current and previous projects, see <http://andrew.thurman.org.uk/>

WORK HISTORY **September 2016 – Present** **Software Controls Engineer – Innovation, SMD**

Reporting to the CTO, I worked on an innovative system for mapping the seabed as an entry to the global \$7.5m Shell Ocean Discovery XPRIZE competition. Our team was the only British finalist – one of only four teams to make it to the competition area, out of 32 original entrants from 25 countries. I led the software team - not only writing much of the software for the autonomous underwater robot, but also managing the software contractors (running the interview process, chairing the interview panel, designing the software architecture, writing requirement specifications, assigning work packets, etc). The system is capable of diving to 4km, fully scanning the water column en-route (including taking a 3D video of the surroundings), creating a 3D topographic map of the ocean floor, and returning to the surface. When complete, a number of robots will function together as a swarm to ensure complete coverage. This project draws on various aspects of my PhD research.

During this time I also assisted with the Conservation X 'Make for the Planet – Borneo' competition, where 15 teams attempted to solve a number of global conservation challenges over a short period at the 5th International Marine Conservation Congress. I remotely mentored teams both before and during the event, via email and video link - discussing their proposals, and giving them feedback and suggestions.

Prior to this I was part of a small team working on the ambitious 'ROV 2.0' project, tasked with redesigning from scratch all aspects of SMD's main suite of products. Some of the work I undertook included:

- Learning a number of programming languages from scratch, to both work with the existing systems (using Rockwell (AB) ControlLogix PLCs and Wonderware Intouch SCADA platforms) and to benchmark options for the future system (using Qt).
- Prototyping and assessing options for the new, fully modular prototype control system for remotely operated subsea vehicles (ROVs).
- Creating various demonstration user interface concepts, including one designed to be used on a big screen, one to be used on a handheld tablet, and one to be used with a 3D stereoscopic headset.
- Writing a modular test and control suite for low level PCBs and subassemblies using Qt.

December 2012 – August 2016 **Electronic Engineer, Tracerco (part of Johnson Matthey)**

I worked on a number of projects at Tracerco, notably:

- Discovery (a novel device for subsea pipe scanning)
- Hyperion T251 (a density/level gauge)
- Hyperion T254 (a local indicator/configurator)
- Veritas (a portable detector for fuel assurance)

I was involved with the Discovery project from a very early stage. The tool uses a radioactive source to create an image of a slice of the pipe. This has involved work on all electronic aspects from conception to completion, and I hold a patent based around this work (WO2015097447). I was heavily involved in the design and release of both generations released, including:

- Designing and building a novel RF based subsea wireless communication system for transferring data at high speed between static and rotating parts of the tool. Transmitting RF subsea is a significant challenge, and one which many people have said was impossible, but through use of waveguides we have produced a robust data transfer system. I took the lead on this section of the project, and undertook the design, experimentation, and much of the construction of the system. This included testing (both in small scale experiments and on the final concept), and building the control electronics.
- Specifying and performing initial setup of a single board industrial-specification computer to replace a larger, desktop-replacement computer, increasing reliability and more closely matching requirements.
- Designing the electronics and writing the firmware for the main control PCB – including power control of subsystems and rotational position encoding. This combined several previous mainly COTS systems, reducing space and complexity.
- Specifying a new subsea connector type for the new generation – changing from expensive, unreliable and fragile connectors to a considerably more robust type used widely in the industry.
- One connection required a 50 ohm coaxial connection, rated to 2.4Ghz signals, and rated to a depth of 3,000m. No available connector and cable was rated sufficiently, and so I worked with manufacturers to find a solution – using one of their existing products and performing tests to ensure that they would be able to withstand the demanding situation.
- Changing from a slow serial connection to an Ethernet connection for communication to the surface – a decision which many at the time thought was risky, but which has given many advantages.
- Building a full benchtop hardware simulator of the tool, allowing for testing of components and modifications in a controlled environment.
- Writing the majority of the documentation for Generation 1 – including user instruction manuals, schematics, and construction documents for external contractors – and some documentation for Generation 2.
- I can work to tight deadlines in a fast paced environment – demonstrated by my involvement in the 9 month timescale for a complete redesign and build of the (considerably more advanced) Generation 2 Discovery tool.

I also completely redesigned a density/level gauge system for use in hazardous environments. The previous version was deemed too large, heavy, and expensive, and many extra features were added in the new version – including AC and DC inputs, an extended temperature range down to -55°C, and additional waterproofing. This work included:

- Running in-house temperature tests on behalf of a power supply manufacturer, as no suitable product was rated to such low temperatures
- Calculating the theoretical power requirement for additional heating elements and selecting a suitable manufacturer
- Relaying several PCBs and sourcing various new components to suit the smaller form factor
- Making firmware improvements to improve the reliability and usability of the product, including adding a bootloader to allow the firmware to be updated in the field without requiring the whole unit to be stripped down
- Undertaking complete environmental testing (EMC, shock and vibration, high / low temperature)
- Working extensively with the internal engineer in charge of certification to solve any issues resulting from CSA certification (amongst others)
- Visiting client sites to diagnose faults in the previous model, in support of field engineers
- Fully developing from scratch a stand-alone display and calibration module that can show the current status information to users in the field (design of schematics, PCB layout, firmware programming, UI design, etc)
- Adding optical and magnetic buttons which work through a thick glass explosion proof screen
- Working with a manufacturer to work out why a component wasn't working as specified, leading to a global product recall and redesign by the manufacturer. In the meantime I modified the existing units to counteract the problem

I designed the firmware for a highly portable device for measuring chemical markers in fuel samples, to test in real time for illegal substitution or dilution. This included various requirements:

- Storage of all historical readings
- Connection via Bluetooth to an Android user interface
- Full, secure encryption at every stage - including storage and communications

EDUCATION

2017-2019 MBA, University of Durham

I am currently undertaking a part time MBA programme at the triple accredited Durham University Business School. This will extend my knowledge of various aspects of management, including strategy, finance, and project management. This is to support my personal development and career ambitions to progress as an R&D engineer towards a management role.

2008-2013 Fully funded PhD - Electronic Engineering, University of Durham

The title of my thesis was Autonomous, Collaborative, Unmanned Aerial Vehicles for Search and Rescue. I investigated the use of flying robots in searching for missing persons, focussing particularly on search route planning, GPS positioning, and relative positioning.

Connected with this I developed the telemetry system for the Durham University Solar Car as part of the World Solar Challenge, racing from coast to coast across Australia in 2011. Other research interests include route planning over probability maps, GPS tracking systems, relative positioning, and other topics associated with collaborative UAVs (swarming, data fusion, etc.).

2004-2008 MEng - Electronic Engineering, University of Durham

For my final year project I researched into stereo display systems - focussing on 3D compression in stereo display systems. I received a 2:1 overall, but achieved a high first for the dissertation, demonstrating my strong ability in undertaking independent research.

TECHNICAL SKILLS

Programming languages:

Competent in several languages, including C, C++, Qt, Python, and Wonderware Intouch / ArchestrA (SCADA), with experience with UNIX scripting. I am an experienced programmer and have taught myself new languages in short timeframes where necessary. I have extensive experience of interpreting and reworking undocumented/legacy code written by others.

Embedded systems:

I have used a number of embedded systems and single board computers, including a variety of Atmel and ARM microcontrollers, Xilinx FPGAs, Telit modules, Arduinos, Gumstix, Rockwell ControlLogix PLCs, and others. I have also used embedded Linux, including OpenWRT.

Training:

I have been trained in the use of radioactive sources, and have been on a lifting and slinging course for overhead cranes. I have experience in soldering both surface mount and through hole components, including PCB reworking. I have had training in fibre-optics, including splicing and connector termination.

Web development:

I have written and maintain a number of websites, and can write in HTML, PHP, CSS, Javascript (including the Google Maps API), MySQL and PostgreSQL. See <http://andrew.thurman.org.uk/> for examples of my work.

Operating systems:

Experienced user of Microsoft Windows, Mac OS-X, and GNU/Linux, including a degree of system maintenance.

Computer applications:

Advanced user of TeX (LaTeX, BibTeX, etc.) - I have organised teaching workshops for students. Expert user of Microsoft Office (Word, Access, Excel, etc.). I have a thorough grounding in Computer Aided Design (CAD) and other design software, including as AutoCAD and Altium (for schematic design and PCB layout).

**VOLUNTARY
EXPERIENCE**

Management of rental properties (2015-present)

I currently manage a rental property in Durham, letting rooms to postgraduate students. This includes advertising rooms, arranging for contracts and rental payments, and coordinating property maintenance. I have in the past managed multiple properties, and prepared them for advantageous sale.

Durham Go Club (Committee member 2006-present)

Go is an oriental board game similar to chess. I run the club jointly with my wife. I organise twice weekly club meetings, teach and develop less experienced players and arrange the annual Durham Go Tournament. This is a two day event, often with over 50 attendees. In 2012 I organised the major national British Open Go Tournament.

Durham Cathedral (Volunteer 2012-present)

I am a member of the liturgical serving team, assisting with the running of various services throughout the year. This involves working very closely with the rest of the team to ensure that services are seamless, despite any unforeseen occurrences that may arise. We aim that everything is done to the highest standard – whether for a small service with a handful of congregants or a major occasion with visiting archbishops and thousands of worshippers, filling the Cathedral to standing room only. During a long weekend in 2017 I coordinated over 50 events in Durham City and the surrounding area as part of the Talking Jesus project. I used my project management skills to coordinate resources, develop Gantt charts to manage timings, and manage budgets. We had extremely positive feedback on the strong organisation from various visiting bishops and their teams.

'Universities' (Officer 2009-present)

I have held various roles (currently Secretary) in a Durham based organisation with charitable aims that organises regular dinners and events. This has allowed me to develop myself into a confident public speaker. As Secretary, I am responsible for maintaining records and completing various returns. I have enhanced our compliance with the Data Protection Act, and am working on meeting the requirements of GDPR. I have often chaired meetings and maintained control of the business despite numerous strong personalities being present. I have interviewed prospective members to establish that they are fit and proper persons, and have ensured that reasonable adjustments have been put in place to meet the needs of those with disabilities or additional requirements. I have implemented an online meal booking/payment system to reduce administration time and cash handling requirements. I have organised formal dinners and events for anything from half a dozen to over a hundred guests.

Durham University Computing Society (Exec member 2006-2014)

I have held various positions, most notably President where I organised internal and external weekly speakers (eg the leading cybernetics academic Kevin Warwick), arranged various social events and trips (eg Bletchley Park), and ran numerous teaching workshops. During my tenure attendance at talks and events rose by over 200%. As Librarian I have obtained discounts and review copies from major publishers such as O'Reilly and No Starch Press.

Durham University Solar Car (Team member 2004-2012)

I have been heavily involved in the design and construction of the Solar Car since its conception in 2004, variously as Motor Development Leader, Telemetry Lead and Project Advisor. I was on the Race Team for the group's first two international races, first racing 2,400 miles across America in the 2008 North American Solar Challenge, and then 3,000km across Australia in the 2011 World Solar Challenge. This combined team-work with my technical skills.

Durham Castle Chapel (Chapel Committee 2007-2012)

I organised services and events for up to several hundred people. In 2009 the Chaplain was on maternity leave. As Chapel Clerk (head of the committee) I took over the complete running of the Chapel during this period – including taking many services. I rewrote the website, including an automated system for updating current information from the mailing list.

**OTHER
INFORMATION**

I have a full, clean driving licence, and my own car.

In my spare time I enjoy playing Go, an oriental board game similar to chess. I also enjoy DIY, and my wife and I are currently undertaking a minor renovation of our 1930s house.