

The Ring

THE JOURNAL OF THE CAMBRIDGE COMPUTER LAB RING

Issue XXXIV — September 2013

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Who's Who

Gabrielle Anderson (BA08) is a Research Assistant at the University of Aberdeen

David Annis (CC BA86) has recently been appointed Business Development Director, SAS Solutions OnDemand. He was previously Head of Managed Services at SAS UK.

John Brimacombe (T MA90 Dip91) has been appointed a non-executive director of the UK Business Angels Association. John brings his experience as an angel investor to the body promoting investing in the UK.

Nic Brisbourne (EM BA95) has recently joined Forward Investment Partners, where he is a director. Forward Investment Partners is the early-stage investment division of Forward Internet Group. It invests in tech start-ups, largely in the e-commerce space, and works with entrepreneurs to create companies from the ideas stage in Forward Labs.

In addition to his many other roles, **David Cleavelly** CBE (PhD82), fellow commoner at Queens' College, has become a member of the Advisory Board for the Centre for Existential Risk at the University of Cambridge, and a non-executive director of Raspberry Pi (Trading) Ltd, a subsidiary of the Raspberry Pi Foundation.

Marius Cobzarencu (T BA10) is working at Last.fm.

Ben Coppin (Q BA96 MPhil08) is Head of Product Development at DeepMind Technologies.

Graham Cormode (K BA98) has recently joined the Department of Computer Science at the University of Warwick as professor associated with the Centre for Urban Science and Progress.

Peter Cowan (JE BA12) is a Java developer at CoreFiling in Oxford.

Peter Cowley (F MA77), board member of Cambridge Angels, has been appointed a non-executive director of James and James, an order fulfilment company.

Dan Cvrcek (PhD01) has founded SmartCrib to commercialise a unique password solution aimed initially at end users in the SME market segment.

Steven Davidson (BA98 MSci99) is a software developer at TrialReach, a company committed to increasing public awareness and participation in medical research.

Nicholas Edwards (GIR BA03) has become a manager, origin strategy and analytics, at Electronic Arts in the San Francisco Bay Area.

John Garbutt (CC BA06) is a senior software developer at Rackspace.

Steven Guest (JN BA00) is lead software engineer of core VNC Enterprise desktop product at RealVNC.

Amir Hajizamani (JN BA11) is working for Rangespan as a software developer.

Dr Jochen Leidner (PET MPhil02) is now a Lead Scientist at Thomson Reuters in London.

Having established the Catalyst Lab in Switzerland over the last three years, Jochen has been asked to build a research group in the City of London. Thomson Reuters, which has 16 offices in London, and whose over 60,000 employees operate in over 100 countries, is an information company serving professionals in the areas of law, finance, governance, risk and compliance, intellectual property, news (Reuters News reaches over one billion people every day), pharmaceutical and life sciences, scholarly and scientific research, and tax and accounting.

In Michaelmas term, Jochen will also teach an invited lecture course at the University of Zürich, dedicated to topics at the intersection of "Big Data" and text mining.

Angus Lepper (Q BA12) is a software engineer at Cisco in Edinburgh.

Mimie Liotsiou (JN BA12) is at the University of Southampton where she is reading for a MSc in Operations Research.

Valeria de Paiva (PhD90) works at Nuance Communications in the San Francisco Bay Area where she is a senior research scientist.

Christian Richardt (CAI PhD12) is working at Inria in France where he is a Post-doctoral Researcher.

The Ring, Issue XXXIV September 2013

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The Ring is the journal of the Computer Lab Ring, which is the graduate association of the University of Cambridge Computer Laboratory.

Gaurav Sachdeva (W MPhil050) is a product manager at Adobe Systems.

Sunil Shah (F BA09) has just started a Master of Engineering in Electrical Engineering and Computer Sciences at UC Berkeley.

Muhammad Shahbaz (RA12) is at the Georgia Institute of Technology where he is a graduate research assistant.

Quentin Stafford-Fraser (AI A89 PhD96) is back at the University of Cambridge Computer Laboratory where he is a part-time Research Associate.

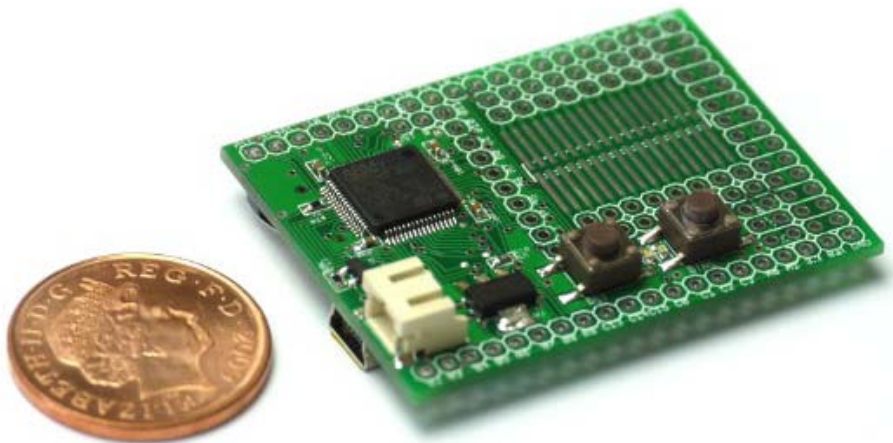
James Steele (F MA04) is a senior software engineer at Riverbed in Cambridge.

Bjarne Stroustrup's (CHU PhD79) latest book (partly written at the Computer Laboratory), *The C++ Programming Language*, 4th Edition, has been published.

Amongst other things, **Rahual Vohra** (CHR BA05) is providing technical advice to BOLDstart Ventures. BOLDstart Ventures provides seed and first-round financing to early-stage Internet companies.

Tim Ward (CHU BA76) is working at Telensa where he is a senior software engineer.

Chris Waring (F MA05) is at Gulf Finance where he is the COO.



Gordon Williams (DOW BA04) has launched a product on Kickstarter. Called Espruino, it's a small computer that anyone can use. Its JavaScript interpreter gives you instant feedback so that you can experiment and develop, whatever your level of experience. For those who can't program, the Web-based graphical code editor can get you started. No compilation or "flashing" step is needed, nor any software on the host computer. You just write code, and as soon as you type a command it executes.

Events calendar

2013

October

Wednesday 2nd, 6.30pm
London Ringlet Bar
Venue to be confirmed

December

Tuesday 3rd, 6.30pm
London Ringlet Bar
Venue to be confirmed

2014

April

Tuesday 1st, 7pm
**Cambridge Computer Lab
 Ring Annual Dinner**
Queens' College, Cambridge

Globosense



Want to be in control of your home?
Marcelo Pias explains how Globosense's
 "Web of Things" technology can transform
 how we manage our lives sustainably.

TR: Marcelo, you've worked for BT and Intel, and spent six years as a researcher at the Computer Laboratory. What prompted you to start Globosense?

MP: While working at the Computer Laboratory (with the Digital Technology Group) I had the opportunity to do application-led system research. I worked on a cool project where half my time was spent in the Lab, and the other half on the running track developing wireless body sensors and high-speed video for tracking the performance of 100m sprinters. This end-user interaction prompted me to think more carefully about what to do next career-wise: should I stay in academia or try something else? I chose to start a company with a Computer Lab colleague. Ring member Peter Cowley helped us as our first mentor.

TR: In 2010 you had a big break when Globosense was selected as one of nine pilot projects, from a field of 125, entering the Energy-Efficient Whitehall competition. Globosense was charged with deploying an energy monitoring and control system capable of dramatically reducing energy consumption in Government buildings. Can you explain your approach and how it has been shaped by your focus on the corporate rather than consumer market? Has your market focus had any other impact on your business model?

MP: The Department of Energy and Climate Change (DECC) and the Technology Strategy Board (TSB) ran a technology competition for solutions to the energy demand problem in four Whitehall buildings. We were lucky to be awarded two contracts for technology development targeting the behaviour change of employees and building occupants. This gave us funding to make a move from academia. We developed two solutions: CUBE, a pocket size device-integrated feedback solution to enhance personal productivity and optimise the use of office devices; and SHAPER, an end-to-end solution with support for user ownership and control technology. It was much easier to talk about energy savings with the Government and corporations as they have large energy bills. For example, a 10% reduction in a £1 million annual electricity bill is significant compared with a similar percentage of savings in a household energy bill. Also, corporations are willing to

invest in solutions that bring returns in the long run. But solutions in this area tend to be customised to the client needs and on-going technical consultancy is a must.

TR: Can you tell me about SHAPER?

MP: SHAPER is an energy data management and control system targeted at employees and building occupants within office spaces. The hypothesis is that many energy-consuming devices, equipment, and services exist to serve the employee and staff work requirements, and if people are aware of the consequences of their actions towards climate change then they can experiment and adjust their work habits to fulfil their work requirements as well as reduce the energy consumption in the work place. The primary aim of SHAPER is to bring information and control technology firstly to make energy information — in terms of kWh or kgCO₂ equivalent — that is related to office appliances visible in mobile learning experiences, and secondly to interact with users to make recommendations for simple control actions (eg, switch off desktop computers). SHAPER also encourages users to engage in energy-saving activities through a Web portal and rewards users through gifts or social values.

TR: What has its deployment within Whitehall taught you about users' attitudes to energy consumption and their willingness to engage with a system over the long term?

MP: This deployment taught us that energy savings in a target area emerged from adopting positive behaviour (habits) rather than dropping or losing bad habits. Positive habits often related to new supportive actions that demand user effort. Once technology novelty and effect is taken for granted — four months following the deployment in this case (Figure 1) — the imposed cost and effort act as a negative force gradually wearing off the adopted actions and their associated savings. This effect can only be neutralised if complementary programmes from the workplace translate the required effort into positive tangible results and establish a positive social norm in the

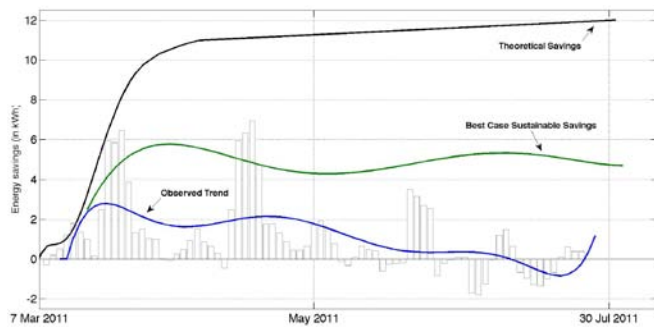


Figure 1: Energy Savings (Trends). The trend analysis explains a behavioural change that spans across numerous weeks and months of a sample building area. The change is a result of increased user awareness of potential energy saving actions and their immediate impact on total consumption.

workplace, a topic that is highly subjective and may have no one-size-fits-all solution. We learnt that a change in behaviour is possible with the assistance of technology but sustained positive behaviours also require external supportive educational programmes and increased face-to-face social engagement (best-case scenario in Figure 1). This can accelerate change by means of reducing individual trial and error, and directing individuals to the most effective energy-saving behaviour at an early stage. Negative behavioural discoveries and backward steps are reduced, and a positive change can be realised.

TR: What is the “Web of Things”?

MP: “Web of Things” is just another term for the concepts that have been around for some time: wireless sensor networks, pervasive computing and Internet of Things (IoT). The difference here is that we take a purely Web approach where data associated with places, objects and people are made available on line via Web interfaces. We encapsulate the technical details of an entire end-to-end system (see Figure 2) into a RESTful API that senses the environment, generates useful interpretation from raw sensor data, provides real-time feedback and allows users to control “smart things” remotely. For example, the API call below initiates an H.264 video stream from a camera: `http://localhost/camera/<cam_id>/video/stream`

TR: While many start-ups focus on horizontal products, you’ve focused on the vertical. How do you see your product being deployed in other industries?

MP: Start-ups have limited or no resources at all so they must focus on a customer problem or else die!. We were very excited by the technology while developing the Whitehall applications. Just after this work, our chairman Jack Lang (also a Ring member) challenged us to “first pick the low-hanging fruit”. We were clearly not doing this but knew that we had to focus on a real market need for our survival. This meant picking a vertical application.

In the long run, I see an opportunity to exploit our analytics platform across industries. Our approach to external interfaces and APIs can facilitate the convergence of IoT applications developed in some verticals. To accomplish this, our platform relies on the Hadoop ecosystem for fast processing of large volumes of semi/unstructured data (video feeds and sensor data).

Last summer, the TSB funded GloboSense and ThingConnect to prepare a study on how data convergence from IoT silos (in particular healthcare and energy) could be exploited to create new applications (see <http://bit.ly/tsb-iot>). The TSB is now funding a few industry-led IoT demonstrators on two projects in Cambridge.

TR: What has been your biggest challenge so far?

MP: Life in a start-up is very hard and the odds are against us. But we’re taking a customer development approach (~Lean Startup) to break the barrier of a technology playground into a business. We went to talk to customers and discovered a number of things, one of which was that our initial market assumptions turned out to be wrong. We discovered that the energy savings problem in Government buildings is specific and needs highly customised solutions. We also found opportunities in emerging economies for DIY cloud-based home security systems.

Last year, the UKTI funded GloboSense to talk to people (consumers, distributors) in Brazil. We found that the penetration of home security systems remains limited to 1% of installations in 55 million potential homes. This low rate is due to the high cost of products, limited ability of user engagement with security systems, and consumer mistrust of intermediaries (eg, installers, manned security service companies). So it was time to pivot and test a new hypothesis about low-cost, DIY product in Brazil. This consumer-product approach was a move

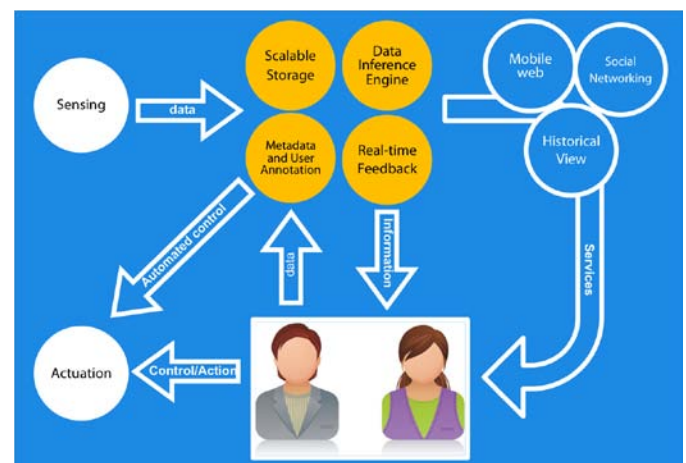


Figure 2: GloboSense's Web of Things Platform



Globosense Brazil — software development branch

from our starting point of a consulting company. We moved our office from the ideaSpace Hauser Forum to Bridge Street in the centre of Cambridge. We also set up a branch in Florianopolis (a great place for kitesurfing in Brazil!) where language translation and pieces of our system have been developed.

TR: What has the coming 12 months in store for Globosense?

MP: CasaOnline (or home on line) is our minimum viable product for the Brazilian market focusing on the monitoring of homes, children, elderly people and pets. It's a video kit with two WiFi cameras and an ARM-based smarthub that connects to our Amazon EC2 server. Consumers access on-line services such as real-time media streaming, data storage and data analysis for notifications (eg, SMS when motion is detected). We'd like bridge a gap in the market with a proposition that is three times as cheap as existing offerings, offers a one-minute installation (no wires) and ease of use with real-time information at a distance.

We've just launched CasaOnline and sales are happening — so good news! Although this is just the beginning of a long journey, it's helping us to get early feedback from paying customers to validate our assumptions. For instance, one of our first customers bought CasaOnline to monitor her 70-year-old mother's house in a very simple way. She suffers from a memory disorder and previous caretakers mistreated her.

casaonline

video kit







Cuide da segurança de sua casa ou comércio à distância



Veja seus filhos em casa enquanto você trabalha



Monitore o bem-estar de seus pais à distância



Veja o que o seu melhor amigo está fazendo



Acompanhe as atividades do seu pequeno comércio pela Internet

Em apenas 1 minuto, sua casa em suas mãos via smartphone, tablet ou computador



I've recently read a list of lessons learnt by an entrepreneur (S. Akhmet) and this one caught immediately my attention: "Sales fix everything. You can screw up everything else and get through it if your product sells well." I couldn't agree more. So in the next 12 months we'll be busy selling the CasaOnline product in Brazil and eventually launch it in the UK. There is still lots of work to do with our distribution channels, technical support, etc.

"Sales fix everything. You can screw up everything else and get through it if your product sells well." I couldn't agree more.

TR: How does your offering differentiate itself from your competitors such as AlertMe?

Globosense started out offering energy monitoring and control in non-residential buildings. As part of our customer discovery, we found an opportunity to offer home security. Current offers are too complicated for consumers to install (they require professional installation), which has limited their adoption — especially in countries that need them the most. Our target market is willing to pay for security and potentially buy other kits as accessories (eg, energy monitoring).

Globosense's key sensor technology is video camera. So we're building competences in real-time video streaming and video analytics (eg, fall detection for the elderly). With our Freemium service model, consumers have unlimited access to video streaming but limited access to video recordings stored in the cloud. Our premium service offers further cloud-based video storage, SMS notifications and basic analytical features.

Some of the cloud-based competitors (eg, AlertMe) have changed their product focus from home security to energy monitoring perhaps mostly motivated by the UK Government push (eg, GB Smart Metering). Their data platform is based on sensor data (eg, energy clamp sensors) and less on video cameras.

If you would like further product information or would like to explore investment opportunities, feel free to contact Globosense at marcelo@globosense.com.

Hall of fame news

Bango

Bango now enables payments for Mozilla's Firefox Marketplace, the new and open store for Web apps built using HTML5.

Bango is providing operator billing and other billing options in the first Firefox OS launch markets, meaning Firefox Marketplace users can choose to charge the cost of digital purchases to their phone bills.

blinkx

blinkx has acquired Grab Media, a leading on-line video content syndication and advertising platform. The specific assets acquired by blinkx in the transaction will enable the company to augment its relationships with advertisers, publishers and content providers.

Cronto

Cronto, a provider of secure visual transaction authentication solutions for on-line banking, has been acquired by VASCO, a leading software security company specialising in authentication products and services.

VASCO acquired all of the stock of Cronto in exchange for an initial cash consideration of €15 million and contingent cash consideration in the form of an earn-out of up to a maximum of €2 million.

Embecosm

Embecosm has held its *Preparing for Paralela* event where those interested in the project, or with a general interest in multi-core parallel systems, were invited to a crash course in the theory of parallel computation and how to construct real programs using the EpiPhany Multicore eSDK.

All videos are available in the *Preparing for Paralela* playlist on Embecosm's YouTube channel.

FusePump

Tesco Direct has expanded its services with FusePump to improve its existing e-commerce marketing services; the FusePump feeds will be used to help Tesco improve their performance in e-mail, retargeting, Google shopping and affiliate campaigns.

FusePump will be building *Tesco Wine by the Case*, a dedicated Wines data feed, which will enable them to integrate their product inventory into Google Shopping. The new feed will also help to improve the quality of product listing ads for Tesco Wine by the Case, which will enhance their visibility within this channel.

Jagex

Jagex has cut the jobs of staff working on new and experimental projects to focus on its flagship titles RuneScape and Transformers Universe.

Linguamatics

Text mining software vendor Linguamatics is the subject of a special "On the Radar" report by industry analysts Ovum. The report recognises Linguamatics as a leader in text mining and predicts strong growth prospects for the coming in the coming year.

Raspberry Pi

Wysing Arts Centre is collaborating with the Crucible network at Cambridge University on a new programme, *Defining Pi*, which aims to test the potential of the new Raspberry Pi computer and spread understanding in coding.

Five artists have been selected and all are embarking on learning new skills in computer programming in order to enable them to make new work with the Raspberry Pi.

Eben Upton, co-founder of the Raspberry Pi Foundation, has received a prestigious Royal Academy of Engineering Silver Medal.

The Silver Medal recognises an outstanding and demonstrated personal contribution to British engineering.

RealVNC

RealVNC's trophy cabinet must be running out of space. It has been named as the winner of the Royal Academy of Engineering MacRobert Award. The award, presented by HRH The Princess Royal, recognises RealVNC's outstanding innovation, commercial success and contribution to society.



Co-founder and CEO Dr Andy Harter received the MacRobert Award from HRH The Princess Royal

The MacRobert Award is the UK's longest-running and most prestigious national prize for engineering innovation and is decided by a panel of distinguished British engineers and entrepreneurs from a range of disciplines.

RealVNC has also been named as a finalist in the Santander Small to Medium sized business of the Year category.

RealVNC is the only company worldwide offering licenses to embed remote access technology in third-party products.

Sophos

Sophos has once again been positioned in the “Leaders” quadrant of Gartner’s 2013 Magic Quadrant for Unified Threat Management’.

Spektrix

Spektrix, a powerful and easy-to-use box office software accessed through the Internet has recently been deployed by two arts organisations in Bristol: the Tobacco Factory Theatre and St George’s concert hall. In Southampton, it is now being used by Nuffield Theatre.

SwiftKey

SwiftKey has been named in Real Business’s *30 to watch in mobile*; the list comprises “the 30 most ambitious UK firms in the mobile sector who have the potential to shake up the world of mobile.”

Job listings

July

TomTom

- *Senior software engineer*

SecureVirtual

- *Technical service delivery manager*

August

Spirit Enterprise

- *Software engineer*

Synergy Energy

- *Lead software engineer*

Product Health

- *Embedded systems engineer*

Graze.com

- *Developers*

Softwire

- *Software developer*

Brainomix

- *Software engineer*

Linguamatics

- *System Admin*

Aircloak

Colourtet

If you have a job advert that you would like included in the weekly listing, please send the details (as a word doc) to cam-ring@cl.cam.ac.uk

Henry Fletcher



Henry Fletcher joins the ever increasing band of Cambridge graduates going it alone.

Henry Fletcher (M MEng12) has joined the ever increasing community of Cambridge entrepreneurs. While starting a company and working for himself were not in his initial plans — at school he imaged he might become a barrister — a distinct affinity for maths, the sciences and technology led him towards engineering. Moreover, he was inspired by his parents, both creative and self-employed, and his older cousin who had started his own business. As Henry progressed through his degree and established a small network, expanding some of his technical pursuits into a viable business became a very attractive goal.

Indeed, while at Cambridge, Henry co-founded Universal Air, with Oxford graduate Yuan Gao. They set it up simply out of a desire to learn hands-on about running a company: accounting lectures and business classes were not for them. They sold development electronics and quadrotor systems to individuals, enthusiasts and academics. Universal Air remains their research branch and UK entity.

To further help him on his chosen path, Henry applied to Entrepreneur First, a not-for-profit early-stage accelerator for top graduates who want to create high-growth tech startups. Henry's application was successful and he became a member of the 2012–2014 cohort. Henry says "Entrepreneur First was of immeasurable value to me and I'd strongly advise any budding entrepreneur to apply. My network expanded rapidly whilst part of the scheme. I met my second co-founder, Max Bruner (a fellow Cambridge graduate), and received

incredible support and advice which is essential for anyone attempting what is probably the most difficult career path any young person can choose."

Henry has recently started Mavrx Inc. with both Max and Yuan. Based in the US, Mavrx is an information and analytics company with a background in manufacturing micro unmanned aerial vehicles (UAVs). They are building the first coordinated high-resolution imaging UAV fleet, combining the power of highly autonomous UAVs with a variety of cameras and sensor options and the convenience of a web-based management interface. Mavrx is working with a growing number of clients who are investigating how recent advances in autonomous aerial technology can benefit their operations. These range from precision agriculture to mineral and aggregate stockpile management. Their long-term goal is to provide turnkey solutions worldwide for physical data collection, analysis and management with a strong emphasis on process autonomy. Henry hopes the company will not only improve the profitability of companies but also the welfare of societies and environments worldwide.

If you have a background in machine vision and are interested in working for Mavrx, please contact Henry at henry@mavrx.co.

Opportunistic Positioning



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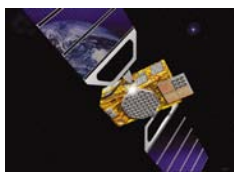
Ramsey Faragher & Rob Harle

We rely heavily on Global Navigation Satellite Systems (GNSS) such as GPS for Aviation, Emergency Services, Defence, Academia, Mining, Agriculture, Telecommunications and even Banking. In 2011 it was noted that around €800 billion of the European economy is dependent on GNSS [1]. A study by the Royal Academy of Engineering in March 2011 entitled "Global Navigation Space Systems: reliance and vulnerabilities" provided an examination of society's strong dependence on GNSS and discussed twenty four failure modes of GNSS systems [2]. This research programme addresses the major concerns of this report by improving the reliability and availability of GNSS, without needing new infrastructure or devices.

Motivation

1. What's wrong with GPS?

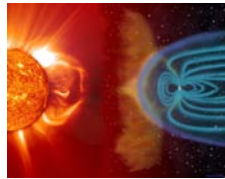
- 50 Watt transmissions from over 20,200 kilometres away
- Received signals are extremely weak (a *quadrillionth* of a Watt)
- Affected by buildings, space weather, radio interference
- GPS Jammers are cheaply available on the internet
- All GNSS suffer the same failure modes



Galileo GNSS satellite



Urban canyon



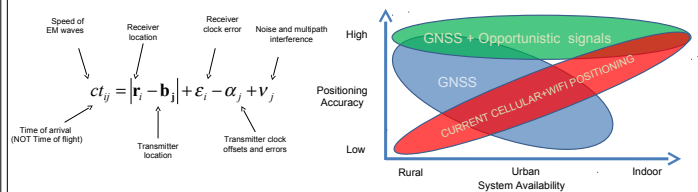
Coronal Mass Ejection

A E30 GPS Jammer

- GNSS need to be enhanced to protect our dependencies
- Needs better availability, robustness, integrity
- The incorporation of opportunistic signal processing within a GNSS receiver can provide a robust tracking system capable of global operations without or without satellite signals, but requiring no extra infrastructure construction or maintenance costs.

3. How does Opportunistic positioning work?

- Outdoors, opportunistic positioning can typically operate in a similar manner to GNSS given modern digital signals with certain properties.
- Opportunistic radio signals were not designed for this purpose and this must be considered to exploit these signals fully.
- Timing broadcast stability and transmitter locations are initially unknown.
- Machine learning algorithms called "Simultaneous Localisation and Mapping" (SLAM) were adapted to permit the use of unstable signals from initially-unknown locations.
- This new flexibility increases the robustness and availability of opportunistic radio positioning and has provided a big step forward in its practical deployment.

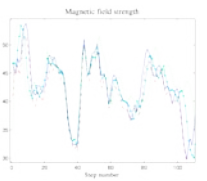


2. Opportunistic Sensing

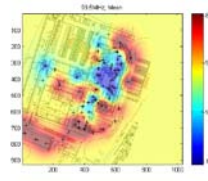
- GNSS are so successful because of their global availability at low cost (to the end user)
- The most desirable enhancement will also be low cost, provide high availability and require no new infrastructure
- We are surrounded by *opportunistic* signals
- Radio signals such as DAB, DVB, 2G, 3G, 4G, WiFi
- Millions of times stronger on reception than GNSS signals
- Deep penetration into buildings and other GNSS "blindspots".
- Protection from jamming and space weather events
- Also magnetic anomalies can provide stable position signatures



A track produced using GSM 2G cellular mobile phone signals



Excellent repeatability of magnetic signatures down a corridor on four separate days



A VHF FM radio "heat map" showing the signal complexity indoors exploited by the indoor positioning system

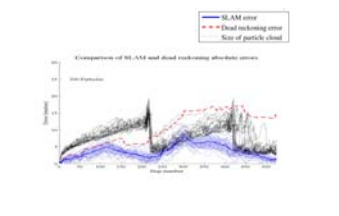
- Previous opportunistic positioning systems have all depended on differential corrections from reference receivers or extensive prior knowledge (e.g. databases of transmitter locations).
- Here we exploit machine learning algorithms to permit stand-alone (non-differential) terrestrial positioning without any prior knowledge of the types or locations of the opportunistic signals.
- Outdoor positioning – timing and phase measurements
- Indoor positioning – signal strength and magnetic anomalies
- Simultaneous Localisation and Mapping and sensor fusion [3]

4. SLAM on a Smartphone

- We have developed an Android app that provides GPS-like positioning performance in any indoor environment.
- The system exploits magnetic anomalies, cellular signals, and WiFi
- The system needs no prior knowledge of the signals in the environment before use – it learns about the environment itself and gets better with use.
- At the core of the system is the smartphone's accelerometer, gyro, compass and barometer (providing 3D "dead reckoning" positioning).
- These sensors provide the initial position estimates, which are improved over time as the system learns about the indoor signal and magnetic anomaly environment



The app in action – the white line is without opportunistic sensing and SLAM, the blue line is the full SLAM solution



SLAM constrains and corrects the dead reckoning errors SLAM (Green solid line) vs Dead Reckoning (red dashed line)

Contact: rmf25@cam.ac.uk

1."Report from the commission to the European Parliament and the Council, Mid-term review of the European satellite radio navigation programmes"
 2."Global Navigation Space Systems: reliance and vulnerabilities." The Royal Academy of Engineering London, UK
 3.Faragher R. M. et. al. "Opportunistic Radio SLAM for Indoor Navigation using Smartphone Sensors" IEEE ION PLANS 2012 Conference paper

Digital Technology Group

<http://www.cl.cam.ac.uk/research/dtg>

Computer Laboratory news

The first episode of the new series of the BBC's *Science Club*, hosted by Dara O'Briain, featured **Professor Peter Robinson** and Charles the animatronic head. The programme visited the Computer Laboratory to discover whether increasingly sophisticated computers can learn to read our emotions.

Jon Crowcroft, the Marconi Professor of Communications Systems, has been elected to the Royal Society for his seminal contributions to the development of the Internet, including techniques that have paved the way for rural broadband.

Professor Crowcroft has also been awarded the 2014 IEEE Internet Award.

The award, sponsored by Nokia Corporation, recognises exceptional contributions to the advancement of Internet technology for network architecture, mobility and/or end-use applications.

John Daugman, Professor of Computer Vision and Pattern Recognition, has been inducted into the US National Inventors Hall of Fame.

The National Inventors Hall of Fame annually accepts nominations for men and women whose work has changed society and improved the quality of life.

Professor Daugman was also one of three finalists for a European Inventor of the Year Award.

Dr Steven Murdoch, researcher in the Security Group, has been awarded an EPSRC/Royal Society Fellowship Award.

Dr Ian Wassell and Wei Chen have been awarded the 2013 IET Wireless Sensor Systems Premium Award for their paper *Energy-efficient signal acquisition in wireless sensor networks: a compressive sensing framework*, IET Wireless Sensor Systems, Volume 2, Issue 1, 2012, pp. 1–8.

The Computer Laboratory has recently announced two new lectureships.



Dr Robert Watson

Dr Robert Watson, formerly a Senior Research Associate at the Computer Laboratory, was appointed from June 1st 2013.



Dr Thomas Sauerwald

Dr Thomas Sauerwald, previously at Max Planck Institute for Informatics, Saarbrücken, Germany, has been appointed from July 1st 2013.

On the retirement of Margaret Levitt, **Caroline Stewart** will take up the position of Departmental Secretary on September 2nd 2013. The Department welcomes **Joanne McNeely** who will fill Caroline's previous position as Office Administrator and PA to the Head of Department. Joanne has been working as the School of Technology REF Administrator.

The University of Cambridge has been recognized as an "Academic Centre of Excellence in Cyber Security Research" (ACE-CSR) by the UK Government.

The status is further acknowledgement of Cambridge's long-standing record of world-class research in the field of cybersecurity, in particular within its Computer Laboratory, where there is a well-respected security research group.