RIVIC
Research Institute of Visual Computing

Newsletter: Issue 5
Autumn 2012

Successful MIUA Conference at Swansea

The 16th Conference on Medical Image Understanding and Analysis (MIUA) was held at Swansea University this year. Swansea University is set in rolling parkland overlooking the majestic sweep of Swansea Bay. The campus is a stone's throw from the old fishing village of Mumbles and a short distance to the Maritime Quarter. The University enjoys a prime position overlooking Swansea Bay, the start of the famously dramatic Gower coastline. MIUA is the principal UK forum for communicating research progress within the community interested in image analysis applied to medicine and related biological science.

It was a single-track conference with oral and poster presentations. Authors were asked to submit 6-page technical papers for review by the programme committee. Review papers of up to 8 pages were also welcomed. In total, the organisers received 52 submissions, each of which was reviewed by at least three referees. Based on these reviews, 22 papers were accepted as oral presentation and 16 as posters.

This year's conference featured invited talks from Prof. Alison Noble from Oxford University, Prof. Guang-Zhong Yang from Imperial College, London, Prof. Daniel Alexander from University College, London, and Prof. Nassir Navab from Technische Universitat Munchen, Germany.

The proceedings of the 16th Conference on Medical Image Understanding and Analysis can be found at: http://miua2012.swansea.ac.uk/uploads/Site/Programme/miua2012proceedings.pdf

This year MIUA also offered a half-day conference tutorial, which was particularly beneficial to research students and early career researchers working in the field. Prof. Nikos Komodakis from the University of Crete, Greece delivered the conference tutorial. The Institute of Life Science at Swansea University kindly provided the venues used for the conference.

The MIUA steering committee, especially Bill Crum and Neil Thacker, and Swansea University were instrumental in organising the event which was generously sponsored by the British Machine Vision Association and RIVIC.

From left to right: Jason Xie RIVIC Swansea with Xin Chen University of Manchester who won the award for best paper, Leila Meziou from the University of Cergy-Pontoise/Ensea France who won the award for best student paper and M Tariq from University College London who won the award for best poster.

PRIFYSGOL ABERYSTWYTH UNIVERSITY
PRIFYSGOL BANGOR UNIVERSITY
CARDIFF UNIVERSITY PRIFYSGOL CAERDYDD
Swansea University Prifysgol Abertawe

New Staff at Cardiff

Kingsley Stock, RIVIC exploitation officer (AIBC). An Associate member of the Institute of Business Advisors since 2004, and a founder committee member of the Welsh section. He is Managing Director of Bustech Solutions (www.bustechsolutions.co.uk). Having started his career as a Cobol Programmer on IBM mainframes and has worked for companies such as ICI, Dunlop, Revlon and BET. He later worked for Hoskyns as a computer consultant and Cap Gemini as a Principle Consultant. He has been a director of 5 companies and formed the first IBM Agency in Wales supporting the IBM AS400 range of computers.

For the last 10 years, Kingsley has been a business advisor working with the Welsh Assembly, Local Authorities and Universities. He has assisted over 500 SME's during that time achieving over £600K of grants.

Kingsley responsibilities are to:

- Identify and engage industrial partners and other organisations for research projects.
- Identify commercial opportunities for exploring research results and provide a route to market through appropriate partners.
- To widen the application domains of visual computing.
- To attend a wide range of networking events and be an industrial facing ambassador of RIVIC.
- To support spin off activities.
- To collaborate with other research groups in RIVIC.

Andrew Aubrey visits Korea University

Facial expressions are one of the key modes of inter-personal communication for humans. Being able to produce realistic communicative head models allows for a detailed investigation of human communication, and also novel approaches to higher-fidelity multimedia and language applications. Current research has almost exclusively focused on the so-called universal expressions (anger, disgust, fear, happy, sad, and surprise). Although these expressions are clearly important from an evolutionary point of view, their frequency of occurrence in daily life is actually rather low. A RIVIC funded project has recently begun investigating the processing of expressions that occur during natural communicative situations (for example; agree, thinking, looking tired, etc.).

Dr Andrew Aubrey, Prof David Marshall and Dr Paul Rosin at Cardiff together with RIVIC visiting fellows Prof Christian Wallraven (Korea University) and Prof Douglas Cunningham (Cottbus) have recently recorded a large 2D and 3D audio-visual corpus of conversations between pairs of people at Cardiff University. Using commonly employed techniques to model the face data, the model will be manipulated to generate unseen (new) data sequences of high quality which will then be used for detailed testing of important factors in communication (such as perception of emphasis, control of conversational flow, expectations about partner's reactions, etc.).

Dr Aubrey obtained EPSRC funding to be a visiting researcher at Korea University in November 2011 to work closely with Prof Wallraven on initial cleaning and validation of the data. During February of this year Profs Wallraven and Cunningham visited Cardiff to further the validation of the data through perceptual tests and carry out novel experiments on conversation back channelling. Once the dataset is ready it will be made available to the research community.

Mars exploration trial on Tenerife

Aberystwyth University's Department of Computer Science has taken a robot called **Idris** to the Canaries.

The Planetary Robotics Vision Scout (PRoViScout) project will be undertaking field trials at the El Teide National Park, Tenerife, between the 13th and 17th September 2012.

PRoViScout is collaborative EU Framework-7 funded project which brings together major European groups currently working on robotic vision for planetary and space exploration.
Aberystwyth University is a major participant in this project. Rivic member Dr Fred Labrosse, who accompanied the robot to Tenerife, developed the robotics platform for the test vehicle, which includes a vision based navigation system.

The PRoViScout project aims to demonstrate computer vision based techniques for identifying navigation hazards in the terrain, spotting likely science targets, and selecting the "most interesting" targets for further study - all without human intervention. These are abilities which will be crucial to future long range scouting and exploration missions on other planets.

El Tiede National Park is favoured as a field trials venue, having good weather and a rich tapestry of image textures and features. These characteristics are important in providing a wide range of conditions under which to test the imaging systems.

Its flat landscape with fine textures of volcanic sand, pebbles and occasional rocky outcrops are similar to those encountered on the surface of Mars.
Most robotic planetary space missions performing in situ exploration of the surface and atmosphere for any planetary object outside the Earth involve a means of mobility provided by either a surface vehicle (rover) or by aerial vehicles (balloons, aerobots etc.).

Mobile systems are among the most critical of all space missions in requiring a rapid and robust on-site processing and preparation of scientific data to allow efficient operations for a maximum use of their limited lifetime.

Professor Dave Barnes, of the Space and Planetary Robotics Group at the University's Department of Computer Science said: "Last year there was a Tenerife field trial as part of the PRoViSG project, using the EADS (European Aeronautic Defence and Space) Astrium Bridget rover.

"This time, it will be an Aberystwyth rover, and our rover will autonomously identify science targets and navigate to these targets using new sophisticated software developed during the PRoViScout project."
As future robotic space missions become more numerous, more ambitious and of longer duration, they will need to be more self-reliant than is feasible today. They will need to make some of their own decisions about navigation, selecting important science samples and possibly even collecting them for return to Earth.

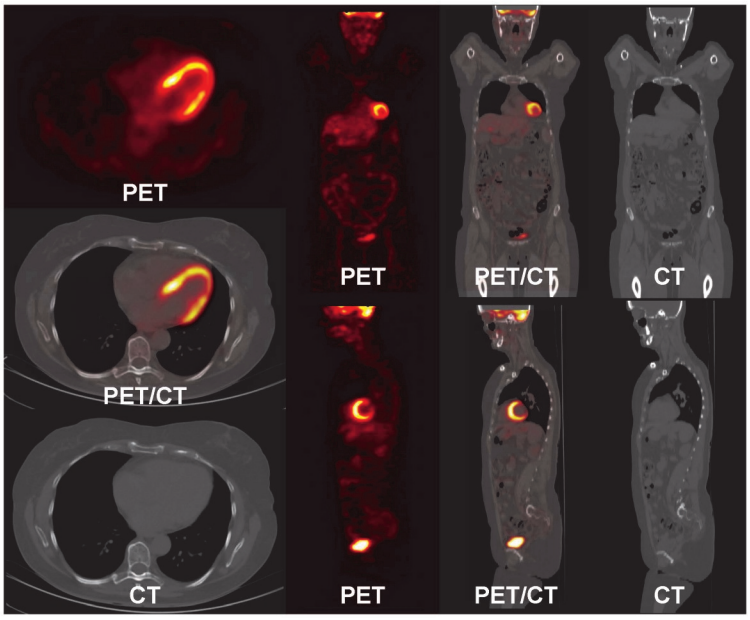
ProViScout will provide the robotic vision building blocks for such future autonomous exploration systems.

Developments at Cardiff

Cardiff University's School of Computer Science has been making progress on a working relationship with Renishaw and a number of meetings have been held to identify ideas for collaboration. Kingsley Stock, RIVIC's Knowledge Exploitation Officer has been co-ordinating the meetings, with technical input from Professor Ralph Martin and Professor David Marshall. In May of this year the university signed a non disclosure agreement to include metrology, medical and other Research opportunities with Renishaw PLC (www.renishaw.com). Renishaw are a major international organisation employing highly skilled engineers who recently acquired the Bosch factory in Llantrissant South Wales to develop new products. Their Head office is in Gloucestershire.

The RIVIC team in Cardiff (Kingsley Stock KEO, Professor Martin and Professor Marshall) have partnered with Renishaw in a new EPSRC funded Case Studentship. This is the first studentship signed between Cardiff School of Computer Science & Informatics and Renishaw, which is seen by both parties as the entry into a new partnership agreement in due course.

Dr Franck Vidal talks about his EU Marie Curie Career Integration Grant (CIG) worth 100K Euros



PET-CT scan of a patient suffering of lung cancer. CT is used to visualise internal anatomical structures and the tumour is not clearly visible. PET provides biological information and highlights some physiological process, e.g. the growth of tumour cells.
Data courtesy of Dr. J.-M. Rocchisani

Fly Algorithm in PET Reconstruction for Radiotherapy Treatment Planning

A brief introduction:

This project is focused on developing new software technologies for lung cancer treatment and it is based on accurate physical models implemented using high performance computing. Four research themes have been identified: improvement of our original reconstruction algorithm for Positron Emission Tomography (PET) imaging, fast respiration simulation, tumour segmentation and extraction, and interactive multi-modal visualisation. The clinical outputs that are expected will be improving the quantitative results in PET, assisting doctors to elaborate their treatment plans using both anatomical (CT) and biological (PET) information, helping to assess the response of tumours to the treatment, and improving of the validation of treatment plans by radiation oncologists.

This multi-disciplinary project will require an alliance with external partners in computer science, medicine and medical physics from France, Belgium, California and Wales.

I am a new lecturer with a broad experience of research in computer science and medical physics. This is my first grant award and enables me to establish a novel research area at Bangor University. It will result in a collaboration with international partners, that will grow in the future.

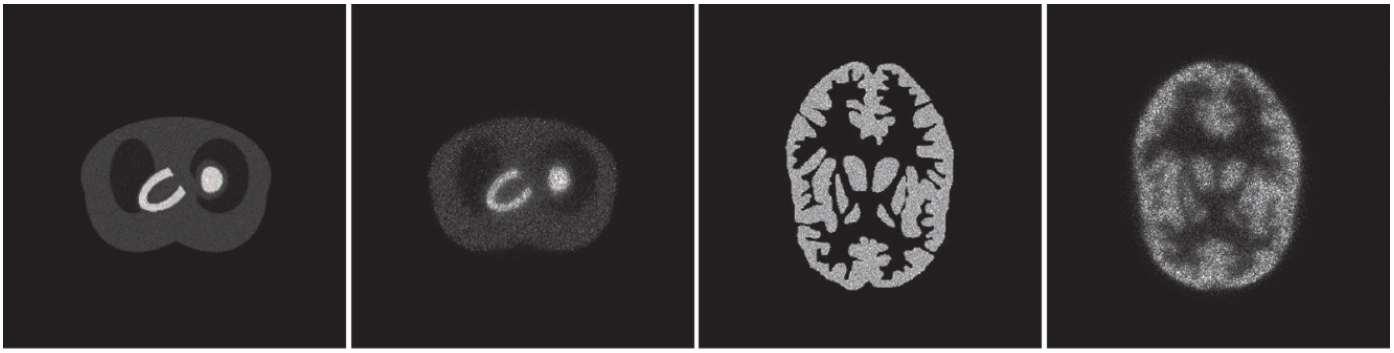
Who will benefit from this work?

As PET hardware improves (better spacial resolution, time-of-flight, etc.) and more computational power becomes available, it is becoming possible to overcome computation time limitations and integrate physically-based corrections in clinical routine.

The Fly4PET research will significantly contribute to the development and acceptance of these technologies. It will have obvious benefits to the quality of treatment to both the clinician and the patient.

What will be the outputs?

We will develop a fully functional reconstruction method based on an optimisation technique called “artificial evolution” as a novel alternative to conventional reconstruction methods that are used in nuclear medicine (such as maximum-likelihood expectation-maximisation (ML-EM) and ordered subset expectation-maximisation (OS-EM)) to improve quantitative results. We will also facilitate their use in radiotherapy planning, treatment monitoring and treatment plan validation.



Cardiac example
Ground truth
(image to reconstruct)

Cardiac example
Completed re-construction

Brain example based on the Hoffman phantom
Ground truth
(image to reconstruct)

Completed reconstruction

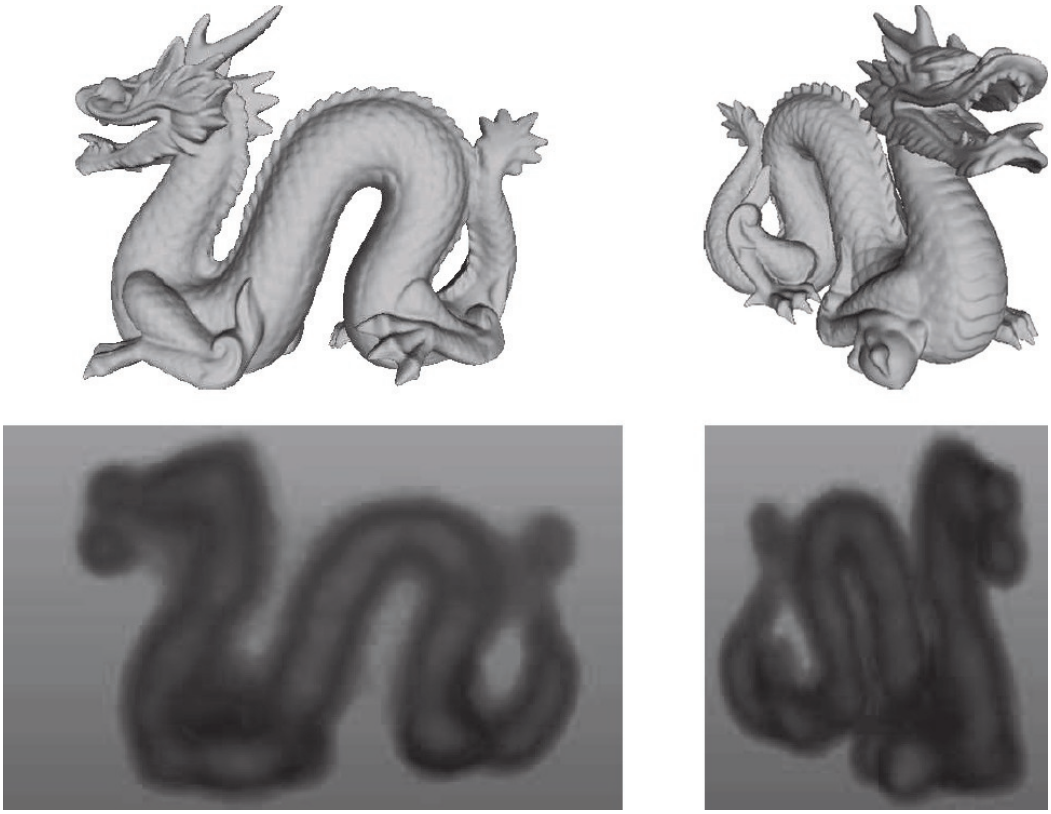
What previous experience will you be drawing on to carry out this research?

This grant application requests support from the European Union to provide start-up funds for my research activities. It builds on my recent appointment as lecturer at Bangor University.

This project uses my previous research experience, and will help to establish a lasting international and multidisciplinary collaboration. It will reinforce the network of collaborators that I have created in Europe and California.

This multi-disciplinary long-term project — at the interface between medical physics, computer science, and medicine - the Virtual Physiological Human (VPH) addresses the themes within the Seventh Framework Programme (SP7).

- It will build upon the promising results I obtained during my research masters degree, my PhD and my postdoctoral studies in the simulation of radiation transport, the use of graphics processing units (GPUs) for fast and accurate simulation, nuclear medicine and radiation oncology.



Fully 3D reconstruction of a complicated shape
Top row: simulated object (the Stanford Dragon); bottom row: volume rendering of the reconstruction

Dr Robert Gittins launches new NING site

The new site is a research forum designed to develop grant opportunities. This open forum for RIVIC members will facilitate Collaboration, discussion and grant funding available in the field of visualisation. This is a forum for RIVIC members only and everyone is encouraged to register at rivicwales.ning.com. Some of the features of the site include topical videos, live chat, breaking news from funding bodies and links to relevant events.

Sian Hope visit to Brazil

Professor Sian Hope visited Brazil recently to visit the University of Sao Paulo, which is the No. 1 University in Brazil where they have 80,000 students. Sian went to two of their seven campuses, the campus in Sao Paulo which houses the Centre for Interactive Techniques and the one in Sao Carlos where the Institute of Mathematics and Computer Science (ICMC) and the Institute of Physics http://www.ifsc.usp.br/english/ are based. http://www5.usp.br/en/institucional/a-usp/ Sian gave a RIVIC presentation which has been forwarded to RIVIC Representatives at each University.

Sian Hope awarded OBE

Congratulations to Professor Sian Hope who has been awarded the OBE in the Queen's Birthday Honours List. She has worked at Bangor University for the last 26 years. Her current roles are those of Executive Director of Innovation, Professor of Computer Science at Bangor University she is also a member of the Science Advisory Board as well as a RIVIC Director. Sian is one of the UK's few female Professors of Computer Science. On hearing that she had been awarded the OBE, she said: "I'm very proud, honoured and almost speechless. This is probably the only time in my life that I didn't know what to say!"

Forthcoming events

31st October 2012, Bangor University Management Centre. VLT-2012 will showcase Project IVY (Interpreting in Virtual Reality) a European funded project focused on the needs of Interpreters and their clients. The project explores the potential of development and usage of Virtual Reality in interpreting scenarios where the participants/users can perform various interpreting tasks for educational and training purposes, through challenging simulation scenarios.

Virtual Learning Technologies 2012

VLT-2012

Education and Culture DG
Lifelong Learning Programme
Project 511862-2010-LLP-UK-KA-KA3MP

Wednesday 31 October 2012
Bangor University Management Centre

E-learning technologies are being used in a wide variety of fields, from medical courses to interpreter training. Indeed Universities often provide Blackboard or Moodle to support course deliver and manage resources. Business and public operators are increasingly using podcasts or video casts to aid learning, while interactive applications for mobile devices and 3D virtual worlds are being used to engender learning and often, those interfaces, are collaborative spaces that incorporate a mix of media types.

VLT-2012 will showcase **Project IVY (Interpreting in Virtual Reality)** a European funded project focused on the needs of Interpreters and their clients. The project explores the potential of development and usage of Virtual Reality in interpreting scenarios where the participants/users can perform various interpreting tasks for educational and training purposes, through challenging simulation scenarios.

VLT-2012 Workshop aims to explore the development and use of digital technologies that are effective and support collaborative or remote learning - particularly focused on the use of 3D virtual worlds. Virtual Learning Technology can potentially provide dramatic gains in a wide range of learning fields. Emerging practices in the use of VLT (hardware and software) afford new methods of learning and working. The workshop will facilitate discussion, exploring both the challenges and opportunities that new technologies bring to Virtual Learning.

Please note, there will be a separate workshop during the morning for invited Project IVY evaluators. If you would like to take part, please contact us for details.

Registration 1.00pm (finish 4.30pm)
Early booking to this free event is essential
jo.mitchell@bangor.ac.uk Tel: 01248 388244

Who should attend?

The event will provide a workshop for discussion, and bring together experts and users of VLT:

- Users and Developers of virtual learning environments
- Research workers interested in the development Serious games and 3D environments
- Academics interested in interpreting pedagogy
- Representatives of educational and training institutions
- Students, interpreter trainers and those who train the clients of interpreters
- Companies interested in virtual learning business solutions

Speakers

- **Ian Hughes (epredator)**
  Chair: BCS Animation and Games Specialist Group
- **Nigel John and Llyr ap Cenydd**
  (Launch of 'VCath' - see separate flyer)
  Advanced Medical Imaging and Visualization Unit
  Bangor University
- **Panagiotis Ritsos, Robert Gittins and Jonathan Roberts**
  RIVIC - Research Institute of Visual Computing
  Project IVY - Interpreting in Virtual Reality
  Bangor University
- **Jeff Howe**
  EADS CASSIDIAN
- **David Burden**
  Daden Technologies

Organisers

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Tel: 01248 388485

This workshop has been organised with financial support from the European Commission. The workshop and its related materials reflect the views only of the participants, and the European Commission cannot be held responsible for any use which may be made of their content.

Project Partners

University of Surrey · UAM · Πανεπιστήμιο Κύπρου University of Cyprus · Prifysgol Bangor University · Eberhard Karls Universität Tübingen · stw · Bar-Ilan University

Event Contributors

BCS Animation & Games Development Specialist Group · BCS Chester & North Wales Branch · CASSIDIAN · daden · RIVIC · Software Alliance Wales · Cynghrair Meddalwedd Cymru

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And finally……..

Stevie Scanlan will be setting sail across the Atlantic Ocean before Christmas, for a once in a lifetime challenge. Stevie hopes to raise money for the RNLI.

If you would like to make a donation please visit:

www.justgiving.com/saraandcharlie