Research Theme: Society

Case Study

Robots for the Real World

RESEARCHERS

Professor Dave Barnes (1955–2014)
Dr Fred Labrosse
Professor Mark Lee
Dr Helen Miles
Dr Mark Neal
Dr Patricia Shaw
Professor Qiang Shen

THE OVERVIEW

Aberystwyth University's Intelligent Robotics research group (IRG) has substantial expertise in producing integrated hardware and software systems for real-world applications with significant impact, including in the space industry. Members of IRG are responsible for developing several key systems of the ExoMars programme and providing data for industry partners.

IRG also actively engages with the general public, to increase understanding, learning and participation in science and engineering. Through varied activities appealing to a diverse range of audiences including their award-winning robotics club, they have interacted with thousands of people, inspiring youngsters and changing perspectives on the future and potential of robotics.

THE RESEARCH

The Intelligent Robotics research group (IRG) has an excellent record of success, with industry endorsement and international recognition. Their research has played a significant role in a wide variety of applications from sea all the way to space, with an overarching theme of operating in unconstrained environments, with strong interdisciplinary collaborations.

This has led to the development of survey robots, deployed to allow better and more frequent data acquisition, including the following projects:

- A survey boat to safely and accurately build 3D models of calving glaciers in Greenland
- A survey off-road vehicle to build 3D models of flooding riverbeds in New Zealand, made possible thanks to the automation of the data acquisition
- Our work on autonomous vision-based driving was integrated in QinetiQ's solution to the Autonomous Last Mile Resupply project
- A planetary scouting rover was developed and tested, containing state of the art hardware and software systems, in an EU-funded international collaboration

Additionally, IRG has increased understanding, learning and participation of science and engineering through organising and regularly taking part in a variety of events to showcase current robotics research to the general public. As part of this objective, fundamental research on robot learning inspired by infant development was also carried out, with significant EPSRC support.

THE IMPACT

IMPACTS ON THE INTERNATIONAL SPACE INDUSTRY

IRG has played a key role in the development, calibration, and testing of the Panoramic Camera (PanCam) and Infrared Spectrometer for ExoMars (ISEM) instruments on the ExoMars rover. This has contributed to innovation and entrepreneurial activity in the UK and European Space Industry through the design and delivery of the AU PanCam Emulator (AUPE). This work has also led to impacts on practitioners and delivery of professional services. AUPE allows international industrial and academic collaborators to develop new processes and methods to analyse the data from PanCam, with IRG providing consultancy for a number of projects. IRG's work has enabled industrial contractors to maintain their tight schedule and has contributed to the success of mission hardware and software development due to the results produced. This also enables public engagement activities centred around the mission.

ENGAGEMENT WITH ROBOTICS FOR STEM DEVELOPMENT

Aberystwyth Robotics Club was established for STEM engagement with local school children, teaching a wide range of skills for developing robotics systems and inspiring future generations of scientists and engineers. The Club has won national awards for STEM engagement. The Robotics Club has provided a template for the establishment of clubs elsewhere. International development funding enabled us to help form a robotics club with 20 local school children in Karbala, Iraq, engaging and addressing social and political divides.

IRG's public engagement programme targets different audiences, with different levels of understanding and preconceptions about robotics.

The IRG has visited over **70** different schools and colleges across the UK engaging over **7,000** children, as well as speaking to nearly **30,000** members of the general public at various events and contributing to a national outreach programme which has reached over **310,000** visitors to science museums across the UK.

Public engagement activities range from traditional talks and Q&A sessions to Film and Panel discussions during the annual Robotics week. The IRG raises awareness of, and showcases, state of the art of robotics research and applications via actively participating in events such as Jodrell Bank's Bluedot Festival, the National Eisteddfod of Wales Science Village and UKRI-organised science and engineering promotion activities. The long-term impact of these events is evident from the feedback attained.

"I attended the film and Q+A for the robotics week last year which initially sparked my interest in robots and artificial intelligence. I returned this year with a greater understanding… Both events significantly increased my interest in robotics and have inspired me to pursue my own research on the topic."

FEEDBACK FROM ROBOTICS WEEK