

GREAT WESTERN RESEARCH *focus*

Since its inception, Great Western Research [GWR] has set about promoting collaborations between the highest quality research groups and the most forward thinking businesses in the South West in order to support the growth of the region and to demonstrate just what is possible when academics and businesses collaborate. A recent partnership, formed through GWR, between Elumotion Ltd, the Bristol Robotics Laboratory, the University of the West of England, the University of Bristol and GWR PhD student Craig Chorley, is focusing on delivering an innovative solution to a very real problem.

The Common Touch

Our ability to sense sensitive, detailed tactile information through our fingertips is key to our ability to meaningfully interact with the world in which we live. We can understand and recognise objects and shapes, feel textures and features as well as lift grip and manipulate objects and tools. Robotics research has sought to create these sensing abilities for some years, focusing mainly on the industrial manufacturing applications. However, there is a greater need for tactile sensing outside of the controlled factory environment and into the uncontrolled, unstructured world in which we live. If robotics is ever going to successfully move from the factory floor and into our real world environment, the robots themselves are going to have to be able to sense, explore and interact with the world around them.

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Touch, unlike vision, is an interactive process. Craig established early on that existing research focused heavily on sensor design, missing the

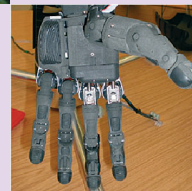
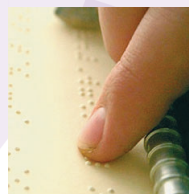
fundamental importance of the interaction between the contact material of the sensor and the sensed object. Our fingertip skin is as much part of our sensing abilities as the sensory nerve endings that create the signals. Looking at the human fingertip structure, the research was able to identify the layered structure of the fingertip skin as an important aspect of our sensing abilities. Our fingertips have a thin hard epidermal layer surrounding a very soft dermis and subcutaneous fat core. This layered structure created a highly compliant, conformable sensing and gripping surface, with a strong exterior which is resistant to shear and wear. Much like the concept behind a pneumatic tyre, able to conform shapes and bumps in the road, maintaining maximum contact area, but also very strong in shear to grip to the road and drive the car forward. Craig created and tested some prototype layered finger designs and published the work in a paper at TAROS Conference (Towards Autonomous Robotics Systems) in 2008.

In September 2008, Craig's University of Bristol supervisor, Dr Jonathan Rossiter, worked with GWR to enable the funding of a research trip to Japan



“[GWR] is about ensuring the sustainability of internationally-excellent research in the South West”

Prof. David Billington



to meet colleagues who were very interested to hear about the research and discuss sensor design ideas that would work best with the beneficial properties of the layered skin design. Over the two weeks spent in Japan, four different robotics research labs were visited, including some of the top robotics research departments in the world. This enabled the project to gain valuable insights into the current research and received very positive responses to both research ideas and progress, as well as making a list of very useful contacts.

Craig returned from Japan with the ideas and inspiration needed to design a sensing system that will capture the best qualities of the biologically inspired skin, which should enable the creation of a very sensitive, versatile prototype fingertip. One of the benchmark tests of the project is to see if his design can be made to read Braille. This would provide evidence of the level of detail and sensitivity, and give a framework to explore the importance of movement in 'Active' tactile sensing.

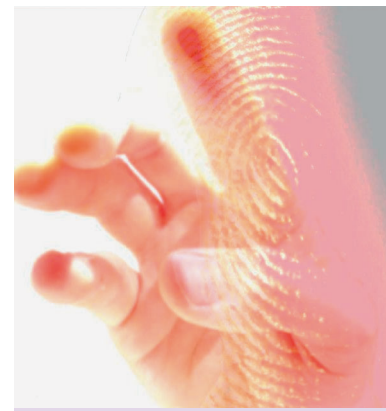
Even though Elumotion Ltd are one of the smallest companies to take advantage of the GWR funding partnership, they saw the exciting potential from investing in research. Based in Bath, owned and run by Dr Graham Whitely and Craig Fletcher, Elumotion Ltd is a robotics company specialising in the development of robotic hardware that aims to replicate human or biological motion. Elumotion has an expertise in advanced prosthetics, having played a major role in the design of one the best selling advanced prosthetic limbs in the world. From the outset of

Craig's research, Elumotion has encouraged him to make use of his independent thinking to create new concepts that would feed into new designs and directions for them.

This GWR sponsored research has formed part of further European FP7 and EPSRC bids prepared by his supervisor Dr Tony Pipe, Reader in Robotics and Autonomous Systems.

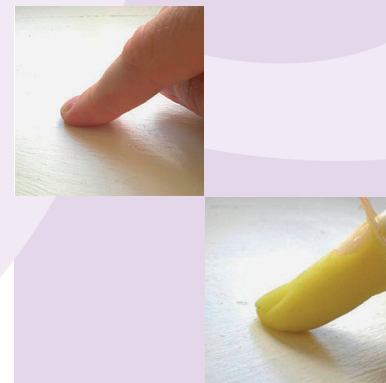
GWR Studentships and Fellowships are stimulating the building of new partnerships with major research funders in the region, and thanks to GWR over £2 million of new public and private investment is being made into research projects in the South West of England.

The inspiration for the GWR concept is simple - "The intention is that it should increase interactions between University research groups and business, and therefore build capacity and attract more money for research," said Prof. David Billington, Executive Director of GWR - "It is about ensuring the sustainability of internationally excellent research in the South West and preparing the region for the technologies of the future, by investing in collaborative forward looking research programs."



GWR is a £14m collaborative project which funds 130 PhD Studentships and 20 Research Fellowships at universities in the South West of England

All GWR studentships are real collaborations, each project is 50% funded by GWR and 50% by the business partner



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