Creamer Media's ENGINEERING NEWS Online

UCT prof reflects on 21 years of radar research

By: Creamer Media Reporter
Published: 06 Mar 09

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Most people, when they think about radar, imagine the round green screen of wartime submarine movies. A few hours spent with Professor **Mike Inggs**, of the Engineering and the Built Environment Faculty at the University of Cape Town, however, will soon make one forget all about green screens as one realises the scope and possibilities of this amazing technology.

Inggs has been head of the Radar Remote Sensing Research Group since it was established 21 years ago.

“Radar is the champagne of electronics,” Inggs explains. “It has every aspect of engineering in it – mechanics, physics and the environment. “You have to be a generalist if you are interested in radar technology.”

Radar, an acronym for ‘radio detection and ranging’, has a number of uses. It can be used to detect the presence of a stationary or moving object at a distance and to detect the speed of an object. It is the third use, where radar is a mapping tool, that has captured the attention of Inggs and his team.

One of the first big projects undertaken by the research group was funded by Armscor. “It was an exciting time,” Inggs recalls. “It was 1989 and the development of computer technology was making the analysis of the radar data much more comprehensive.”

The group built some of the first processing hardware and, until the project was moved to the Council for Scientific and Industrial Research, it analysed synthetic aperture radar (SAR), recorded by a specially equipped aircraft as it flew over the area to be mapped.

“Our original funders were looking at military applications,” he says. “Metallic objects reflect differently so it is easy to see, for example, if military units are moving around.”

But it was the peace-time uses that really excited the team.

“Radar penetrates through clouds, through vegetation and even the upper level of the soil,” Inggs explains. “That makes it an ideal tool for disaster management. It is also ideal for early prediction of crop yields. It really should be used more because we could save millions by recognising when yields are going to be poor and buying early.

“Radar is also one of the most important weather prediction tools. Using scatterometers, we can measure the strength and direction of surface winds and the height of ocean waves.”

Sadly, the issue of funding has put paid to much of the SAR work that the unit has done.

“I was excited by the possibilities of low-frequency, long-wavelength radar,” Inggs explains, “but, in the late 1990s, the defence budget was reduced, so we only managed to have the equipment fitted onto one Dakota. The data it produced was really useful but, after a brief use of the technology for a De Beers geological survey, by 2005, the SAR work was effectively over.”

Inggs has hopes of a revival now that South Africa is establishing its own space agency but, in the meantime, there have been plenty of other applications for him and his team to explore.

“In the mid1990s, we began to use subsurface radar. The penetration depth varies according to the soil composition, from a few metres in some rock to kilometres in ice. It’s very useful for landmine detection, but the First World seems to have lost interest in that, so it’s not used as much as it could be.”

US company Ball Aerospace funded the University of Cape Town to build sophisticated ground penetrating radars that are particularly useful in civil engineering. The radar units are fitted to borehole drills so that prospectors can get an idea of what is happening outside the core. This work has entered the private sector in the US, and instruments are being developed by a private company.

“Most of our funding comes from overseas. We can offer a lot more research and analysis for the dollar,” Inggs says.

And what of the future? The new radar laboratory to be opened at the university on March 24 will provide welcome relief for a department that has doubled in size in the past 13 years.

Inggs is also excited about many new appli-cations for a technology that just keeps on developing. Since 2005, he has been working on passive coherent location (PCL) technology.

“The earth is full of signals, from things like TV and radio,” he says. “We are building systems that will allow us to parasite off this energy to implement radar detection of aircraft. It’s perfect for the Third World. We’ll be able to use it, for example, to build air-traffic control systems at a fraction of their present cost.”

Inggs feels strongly that ‘cognition’ – the ability to adapt itself to the surrounding environment – should be built into this type of radar and, based on similar work in communications, coined the term ‘cognitive radar’ for PCL.

Professor **Simon Haykin,** of Canada’s McMaster University, had already coined this term for radar, in general, and is extremely interested in the work of the group. He will be visiting the University of Cape Town early next year.

Inggs and his team are also working on network radar with colleagues at University College, London, where a cluster of radars collaborate with one another. The University of Cape Town team is responsible for the software and precise clocks that are used to synchronise the radars.

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