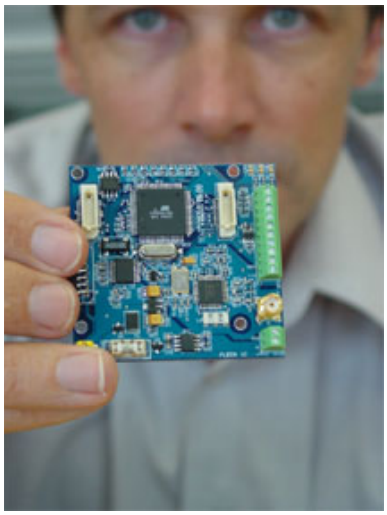
Keeping Check with Flecks

Dr Peter Corke – CSIRO ICT Centre



ICT Centre researcher Peter Corke with a CSIRO-designed Fleck.

Following on from the successful SmartSpaces (www.smartspaces.csiro.au) project, the CSIRO ICT Centre is ramping up its research effort in wireless sensor network technology.

Currently there are no compact, low cost, low power sensor devices suitable for deployment in large numbers in remote wireless networks. So, CSIRO researchers took up the challenge and designed the Fleck, which typically includes an 8-bit microprocessor, a radio transceiver and multiple sensors.

“The really interesting problems come with large scale and partly-connected networks such as might be used in agricultural and environmental applications,” says CSIRO ICT Centre researcher Peter Corke. “Simulated networks take us only so far; we want to find out the issues involved with real world deployments”. To further this research, the team has just taken delivery of 100 Fleck units, manufactured right here in Australia.

The Fleck’s advantage over other devices on the market includes their ability to run off solar power, a built in temperature and light sensor, and the ability to connect two analog, four digital and one serial sensor.

For more complex applications an expansion interface can be applied. The team have developed expansion boards for greenhouse monitoring (PAR, air temperature and humidity, and soil moisture and temperature) and for agricultural soil moisture measurement. Other interfaces on the drawing board include audio and video capability for biodiversity monitoring.

An earlier version, developed with support from the Food Futures Flagship and currently deployed by CSIRO Livestock Industries at Rockhampton and Armidale, is currently providing researchers with very rich information about the movements of cattle, using accelerometers, an electronic compass and GPS. Further work is being done to transmit data from inside the rumen of a cow, giving real-time information about the animal's condition, food and water intake.

Solar powered environmental measurement station based on Fleck technology.

“This technology will revolutionise the way that natural scientists gather data” says Corke. “Remote sensing and GPS tracking devices were revolutionary data gathering technologies in their day; wireless sensor networks are the next wave”. “They can provide direct measurement of many physical and chemical variables at arbitrary temporal and spatial scale, and naturally complement what can be achieved by remote sensing”.

The CSIRO Flecks have a radio range of at least 500m. If they were deployed in a line they would stretch out over 50km, or set out in a grid they would cover a region 5x5 km, providing rich sensory information at each node.

In the real world however, the devices may not always be in radio range, so research will focus on dealing with partially connected networks where some of the nodes are mobile. When the Flecks come back into radio range they can begin data exchange with the node where it is needed. “As an example, data from remote soil sensors could be carried by cattle back to a node at their water trough” says Corke.

Taking this idea one step further it may be possible to develop a totally disconnected network where an aircraft (manned or robotic) flies over the region and uploads data logs. This makes particular sense in the underwater scenario where radio communications is not possible, but short range optical communications is. This summer, the team are planning to test a low-power underwater data logging device which will upload data optically to an unmanned underwater vehicle.

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