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Water Catchment and Storage Monitoring

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Sensors and Sensor Networks technologies provide the means for comprehensive understanding of natural processes in the environment by radically increasing the availability of empirical data about the natural world. This step change is achieved through a dramatic reduction in the cost of data acquisition and many orders of magnitude increase in the spatial and temporal granularity of measurements.

Australia's Commonwealth Scientific and Industrial Research Organisation (CSIRO)
is undertaking a strategic research program developing wireless sensor network technology for environmental monitoring. As part of this research initiative, we are engaging with government agencies to densely monitor water catchments and storages, thereby enhancing understanding of the environmental processes that affect water quality. In the Gold Coast hinterland in Queensland, Australia, we are building sensor networks to monitor restoration of rainforest within the catchment, and to monitor methane flux release and water quality in the water storages. This poster will present our ongoing work in this region of eastern Australia.

The Springbrook plateau in the Gold Coast hinterland lies within a World Heritage listed area, has uniquely high rainfall, hosts a wide range of environmental gradients, and forms part of the catchment for Gold Coast's water storages. Parts of the plateau are being restored from agricultural grassland to native rainforest vegetation. Since April 2008, we have had a 10-node, multi-hop sensor network deployed there to monitor microclimate variables. This network will be expanded to 50-nodes in February 2010, and to around 200-nodes and 1000 sensors by mid-2011, spread over an area of approximately 0.8 square kilometers. The extremely dense microclimate sensing will enhance knowledge of the environmental factors that enhance or inhibit the regeneration of native rainforest. The final network will also include nodes with acoustic and image sensing capability for monitoring higher level parameters such as fauna diversity. The regenerating rainforest environment presents a number of interesting challenges for wireless sensor networks related to energy harvesting and to reliable low-power wireless communications through dense and wet vegetation.

Located downstream from the Springbrook plateau, the Little Nerang and Hinze dams are the two major water supply storages for the Gold Coast region. In September 2009 we fitted methane, light, wind, and sonar sensors to our autonomous electric boat platform and successfully demonstrated autonomous collection of methane flux release data on Little Nerang Dam. Sensor and boat status data were relayed back to a human operator on the shore of the dam via a small network of our Fleck™ nodes. The network also included 4 floating nodes each fitted with a string of 6 temperature sensors for profiling temperature at different water depths. We plan to expand the network further during 2010 to incorporate floating methane nodes, additional temperature sensing nodes, as well as land-based microclimate nodes.

The overall monitoring system will provide significant data to understand the connected catchment-to-storage system and will provide continuous data to monitor and understand change trends within this world heritage area.