NUSwan: Water sentinel

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This robotic swan collects real-time water-sampling data cost-efficiently

A flock of swans drifting on Pandan Reservoir may look like they are not doing much. But they are in fact on a mission, collecting real-time intelligence about the water. The New Smart Water Assessment Network (NUSwan) project is a low-cost robotic platform that could offer water authorities an affordable and efficient alternative to the current laborious method of water sampling. The time-consuming and cost-intensive operation now requires a boat ride out to fixed sampling locations.

NUSwan, developed by two NUS institutes — the Tropical Marine Science Institute (TMSI) and NUS Environmental Research Institute (NERI), is being test-bedded at Pandan and Marina reservoirs until September 2015. Data collected during this phase will be validated against that from other traditional monitoring methods.

Cost has been a barrier in getting field data, limiting scientists' understanding of the environment and relationship between numerous factors that are at play in complex ecosystems.

"We believe NUSwan, after successful test-bedding, will be able to enhance our current capability and mitigate such a barrier," said TMSI's Acoustic Research Laboratory Head, Assistant Professor Mandar Chitre, a lead researcher on the project.

Two of the swans are equipped to collect water parameters such as dissolved oxygen, pH levels and chlorophyll, while the third gathers atmospheric data, acting like a weather station. Data from the swans is streamed wirelessly to a server that can be accessed via the Internet.

The swans can be loaded with different sensors and actuators, depending on need. They can also conduct instantaneous operations, deviating from their preprogrammed mission if the on-board probes sense an irregularity. In such a case, the operator can command one of the swans to collect water samples for detailed laboratory analysis.

TMSI Research Associate Mr Koay Teong Beng showing off the NUSwan's sensor

Asst Prof Chitre said this would allow for a tailored sampling strategy based on varying site conditions. Stakeholders can quickly and efficiently interpret evolving situations and activate appropriate responses where necessary.

The NUSwan project applies concepts from Starfish, a TMSI-developed autonomous submersible robot. The NUSwan, however, uses a comparatively cheaper sensor as it does not need to ply the depths of a sea or ocean.

The Chinese National Engineering Center and the Shanghai Jiao Tong University have signed a Memorandum of Understanding with NERI to test-bed the system in several rivers in Southern China. They are also exploring using NUSwan for water surveillance in one of the world's largest reservoirs, which is found in China.

For the next phase, the scientists plan to introduce new software that enables several robots to work cooperatively on a mission. New sensors and probes will be developed, including one that monitors low-concentration phosphate levels that could be incorporated into NUSwan in the future.

http://news.nus.edu.sg/highlights/9246-nuswan-water-sentinel