

# A Multi-Functional, Deep Water Monitoring Robot for Pollution Control in Reservoirs

Lao, Seong Hok (School: Pui Ching Middle School)

Ho, Man Chon (School: Pui Ching Middle School)

Given the considerable threats pollution outbreaks pose to reservoir freshwater supply, we aim to develop a deep water monitoring robot that can conduct constant and comprehensive data collection in reservoirs, and take immediate actions in case of sudden pollution outbreaks, e.g. algal bloom, to ensure sustainable freshwater supply. The robot comprises of an Unmanned Surface Vehicle (USV), collaborating with a Remotely Operated Underwater Vehicle (ROV), acting as its extended arm. The ROV can collect water quality data from different water layers and depths. According to basic standards in water quality determination, especially those related to algal bloom, types of data gathered include: pH, conductivity, dissolved oxygen (DO), temperature, and environmental parameters such as wind speed and water flow rate. Real-time data visualization evinces immediate changes in water quality parameters. Remote control is achieved by GPS, wireless network and a self-designed web app. Comparison of data sets stored in our data-accumulation system can be made to highlight over-time changes, which in turn leads to trend analysis for pollution outbreak prediction. A series of tests has been conducted in Macau's Main Storage Reservoir to test such functions as surface water sampling, real-time surface and underwater data collection. Our robot can optimize reservoir management through constantly monitoring its water quality, and provide extensive data for reference in case of pollution outbreaks, in particular algal bloom. It is hoped that our robot will serve as a standard solution to preventing disruptive freshwater pollution and protecting the Earth's precious water resources.

## Awards Won:

Third Award of \$1,000

King Abdulaziz &

his Companions Foundation for Giftedness and Creativity: Award of \$1000 for research Water Technology