Enhancement of the Unmanned Surface Vessel (USV) System for Water Quality Monitoring at Impounding Reservoirs

Raw water from the impounding reservoirs is one of the major sources for drinking water supplies in Hong Kong. Water quality monitoring at impounding reservoirs would assist to facilitate the effective control of water treatment process at the downstream water treatment works to ensure the drinking water safety. The Water Supplies Department (WSD) has adopted a system consists of four unmanned surface vessels (USV) for water quality monitoring and sampling at impounding reservoirs. The use of multiple USVs for water monitoring allows parallel operation for increased coverage and significantly increase the number of monitoring points, which enables the capture of spatial change in water quality of the whole reservoir surface.

The present USV system has increased the water quality data collection efficiency by increasing the number of water quality monitoring points and shortening the data collection time. To enhance the USV system performance, the following robotic intelligence aspects on route planning and sampling are proposed to be developed, including (i) automatic route planning and segmentation (planning the shortest monitoring route based on the locations of water quality monitoring points and segmentation of routes for multiple USVs); (ii) smart stepped-up monitoring (based on the real-time water quality monitoring data); and (iii) smart water sampling (based on real-time water quality monitoring data). It is believed that a smarter route planning, water quality monitoring and sampling could further shorten the data collection time during the USV operation, and at the same time allow a more detailed capture of the water quality of the whole reservoir surface.