Autonomous Ecosystem Surveillance Vehicle: An Autonomous Aquatic Environmental Patrol Boat Aimed at Reducing Current Capability Gaps in Aquatic Bio-Security Sector by Realtime Data Transmission

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The US Corps of Engineers completed an electric fish barrier in the Chicago Sanitary and Ship Canal in 2002 to prevent the invasive Asian carp from moving into the Great Lakes. The Great Lakes provide an ideal habitat for the carp to proliferate, which could lead to an ecological disaster by choking out native fish species. This incident highlights a problem: while current methods of preserving biosecurity and biodiversity are sufficient on land, there is a lack of water-body monitoring methods. Testing water samples takes an extensive amount of time due to transportation to laboratories being required for an accurate result. To address this problem, we have engineered a boat equipped with a mobile platform capable of lowering into different depths to improve current aquatic biosecurity methods in three aspects: aquatic species, water quality, and seabed monitoring. By utilizing this platform, cameras in all four directions constantly survey the underwater environment for invasive fish by extracting features of detected fish from different depths underwater. Moreover, we have engineered a rotating spectrometer that analyses water samples collected by the platform, which also has various water quality sensors and outputs the concentration of chemical properties. Lastly, the cameras were utilized to survey and map litter underwater. This data can be compiled and sent to authorities by automatically monitoring the water body over time, providing valuable information on the underwater status. By combining these methods, we can minimize the current lack of aquatic biosecurity monitoring methods, providing a better environment in areas such as reservoirs that contribute to a greater living space for all.

Awards Won:

Shanghai Science Association for Young Talents: Award