



Implementation of a GPS Guided Remote Controlled Surveillance Rescue Boat

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Drowning remains a critical socio-technical challenge in Sri Lanka, intensified by monsoon-driven flooding, hazardous currents in inland reservoirs, and a lack of lifeguard infrastructure in rural coastal regions. This research presents the engineering design, fabrication, and experimental validation of a low-cost, GPS-assisted Unmanned Surface Rescue Vehicle (USRV) integrated with a preventative geofencing wireless signaling system. The vessel utilizes a catamaran architecture for enhanced lateral stability, locally fabricated using a fiberglass-reinforced plastic (FRP) matrix over a medium-density fiberboard (MDF) core to ensure both affordability and watertight integrity. Propulsion is achieved via dual water-jet thrusters powered by two nickel-metal hydride (NiMH) battery modules, strategically placed to optimize stabilizing mass and vessel balance. Experimental validation confirmed a vessel mass of 16.50 kg and a static draft of 6.60 cm, aligning with theoretical hydrostatic predictions within a 10.00% margin. Hydrodynamic analysis demonstrated efficient hull-water interaction, overcoming a calculated drag force of 2.41 N at operational speeds. A core innovation is the integration of a swimmer-worn GPS wristband featuring geofencing logic. Unlike reactive vision-based systems, this preventative trigger transmits an SMS alert with real-time coordinates via a Global System for Mobile Communications (GSM) link upon boundary violation. Field testing confirmed a notification latency of less than 5.00 seconds, effectively mitigating manual detection delays. This study provides a scalable, locally manufacturable solution for improving search-and-rescue (SAR) efficiency in diverse aquatic environments.

Keywords: Emergency response system, Geofencing technology, GPS-assisted rescue, Twin-hull design, Unmanned surface vehicle