Control System for an Autonomous Sailboat

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Autonomous vehicles are predicted to be an enormous disrupter to our economy, creating a massive and unpredictable impact, much like the smartphone on telecommunications. Automation can reshape transportation, consumer behavior, and society at large. Marine transportation is at the leading edge, with automated boats crossing the oceans, and ferries operating in Japan. Sailboats and sail assisted boats, in particular, are not just efficient and environmentally friendly, but also allow automated boats to be at sea for extended periods. This is excellent for applications such as oil and gas pipeline monitoring, data collection, and ocean mapping. Navigation is critical, and GPS provides a great option, but it can sometimes be unavailable or inaccurate, requiring some alternative method. Dead Reckoning is an algorithm using direction and speed to continually update a path, with errors building up over time. Navigating accurately via Dead Reckoning alone requires a large and expensive gyroscope. This project includes the creation of a novel navigation approach fusing GPS and Dead Reckoning using a multi-sensor Inertial Measurement Unit to select the most accurate approach at any given time. Accurately knowing the location, together with wind speed and direction, enables the fastest possible route to be calculated. These functions are all integrated into a single sensor system enclosure with 3D designed and printed parts. The hardware and software solution enables an autonomous sailboat to navigate confidently, while consistently calculating the best approach even with poor GPS reception.

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