

ABSTRACT

This research aims to develop an autonomous navigation system for a window cleaning robot capable of cleaning glass. This research is limited to the development of a navigation system for flat glass surfaces in multi-storey buildings with favorable weather conditions. The research methods include literature review, system design, simulation, implementation, and analysis of results. The literature review was conducted to understand existing navigation technologies and systems. System design includes the development of navigation and control mechanisms. Testing was carried out in stages, including calibration and performance testing of each sensor. The barometer (MS5611) showed a cumulative drift of ± 21.29 cm over 20 minutes, which was successfully reduced using a Kalman Filter to a standard deviation of ± 58.27 cm from an initial ± 172.78 cm. Implementation of a Complementary Filter on orientation data reduced yaw bias to $\pm 0.85^\circ$ at several orientations, although a large bias (-7°) still occurred without a magnetometer sensor. Robot implementation was carried out by integrating the Complementary Filter and Kalman Filter to ensure the stability and accuracy of robot movement during the cleaning process.

Keywords: Window cleaning robot, autonomous navigation, IMU, Ultrasonic, Filter Control.