

ABSTRACT

This study develops a robotic system for cleaning multi-story building windows, integrating the YOLOv5 object detection algorithm with a fuzzy logic-based motor speed controller. The system is designed to automatically detect stains through a camera and adjust the brush speed according to the detected level of dirt on the glass. The main goal of this research is to observe the potential for energy consumption savings while also reducing the risk of workplace accidents associated with manual cleaning at height.

The methods used include the design of a hardware system based on Jetson Nano, the implementation of the YOLOv5 algorithm for stain detection, and fuzzy logic for controlling the PWM output of the brush motors. The results of testing on 30 image samples show that the system is capable of detecting stains with an average accuracy of 90,82% and adjusting motor speed adaptively. The fuzzy logic controller was able to save power consumption by up to 38% compared to a conventional control method using 100% PWM..

In conclusion, this system has been successfully implemented comprehensively. The integration of YOLOv5 and fuzzy logic makes this system a potential solution for automatic window cleaning robots, while also supporting work safety in high-rise buildings and providing significant power savings.

Keywords: *window cleaning robot, fuzzy logic, YOLOv5, motor control, stain detection.*