ABSTRACT

Autonomous miniature vehicles currently serve as a solution to reduce traffic accidents, many of which occur due to driver or road user error. Developing full-scale autonomous vehicles requires significant investment and extended time for real-world implementation. Therefore, a miniature model implementing obstacle avoidance and object detection systems is essential to represent real-world road conditions, while also reducing testing costs and time.

The miniature autonomous vehicle must rapidly detect surrounding objects and process this data into manuvering commands. A 2D LiDAR provides distance and angular data of objects around the vehicle, which is processed using fuzzy logic control for obstacle avoidance commands.

In this study, the fuzzy logic control system was tested for its ability to avoid objects positioned ahead of the miniature autonomous vehicle within a 30°–150° field of view, on a one-way track with objects spaced at 50 cm and 80 cm. Tests were conducted on tracks of varying widths (90 cm, 120 cm, and 150 cm), with different initial vehicle positions and obstacle locations. Results indicate that the vehicle successfully avoided objects placed at the center of the 150 cm-wide track. For obstacles positioned on the right or left sides, avoidance was achieved on tracks 90 cm and 120 cm wide.

Keywords: *miniature autonomous vehicle, obstacle avoidance, LiDAR, fuzzy logic control.*