IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 5, June 2025
Impact Factor: 7.67

Electromagnetic Braking System for Autonomous Robotics: A Safety-Oriented Approach

Gunjal N. L.[1], Shashikant Fand[2], Ashutosh Dahe[3], Vikas Dhakane[4], Vaibhav Surunkar[5]
Assistant Professor, Department of Mechanical Engg., Adsul Technical Campus, Chas, Dist. Ahilyanagar, India[1]
BE Student, Department of Mechanical Engg., Adsul Technical Campus, Chas, Dist. Ahilyanagar, India[2, 3, 4,5]

Abstract: *This paper presents the design, development, and experimental evaluation of an electromagnetic braking system (EMBS) integrated with ultrasonic obstacle detection for a single-wheel autonomous robot. The primary objective is to enhance robotic safety through real-time obstacle detection and automated braking response. The system utilizes an HC-SR04 ultrasonic sensor for continuous environmental monitoring and an electromagnetic brake for contactless, rapid deceleration when obstacles are detected within predefined proximity thresholds. Experimental results demonstrate successful obstacle detection within 10-20 cm range with braking response times under 0.5 seconds and stopping distances of 10-15 cm. The integration of sensor-based obstacle detection with active electromagnetic braking provides a cost-effective, maintenance-free solution for autonomous robotic navigation safety, with potential applications in delivery robots, warehouse automation, and human-robot interaction scenarios*

Keywords: Electromagnetic Braking System, Ultrasonic Obstacle Detection, Autonomous Robotic, Human-Robot Interaction.

DOI: 10.48175/568