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Title: Obstacle detection using ultrasonic sensor for a mobile robot

Authors: [Joseph Azeta, and et al]

Journal: IOP Conference Series: Materials Science and Engineering

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References: Joseph Azeta et al.. (2019). Obstacle detection using ultrasonic sensor for a mobile robot. IOP Conference Series: Materials Science and Engineering

IEEE Citation

In-text: [1]

References: [1] Joseph Azeta et al.. (2019). Obstacle detection using ultrasonic sensor for a mobile robot. IOP Conference Series: Materials Science and Engineering

Related articles:

[1] **Obstacle Detection and Enhanced Safety for Self-driving Automobiles (ODESSA)**

Abstract: As autonomous driving technology evolves, ensuring car dependability and safety is crucial. The versatile Quanser Car (Q-car) platform provides an ideal testing ground for driverless vehicles. This research focuses on enhancing self-driving car safety by implementing an effective obstacle detection system. The study aims to improve obstacle recognition in self-driving Q-Cars by integrating depth cameras with MATLAB Simulink. Depth cameras offer advantages over yolo v5, providing vital three-dimensional environmental data essential for accurate obstacle detection and distance measurement. The research explores depth camera usage in driverless cars, detailing their integration into the Q-Car platform via Simulink. Additionally, it investigates how depth cameras can enhance safety features, especially collision avoidance. By leveraging depth cameras and MATLAB Simulink, the project aims to significantly boost autonomous vehicle safety and reliability on the Q-car platform, potentially advancing autonomous driving technology and fostering the development of safer self-driving cars.

DOI: 10.1007/978-3-031-93688-3_26

View paper

[2] **Fully Distributed Cooperative Multi-agent Underwater Obstacle Avoidance**

Abstract: Navigation in cluttered underwater environments is challenging, especially when there are constraints on communication and self-localisation, and there is clutter in the environment. In this paper, we first studied the connection between everyday activity of dog walking and the cooperative underwater obstacle avoidance problem. Inspired by this analogy, we propose a novel dog walking paradigm and implement it in a multi-agent underwater system. Simulations were conducted across various scenarios, with performance benchmarked against traditional methods utilising Image-Based Visual Servoing in a multi-agent setup. The results indicate that our dog-walking-inspired paradigm significantly enhances cooperative behavior between agents and outperforms the existing approach in navigating through obstacles.

DOI: 10.1007/978-3-032-01486-3_28

View paper

[3] **Robot Perception**

Abstract: This chapter presents a study on robot perception. It begins by establishing the research motivation: enabling large-scale human detection and tracking in public (non-domestic) environments using embodied sensors and onboard computing. Subsequently, it introduces contemporary 3D lidar technology as an embodied sensor, covering its fundamental operating principles and relevant

applications in mobile robotics. The chapter then details the “adaptive clustering” method developed by the author, highlighting its advantages and limitations through a performance comparison with other established methods. Following this, it describes several hand-crafted features extracted from point clouds, proven effective for human model training. Finally, it presents a multi-target tracker optimized for point cloud data.

DOI: 10.1007/978-981-96-7094-9_3

View paper

[4] **Prototype Design and Implementation of an IoT Based Intelligent Dustbin for Smart City**

Abstract: In today’s evolving urban landscape, garbage management has emerged as a critical challenge for environmental sustainability and public health. Traditional waste collection involves manual inspection, where individuals check for waste accumulation, which is time-consuming and complex. To address this problem and assist waste management staff by saving time and reducing unnecessary trips, an intelligent dustbin prototype is proposed. This system allows workers to focus their efforts only when necessary, improving efficiency in waste collection. The intelligent dustbin prototype uses Internet of Things (IoT) components including NodeMCU ESP8266 microcontroller, HC-SR04 ultrasonic sensor, and Neo 6M GPS module to monitor garbage levels, track dustbin locations, and notify authorities if the garbage exceeds a threshold. The prototype is integrated with two in-built mobile applications: the Blynk App for real-time garbage level monitoring and the Telegram App, where a bot sends alerts and dustbin locations to waste management staff. This aids efficient waste management and improves collection and resource distribution.

DOI: 10.1007/978-3-032-00777-3_10

View paper

[5] **PMC Peripheral Interfacing**

Abstract: After reading this chapter, the reader should be able.

DOI: 10.1007/978-3-031-85944-1_4

View paper

[6] **Sonochemistry in Chemical Engineering**

Abstract: Sonochemistry, specifically dependent on acoustic cavitation, has transformed chemical engineering through its possibilities of provocation of localized temperature and pressure. This chapter

will discuss sonochemical technology, specifically ultrasonic reactors, which include ultrasonic baths, horns, and multiple-frequency flow cell reactors. Bubble dynamics are modeled according to the Rayleigh-Plesset equation together with the role of frequency, temperature, pressure, liquid, reactor geometry, and the transducer's position. It has been used in nanoparticle preparation, nanoemulsion process, filtration process, ultrasonic atomization, and improvement of reaction rates in polymerization process, catalysis process, and enzymatic process. The chapter also discusses mass transfer modeling, namely the diffusion-limited model for vapor transport, ultrasound generation methods, piezoelectric and magnetostrictive transducers. Comparisons of sonochemistry with other hybrid technologies in controlling air contamination and biological wastewater treatment are also provided to highlight the importance of sonochemistry in developing more sustainable and innovative chemical engineering methods.

DOI: 10.1007/978-3-031-91656-4_3

View paper

[7] **Induced Antifragility**

Abstract: This chapter is dedicated to induced antifragility. Here, we discuss the benefits of input distribution irregularities based on emergent system dynamics in a feedback loop with a controller that drives the system towards a prescribed dynamics. We consider methods for detecting, analyzing, modelling, and controlling road traffic, robotics, and industrial control systems' antifragility.

DOI: 10.1007/978-3-031-90425-7_4

View paper

[8] **Adaptive Positioning of a Mobile Robot for Precise Workstation Operation**

Abstract: This study presents an adaptive positioning method for mobile cobots using a vision-based correction system integrated into a UR10 robotic arm. The approach involves two-stage positioning: the AMR (MiR100) docks at an initial location, then the vision system detects a reference marker to establish a local coordinate frame for precise task execution. This compensates for global positioning errors, enhancing repeatability and accuracy. Experimental validation on a CNC workstation confirmed improved alignment precision over standard AMR methods. The results highlight the potential of vision-based adaptive positioning for high-precision mobile cobot applications in dynamic industrial environments.

DOI: 10.1007/978-3-032-01517-4_26

View paper

[9] **Toward Semantic Scene Understanding: Benchmarking for Mobile Robot Navigation Indoors**

Abstract: Mobile robot navigation is a constantly evolving field that is adopting new paradigms along the way, and recent methods, such as Transformer-based models, have helped facilitate advancements in perception and decision-making tasks in this decade alone. This paper explores modern scene understanding techniques, including Contrastive Language-Image Pretraining (CLIP) and its role in improving semantic scene comprehension for various indoor environments. Existing benchmarking methods for evaluating autonomous mobile robot navigation performance are limited in accommodating the dynamic nature of real-world scenarios. Therefore, a set of metrics is proposed for robust evaluation, highlighting the need for standardized frameworks that meet modern expectations. Furthermore, a multimodal robot navigation model is introduced; it consists of visual and laser data combined with semantic embeddings to augment navigation performance. The proposed model and metrics aim to contribute to better benchmarking standards for indoor robot navigation systems.

DOI: 10.1007/978-3-031-93825-2_9

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