Developing an Affordable Robotic System for Automated Fall Hazard Detection and Localization in Indoor Construction Environments

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ABSTRACT

Studies suggest that fall accidents are one of the leading causes of fatalities in the construction industry. To mitigate the risk of fall hazards, an automated site inspection system is crucial, considering that conventional methods of monitoring construction sites are labor-intensive, time-consuming, and error-prone. Affordable unmanned ground vehicles (UGVs) can provide several advantages as they are cheap and can operate long hours in a congested indoor construction setting. Towards that end, this research study aims to assess the feasibility of an affordable UGV for automated detection and localization of fall hazards in indoor construction environments. Notably, all the slipping, tripping, and falling hazards in the indoor construction environment were considered as potential fall hazards for the purpose of this research. The proposed robotic system is assembled by four low-cost hardware modules, which improves upon the affordability of the available automated robotic system. The objective of this study was achieved by leveraging a deep learning algorithm to identify the potential fall hazards. Further, hazard locations were marked onto the map created using Hector SLAM. The proposed system can contribute to the safety management of construction workplaces by effectively detecting potential fall hazards.