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Abstract

Performance Analysis of LIDAR Assist Spatial Sensing for the Visually Impaired †

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Echolocation can enable people with vision impairment to comprehend the surrounding spatial information. However, this technique often requires long term training, and the accuracy of echolocation is subject to varying conditions. Furthermore, people often has generate the sound and process the received information simultaneously. This work presents a proof of concept LIDAR Assist Spatial Sensing (LASS) system focuses on overcoming these restrictions by detecting the location of surrounding obstacles of the user through a LIDAR and translating this spatial information into stereo sound at different pitch. Both the stereo sound and the pitch informs the user of the obstacles' orientation and distance, thus granting visually impaired users with enhanced perception of spatial areas and obstacles. The work is divided into two phases. Phase I involves hardware and software engineering. Phase II focuses on system efficacy study. 18 blindfolded human participants equipped with the LASS system were studied, which was cleared by the Penn State IRB. Our study demonstrates that with minimal training, blindfolded individuals equipped with the LASS system, were able to identify the number of obstacles, rank their distance, and perceive obstacles' relative location.

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