

Group #09

HAVEN: Haptic and Visual Environment Navigation

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Abstract

Visual impairment and age-related vision loss significantly limit independent navigation and environmental awareness. Current assistive devices, such as white canes and guide animals, are limited in efficacy and availability. A wearable navigation system was designed to support and work alongside existing solutions and was developed using low-cost consumer hardware. Smartphone cameras and LiDAR are used with SLAM algorithms to recreate real-time 3D environments that update at 1.75 Hz. The data is then used to identify obstacles and generate walkable paths, the direction of which is translated into head-mounted haptic feedback. Results suggest that integrated smartphone-based wearable navigation systems can provide an affordable and practical solution for enhancing autonomy and safety among the visually impaired, with future plans to further improve path generation accuracy.