

A fusion of UWB and sonification methods for accessible public transportation

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Accessible public transportation remains a significant challenge for visually impaired individuals, largely due to the unreliability of conventional positioning systems like GPS in complex urban and indoor environments. This paper introduces a novel system designed to enhance the independence and safety of visually impaired users navigating public transportation facilities and vehicles. Our solution leverages Ultra-Wideband (UWB) technology to provide precise and real-time localization, overcoming the limitations of existing methods. The proposed system accurately tracks user position around public transportation hubs and inside vehicles, enabling the delivery of reliable navigation instructions. A core innovation of this work lies in its utilization of sonification methods as the primary feedback mechanism. By translating spatial information into intuitive auditory cues, our system aims to significantly reduce the cognitive load often associated with traditional navigation aids. This approach allows users to perceive their environment and receive guidance efficiently and effectively, promoting a more natural and less demanding navigational experience.

We demonstrate the system's efficacy through comprehensive testing in diverse scenarios, including both static and dynamic environments. The results consistently highlight the high accuracy of the UWB-based positioning, validating its potential to provide a robust and dependable solution for accessible public transportation. This research contributes to fostering a more inclusive urban environment by empowering visually impaired individuals with enhanced mobility and confidence in their daily commutes.

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