Smart Glasses with Voice User Interface for the Visually Impaired

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This interdisciplinary research project focuses on the challenges encountered by individuals with moderate to severe vision impairment, a category that includes around 217 million people out of the 2.2 billion globally who experience some form of vision impairment (WHO 2023, Ackland et al. 2017). Assistive technologies have been developed to aid this demographic, but they often suffer from limitations such as poor accuracy, limited range, ergonomics issues, and high cost (Elmannai et al. 2017). The proposed solution is a novel assistive device - smart glasses equipped with facial emotion recognition, voice user interface, and distance sensing, all integrated into a glasses frame. This device is intended to enhance the quality of life for the visually impaired by improving social interactions and ability to navigate their environment. The project's design involves embedding a camera for face detection, a voice-controlled interface within the glasses and state-of-the-art distance sensors. These components will provide facial emotion recognition (identifying emotions like happiness or sadness), audio feedback through bone conduction and obstacles detection. The device's unique feature, powered by machine learning algorithms, is its ability to discreetly inform the user about the emotional state of people they interact with. Two hypotheses guide this research: (1) the inclusion of facial emotion recognition will enhance user satisfaction in social interactions, and (2) the smart glasses will enable more effective indoor navigation compared to navigation with only a mobility cane. A user-centered research method will be employed, involving surveys to measure usability, simplicity of use, effectiveness, size, weight, comfort and user experience (Demers et al. 2001, Rust et al. 2004). The prototype has undergone multiple rounds of testing and refinement based on feedback from a visually impaired adult male user. Preliminary results of the tests confirm both hypotheses. Future research will involve a control and a test group as well as a more rigorous testing procedure. The project also involves an innovative approach to personalization, with glasses tailored to individual users by using a 3D scanner. This customization, combined with advanced processing units and the latest sensor technology, aims to create an ergonomically designed assistive device. The expected outcome of the research is a comprehensive assistive technology that improves the social interaction and independence of visually impaired individuals. The device will be showcased by the poster. This project stands to make a significant contribution to the field of assistive technology for the visually impaired.

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