Smart Glasses for Blind

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Abstract

Introduction

For decades, blindness has been a concern for people worldwide. According to the WHO, 2.2 billion people are suffering from a vision impairment problem. In an article in the National Medical Journal of India, almost 8 million Indian people are blind, which accounts for half of the quarter of the blind and visually impaired people. Being a part of a distinct society, there is a need to provide safe navigation and make them independent of others. Safe navigation is mostly important in the outside environment, like outside of the house, so they don't collide with any object, can be prevented from accidents on roads, falling from the stairs, falling into the gaps of buses and trains, difficulty walking on the sidewalks, getting hit by moving vehicles or cyclists, getting lost in unfamiliar places, tripping over uneven surfaces, struggling to find proper public transport, or being unaware of sudden environmental hazards like construction zones or weather-related dangers. Throughout the year, many safe navigation methods have been introduced, from human assistance, dog assistance, to technological ways. Still, technology advances are lagging in providing safe navigation in the outside environment.

To solve this problem, a lot of research has been done to help blind people navigate safely. One of the methods introduced is "Low Cost Ultrasonic Smart Glasses for Blind" which uses. This wearable device integrates ultrasonic sensors to detect obstacles and provides auditory feedback to the user.

Literature Review

[1] Payal Dhar, "Smart Glasses Make Human Echolocation Possible", 2023

Researchers from the University of Technology Sydney (UTS) and Aria Research have developed a technique called "acoustic touch" to assist blind and low-vision (BLV) individuals in navigating their environment. This method, when integrated with smart glasses, converts visual information into auditory icons, allowing users to perceive objects through sound. The system utilizes head movements to trigger specific audio cues corresponding to objects within a virtual cone extending from the user's head.

[2] Rotimi Abayomi, “Design and Implementation of Smart Glasses for Blind People - Using Raspberry PI”, 2022

The paper aims to develop an assistive device to enhance the mobility and independence of visually impaired individuals. The smart glasses incorporate a Raspberry Pi as the central processing unit, interfaced with a camera module for real-time image capture. The system utilizes image processing techniques to detect obstacles and provides auditory feedback to the user through connected earpieces, alerting them to potential hazards in their environment.

[3] Maghfirah Ali, Tong Boon Tang, “Smart Glasses for the Visually Impaired People”, 2016

The paper presents the development of an assistive device aimed at enhancing the daily lives of visually impaired students. The primary focus is on facilitating the reading of printed materials through text recognition technology. The smart glasses are designed to be cost-effective by utilizing a Raspberry Pi 2 single-board computer as the central processing unit, paired with a Raspberry Pi camera module for image capture. When the user initiates the reading function via a push button, the camera captures an image of the text. This image undergoes processing to enhance quality and orientation before being analyzed by the Tesseract Optical Character Recognition (OCR) engine to extract the text. The recognized text is then converted into speech and delivered to the user through an earpiece.

[4] Vaishnavi Lingawar, Madhunika Nilakhe, Mrunali Kamble, Prof. M.P Shinde, “Prof. M.P Shinde”, 2023

The paper presents an innovative Ultrasonic Smart Glasses system designed to aid visually impaired individuals in navigating their surroundings independently. The device integrates ultrasonic sensors, a control module, an MP3 player, and a buzzer to detect obstacles and provide real-time auditory feedback. Using Arduino technology, the system calculates the distance of obstacles and alerts the user through sound cues, enhancing their mobility and confidence. The proposed solution is lightweight, cost-effective, and user-friendly, offering a significant improvement over existing assistive devices.