Smart Wearables for Kids: Enhancing Awareness with Haptic and Auditory Cues for Visually-Impaired Children

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Motivations

Children with visual impairments often find traditional canes challenging to use safely. While these canes work well for adults, they can be difficult for young children to manage. Early intervention and adaptive technology are essential for fostering their independence [1]. Additionally, there is a lack of research on how effective these canes are for toddlers, pointing to a need for improved solutions [2, 3, 4, 5].

Fig. 1 Wearable Cane Designed for Toddlers[1]

Methodology

- Create an Aruco Marker that is generated and recognized by the computer. (See Fig. 2)
- Using OpenCV-Python, measure the distance between the user's hand and the Aruco Marker.
- Utilizing a computer library, bridge the python code into the Arduino system.
- With an Arduino board, make a device that can send out auditory and haptic cues. (See Fig. 3)
- 3D print a wearable wrist bracket to mount the Arduino board onto.

Conclusions

Future work includes designing an ergonomic bracket to securely hold the Arduino board for comfortable use by children. Enhancing the object recognition system will improve the accurate detection and classification of potential hazards. Additionally, developing a consumer-compatible camera system will support the creation of a comprehensive vision program capable of full-body tracking, ensuring precise monitoring of limb positions to prevent safety risks.

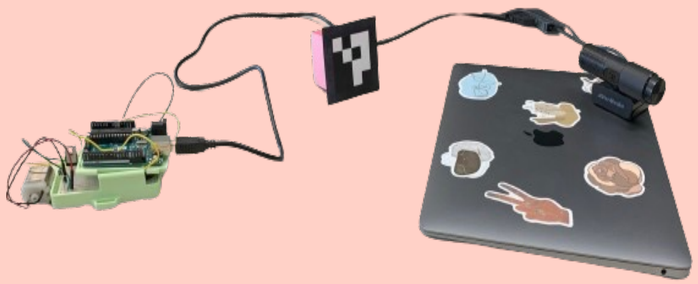


Fig. 5 Prototype Used in System Protocol

Objectives

Fig. 2 Aruco Marker

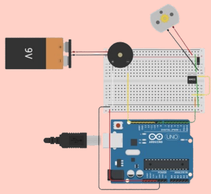


Fig. 3 Arduino Circuit

I. Develop a System for Object Recognition and Distance Measurement

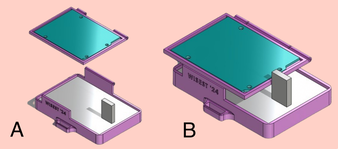
II. Integrate Auditory and Haptic Feedback into Wearable Technology

III. Design and Prototype a Wearable Device for Children:

Results

This project integrates computer vision and tracking software to enhance the safety and independence of visually impaired children. By providing real-time feedback with affordable tech, it highlights how modern innovations can be applied for assistive purposes, driving progress in wearable technology and improving lives.

Fig. 4 Exploded (A) and Isometric (B) of Arduino Wrist Bracket



References

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