BlindCrown - General Aspects

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1 The Problem

Society is not built for blind people. We see this everyday as threats at head level either are not regulated or the regulations are not being applied. From metal advertisements to tree branches, there is a lot of room for worry for people with visual impairment. While there are tools they can use to guide themselves on a daily basis, such as walking canes, these tools are not perfect and cannot protect against any kind of danger. We see head-level protection as one of the most overlooked aspects when talking about people who suffer from partial or total blindness.

2 Our Solution

We propose a new device meant to increase the real-time detection of this kind of threats: BlindCrown. This device is made up of sensors and vibration motors attached to a hat or helmet. It sends vibrations proportional to the distance to the nearest object in a direction to the user. In this way, the BlindCrown user can feel when an obstacle is getting closer to their head and avoid it. The device is able to connect to a Microsoft Azure cloud service and receive updates regarding vibration intensity.

3 The Connection to HCI

The BlindCrown device exemplifies the principles of Human-Computer Interaction by improving the user experience and addressing specific needs of visually impaired individuals. HCI focuses on creating intuitive and accessible interfaces, and our solution aligns with these goals by providing tactile response that is easy to understand and use. The use of vibration motors as a feedback mechanism ensures real-time communication. By bridging the gap between the environment and the user through a wearable interface, BlindCrown can easily integrate into the daily life. Besides all this, from the user's perspective there will be a very simple web application to control the vibration intensity, offering an interface for communicating with the device.

4 The Connection to IoT

The communication with the Microsoft Azure cloud service represents the IoT part of this project. This connectivity transforms the device from a standalone tool into a smart system that uses the power of the Internet of Things to improve its functionality and adaptability. BlindCrown is able to dynamically adjust its vibration intensity based on the data received from the cloud.

5 The Connection to Azure

In short, the BlindCrown device is capable of adjusting its vibratory intensity by listening and receiving incoming messages from the Azure IoTHub that it connects to.

6 Technical Aspects

The prototype is an Arduino-based device that uses ultrasound proximity sensors to measure distances. There are 3 sensors in total, each having a lateral arc of 15°, so with optimal placement, the user will be able to detect objects in a 45° arc in front of him. Each sensor has a coin vibration motor associated with its direction, which will vibrate depending on the distance measured by the sensor to the nearest obstacle.

7 Other Similar Devices

7.1 UltraCane

UltraCane is an advanced walking cane that sends small vibration feedback regarding obstacles in the path of the user. It can detect dangers at head level, similar to our solution, but also objects at chest level. This makes it useful for individuals navigating areas with complex obstacles. Its ability to detect multiple height levels ensures a safer and more comprehensive navigation experience.

7.2 BuzzClip

BuzzClip is a wearable mobility device that uses ultrasonic sensors to detect obstacles and provides vibratory feedback to the user. It can identify dangers at head level, and also obstacles in the user's upper-body path. As a clip-like device, it is compact, hands-free, and complements traditional mobility aids. Its portability and ease of use make it a great choice for improving spacial awareness at a mobility cost low to none.

References

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