Technical Survey: Smart Cane

Arthur Helmen
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1. References

1.1 M. Aggravi, D. Prattichizzo, G. Salvietti, "Haptic Assistive Bracelets for Blind Skier Guidance" , *AH '16*: *Proceedings of the 7th Augmented Human International Conference 2016.*

This article discusses the current state of how those with visual impairments are able to ski - generally by following an instructor closely and listening for verbal commands. The researchers also propose a solution that allows for more effective communication, through the use of haptic feedback. The researchers had the instructors communicate their instructions (how the blind skier should turn), by pressing buttons on their own poles, and the blind skiers received the haptic feedback through arm bands. Since we intend to communicate similar information to the users of our smart cane, this will be a valuable source that may show us the best way to use haptic feedback to communicate navigational cues.

1.2 E. Folmer, B. Sucu, "The Blind Driver Challenge: Steering Using Haptic Cues": *ASSETS '14: Proceedings of the 16th International ACM SIGACCESS Conference on Computers & Accessibility.*

These researchers used haptic feedback vibrations along a steering wheel in an attempt to give accurate navigational cues to visually impaired, and regular sighted, test subjects in a virtual environment. They were able to show that blind people have a greater sensitivity to haptic cues, compared to normal sighted people. Which adds confidence to our use of haptic feedback for our project. Additionally, the ways they used their cues can provide insight on how we should communicate navigational instructions to our users

1.3 M. A. Al-Ammar, H. S. Al-Khalifa, A. S. Al-Salman, "A Proposed Indoor Navigation System for Blind Individuals", *iiWAS '11: Proceeddings of the 13th International Conference on Information Integrations and Web-based Applications and Services.*

These researchers explored a way to use smartphone technology to find a path to a specific destination inside a building. They broke down the problem into different areas and provided specific solutions, where a blind person would be able to navigate to a point in a building with

little-to-no assistance. This is interesting, since a main focus of our project is providing in-building navigation.

1.4 M. Brock, P. O. Kirstensson, " Supporting Blind Navigation Using Depth Sensing and Sonification", *UbiComp '13 Adjunct: Proceedings of the 2013 ACM Conference on Pervasive and Ubiquitous Computing Adjunct Publication.*

Using a depth camera (Microsoft Kinect), these researchers were able to map a room, and convey the information to blind and blind-folded users through audio feedback. Their test subjects were able to learn how to use the system quickly, and then navigate through an obstacle filled room. The idea of mapping out a room in front of a user was interesting to us at first, but we thought it might be unrealistic. This article may clue us in on how to implement such functionalities into our design.