Smart Cane

Extended Annotated Bibliography

Jonathan Williams (cwilliams22@tamu.edu)
Texas A&M University

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References

[1] L. Kartika, G. I. Hapsar, and G. A. Mutiara, "Smart-cane for the blind with wind direction position based-on arduino," in *The 4th Annual South East Asian International Seminar (ASAIS) 2015*, 2015.

This paper goes into detail on a new and novel way of determining user position through the winds around them. It also covers a way of measuring user approval through something called the "Likert Scale". Overall, they propose some interesting ideas of determining user orientation in ways our team hadn't thought of. The only downside being that this device is not as functional indoors due to the lack of ambient winds.

[2] M. Lan, A. Nahapetian, A. Vahdatpour, L. Au, W. Kaiser, and M. Sarrafzadeh, "Smartfall: An automatic fall detection system based on subsequence matching for the smartcane," in *Computer Science Department Electrical Engineering Department Wireless Health Institute University of California Los Angeles*, 2009.

In this paper, the authors noticed that falls were the leading cause of death for elderly. They developed a system that can be installed on a previous SmartCane system they had developed recently. This system uses a method called subsequence matching, which is different from how most other fall detection systems function, and through this have developed a near perfect fall detection system. This sort of technology could be

useful in our design as part of an emergency detection system to keep the user safe in the event of an accident.

[3] J. M. Loomis, R. G. Golledge, and R. L. Klatzky, "Navigation system for the blind: Auditory display modes and guidance," in *Presence, Vol. 7, No. 2, April 1998, 193–203*, 1998.

This research paper goes very in depth on a purely audio based approach to guiding blind people around. Their findings will be useful in our final implementation as we will offer an audio-only-based feedback should the user request it. This will help us further refine our audio feedback and keep things simple but informative for the user without overwhelming them with useless and unneeded information.

[4] R. K. Megalingam, A. Nambissan, A. Thambi, A. Gopinath, and M. Nandakumar, "Sound and touch based smart cane: Better walking experience for visually challenged," 2015.

This paper is an introspective to another design methodology used for an entire product. This time the focus wasn't on cheapness or ease of use, but rather on adding more "smart" features. Their main goals were object detection and integrating that with an Android device via Bluetooth. This will be useful information as we are also planning on integrating our device with a smartphone app.

[5] J. Sakhardande, P. Pattanayak, and M. Bhowmick, "Smart cane assisted mobility for the visually impaired," in *International Journal of Electrical and Computer Engineering Vol:6*, 2012.

This is a look at a current product on the market. It was developed primarily with ease of use and cheapness in mind. The paper goes into detail on their design process and how they made certain decisions. This will be useful both in seeing what methods they used to keep cost down while also giving an insight into what features are considered the bare minimum for a cane to be called "smart".

[6] A. Serino, M. Bassolino, A. Farne, and E. Làdavas, "Extended multisensory space in blind cane users," in *Association for Psychological Science Volume 18-Number 7*, 2007.

This paper does research into how our body interprets certain stimuli around the hand and how that can help blind people visualize their surroundings. Through their studies, they discovered that using certain methods of audio-tactile feedback greatly expanded the pre-hand space of blind subjects. Interestingly, the space was limited to just around the hand if they held only the handle isntead of the full cane. This paper can give us an insight into what kinds of feedback would be good to use for our device.

[7] E. E. STORE and SERVICES, "Raspberry pi camera module," 2016.

This documents the inner workings of the Raspberry Pi camera module and offers a python solution to taking picutres and videos with the cameras. While this only document only applies to the standard Pi camera modules, the code seems to work with any camera as long as they connect through the same ribbon cable slots on the Pi. Both these specs and code were used to test the functionality of the cameras and will be used to operate the cameras as needed.

[8] A. F. Symon, N. Hassan, H. Rashid, I. U. Ahmed, and T. Reza, "Design and development of a smart baby monitoring system based on raspberry pi and pi camera," in *2017 4th International Conference on Advances in Electrical Engineering (ICAEE)*, 2017.

This paper covers the development of a baby monitoring system using the Raspberry Pi and the default Pi cameras. This is relevant in a multitude of ways as we also plan on using the Pi's cameras in a smart way and this provides a lot of insight. Along with including their designs and development process, from which we can take even further inspiration.