A Full Fledged Application-based Cane For Blind And Visually Impaired People

Rohan Chaubey, Manodeep Roy, Shratik Mishra, Yedhukrishnan Pillai
Shree L. R. Tiwari College of Engineering, Computer Department

Abstract—— The life of the blind people is very hard, even today in the 21st Century when several things make their life easier. Their biggest problem is traffic because people sense the environment mostly through their eyes and sadly, the other organs cannot substitute sight. On the other hand, in traffic one risks the lives of others too. Serious injuries can be obtained by not seeing the obstacles in the homes. Bones can break, or even worse; permanent injuries can occur. In severe cases even the chance of death is present. Our vision is to help in this problem by developing a device and corresponding software. Handling should be accessible, dynamic and minimalistic. The solution consists of two parts. The first being the software running on a mobile phone which has GPS enabled navigating system along with software that can scan a document and provide a voiceover for it, and the other one is the custom built hardware. The device contains an ultrasound sensor and two infrared sensors which detect the distance between the objects and the cane, and then the software processes the signal and notifies the user.

Index terms: Braille, GPS, ultrasound sensor.

_____*****_____

I. INTRODUCTION

According to the research made by WHO in the October of 2011, there are nearly 290 million people visually impaired worldwide: 43 million are blind, and 247 have low vision. People 50 years and older are 82% of all blind. The primary causes of visual impairment are uncorrected refractive errors (43%) and cataract (33%); the first cause of blindness is cataract (51%). Visual impairment in 2017 is still a major global health issue: the preventable causes are as high as 80% of the total global burden.

Blindness is the condition of lacking visual perception due to physiological or neurological factors. Various scales have been developed to describe the extent of vision loss and define blindness. Total blindness is the complete lack of form and visual light perception and clinically recorded as NLP, an abbreviation for "no light perception." Blindness is frequently used to describe severe visual impairment with residual vision. Those described as having only light perception have no more sight than the ability to tell light from dark and the general direction of a light source. Many countries define the state of legal blindness. In North America and Europe, it means ten times worse sight than in the case of healthy subjects. Nearly 10% of the legal blinds cannot see at all. The life of the blinds – despite the innovations of the XXI. Century – is very hard. There were several innovations born to help their everyday lives. For reading and writing, they use Braille writing and languages based on it. Since impaired vision typically occurs in old age, only 10% of the blind knows it. For using computers, there is text to speech and magnifier software. Even audio books are helpful for them. In traffic, their most valuable aid is the white cane. The cane helps them to notice the inequalities on the road in time and some potential dangers. The device developed by us is like the white cane, helps them in the traffic. The hardware maps the area in front of the user using three sensors and a mobile phone, which is controlled by voice commands. The phone processes the data from the sensors, and by the frequency of the sound, it notifies the user about the distances.

II. ARCHITECTURE

The Hardware for the cane consists of ultrasonic sensors, a camera, and a GPS; all assembled on a single walking cane.

The ultrasonic sensors would be such that they're in a strip that covers the whole circular perspective of the cane.

The length of the cane will be that of an ordinary walking white cane i.e. between 110 cm to 150 cm. Its foldable length would be around 15 cm - 20 cm.

It would consist of the Top-Braille, which is a revolutionary reading personal assistant. Top-Braille is ideally designed to allow people who are blind instantaneous access to read all printed texts.

As the user moves Top-Braille along printed text, the printed material is translated into Braille. The translation of each written character is controlled by the speed with which the user moves Top-Braille. Navigation software indicates the direction to the user and allows the user to follow the text line by line. Top-Braille is ergonomically designed to provide comfort and ease of use.

Use of a microcontroller to establish a connection between mobile phone and the cane. The GPS and audio of the mobile phone are put into use.

A use of switch will also be made so as to help switch between the reader mode use of audio and travel mode use of audio services provided by the cane.

III. WORKING

Ultrasound sensors: The ultrasound sensors will work like SONAR. It will send out sound waves, which will reflect on countering an obstacle when the receiver receives this signal of obstruction, it will notify the user of the real obstacle in the path, and inform the user of the safest probable direction of movement.

Top Braille: The camera provided on the stick will work as a scanner and scan the document in the picture and using the mobile application provided, the text will be converted into the voice over. The user can use the switch on top of cane to change to document read mode, and when the user is in this mode, the mobile will read the text to the user, using the mobile audition services.

GPS: The use of this system will be like that of in conventional devices, the user will have to enter a starting address as well as a destination address. The GPS will provide the necessary guidelines, including the steps of which an absolute change in direction is needed. The use of GPS services of mobile along with the ultrasound sensors of cane will ensure the safest possible travel of the user.

The notification of the change in direction will be made using the audio services provided in the cell-phone.

IV. CONCLUSION

During the development process, we gained lots of experience, and – hopefully – created a device which eases the lives of visually impaired people. From the start, it is designed for the future user, that's why the concept is so simple – sadly the users could not see if it were nicer – and this is the reason for the lack of settings. It does provide an out of the box experience. One just has to plug in the device, and without any calibration, registration or configuration he can use it.

REFERENCES

[1]   North Arizona University Website: https://nau.edu/health-services/disability-resources/assistive-technology

[2]   Radar for the Blind
Kenneth Chee, Xyrus Ferriol, Edmund Ing, Jeffrey Leung and William Yiu Computer Engineering Program California Polytechnic State University San Luis Obispo, CA embedded-innovations@googlegroups.com

[3]   Digital Radar Aided Cane Ernesztina Zuban, Henrik Labadi, Istvan Balogh, Kornel Kovacs, Zlatko Čović Subotica Tech – College of Applied Sciences, Subotica, Serbia zuban.ernesztina@draftgate.com, henrik.labadi@studentpartner.com, nagyonbalogh@gmail.com, kornel.kovacs@draftgate.com, chole@vts.su.ac.rs

[4]   (IJACSA) International Journal of Advanced Computer Science and Applications

[5]   Braille Calculator: http://ijecs.in/ijecsissue/wp-content/uploads/2013/02/481-483ijecs.pdf

[6]   Technologies for Blind People: https://www.actionforblindpeople.org.uk Everyday life › Assistive Technology

[7]   YouTube: Molly Burke Channel https://www.youtube.com/user/MollyBurkeOfficial