A Review on Smart Cane for Blind People

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Abstract

Today technology is growing to a greater extent, however there is no cost effective device for visually impaired people. Any individual with limited or no sight is at a disadvantage in today's society. The loss of vision can be extremely detrimental to one's safety and mobility. Throughout the world, there are approximately 39 million individuals who are totally blind plus an additional 284 million who are visually impaired[1]. The Eyes for the Blind team aims to assist these individuals by developing a modified blind cane to help them commute with a greater sense of security. By developing such a product, our team plans to accomplish four objectives: Increase the safety of visually impaired or blind individuals; Provide individuals with limited or no vision a greater sense of security; Promote mobility of the user; Develop a device that is reliable, affordable and simple to use[1],

Introduction

There are about 253 million people live with vision impairment, 36 million are blind and 217 million have moderate to severe vision impairment. 81% of people who are blind are aged 50 years and above (WHO estimation). The number of visually impaired people are expected to grow in the future due to various reasons. As a result, there is a need for a cost effective system that can be used by blind people in order to walk easily and comfortably. It is necessary that a smart solution is proposed for the blind people so that they can use this in their daily life.Recently there has been a lot of electronic travel aids designed to help the blind people to navigate safely and independently. To identify the position and location of the blind person, those solutions rely on GPS technology. Such system is suitable to be used in outdoors to trace the exact location of the blind people whenever there is any emergency occurs. This location is traced in the forms of coordinates. On the other hand, to enhance the means that assist blind persons to navigate quickly and safelyin an unfamiliar environment, various projects were introduced using different technologies like Radio-frequency identification(RFID),GPS, Ultrasonic, Laser and GSM [2,3,4].

Literature survey

A deal of research has been performed to improve autonomy of visually impaired people and specially their ability to explore the environment. Wearable systems have been developed based on new technologies: laser, sonar [8] or stereo camera[10] vision for environment sensing and using audio or tactile stimuli for user feedback[8]. Some early examples about those systems can be illustrated by the C-5 Laser Cane[14] based on optical triangulation to detect obstacles up to a range of 3.5 m ahead[4]. It requires environment scanning and provides information on one nearest obstacle at a time by means of acoustic feedback. The laser system measures the distance to the obstacle and a sound tone proportional to this distance is played. This system developed in the 70's is the precursor of a large series of devices trying to remove the cane of the blind user. More recent development using stereoscopic cameras coupled with a laser pointer and audio system have been developed at the University of Verona. One of the main interests here consists in the translation of the 3D visual information into relevant stereoscopic audio stimuli. The sound generated on ear phones simulates a distant noise source according to the position of the obstacle[3].

Development of an Intelligent Guide-Stick for the Blind 2001 IEEESung Jae Kang1, Young

Ho, Kim1, In Hyuk Moon2,There are many guidance systems for visually impaired travelers to navigate quickly and safely against obstacles and other hazards faced. Recent statistical data [1] reported that there were 46,000 blind persons in Korea, 1999. In general, the blind travels using a white cane or carries a guidance dog. But, the guidance dog is very expensive for the blind and hard to maintain. Therefore, most blind use white canes without the information of environmental situation. The most important function for the blind persons is to get information on the shape of the road and the position of obstacles when they are in unknown places. With this information, they need to arrive at their destinations, avoiding unexpected obstacles. Many robot technologies have been applied to guide the blind and some are commercially available.

Figure1 : The photograph of the intelligent guide stick

Optical Device Indicating a Safe Free Path to Blind People IEEE2012Joselin Villanueva, Student Member, IEEE, and René FarcyWALKING safely and confidently without any human assistance in urban or unknown environments is a difficult task for blind people. Visually impaired people generally use either the typical white cane or the guide dog to travel independently [1]. Although the white stick gives a warning about 1 m before the obstacle, for a normal walking speed of 1.2 m/s, the time to react is very short (only 1 s). The stick scans the floor and consequently cannot detect certain obstacles (rears of trucks, low branches, etc.) and obstacle bellow knee level and shoulder level detection is very hard. The IR devices that we have been developing are the Tom Pouce and the Minitact. The aim of these devices is to protect users from obstacles that are at knee to head level. The device can be fastened to the cane or held by the user. It gives a vibrating warning when an obstacle is ahead of the white cane or of the hand. In outdoor situations, the Tom Pouce I (first generation) is fixed to the white cane at hand level. The cane and the device are continuously swept sideways. In this way, the unevenness of the ground is detected by the tip of the cane. High and horizontal obstacles are detected by the device. The permanent right and left scan of the device allows the user to perceive the direction of the various paths that are available, owing to a lack of vibrations[9].

Figure 2: Outdoor obstacle detection

Blind people detect obstacles by sweeping their white sticks and by making contact with obstacles. In the worst case sce-nario, they get hurt, particularly by objects which are located in a high position, such as rears of trucks, branches, advertising boards, etc

Comparison table of Literature serve:-

Sr. No.	Name of Paper	Year and Publication	Technology used	Results
1	Development of an Intelligent Guide-Stick for the Blind Sung Jae Kang1, Young Ho, Kim1, In Hyuk Moon2	2001 IEEE	Servomotor Microcontroller ultrasonic sensors	Simulation Results
2	Bioinspired Electronic White Cane Implementation Based on a LIDAR, a Tri-Axial Accelerometer and a Tactile Belt TomàsPallejà, Marcel Tresanchez, MercèTeixidó and Jordi Palacin	*Sensors* 2010	LIDAR; accelerometer; tactile	Test field Results
3	The Smart Vision Local Navigation Aid for Blind and Visually Impaired Persons João José, Miguel Farrajota, João M.F. Rodrigues, J.M. Hans du Buf	International Journal of Digital Content Technology and its Applications Vol.5 No.5, May 2011	Image Processing	Simulation Results
4	Optical Device Indicating a Safe Free Path to Blind People Joselin Villanueva, *Student Member, IEEE*, and René Farcy	IEEE2012	Microcontroller IR sensor Ultrasonic sensor	Test field Results
5	Enhanced Independence Free Path Detector To Blind People Using GSM Mr.B.Anbazhagan1, Mr.V.Nandagopal	April 2013 IJAREEIE	LED Photodiode IR device	Simulation Results
6	Guiding A Safe Free Path To Visually Impaired Person Ashok kumar.R1, P.Venkat Rao	September 2013 IJIEEE	ARM controller 2D Robot Smart Phone GPS	Computer vision Application & Simulation Results
7	New electronic white cane for stair case detection and recognition using ultrasonic sensor Sonda Ammar Bouhamed, ImeneKhanfirKallel, DorraSellamiMasmoudi	IJACSA 2013	Monocular camera Microcontroller Ultrasonic sensor Bluetooth	Test field Results And Simulation
8	Wearable Obstacle Detection System for visually impaired People Sylvain Cardin, Daniel Thalmann and Frederic Vexo	Springer, pp 331-349, 2010	Microcontroller Sonar sensor	Test field Results

Conclusion

Blinds and visually impaired people need some aid to interact with their environment with more security. Accordingly, a multi-sensor system that scans floor surfaces and detects the presence of obstacles was developed. Since nothing is purely good or bad. This research details the creation and preliminary evaluation of a device that aims to improve the safety of independent navigation by visually impaired individuals. This device has permit to reach a step forward the integration of visually impaired people or a precious help when the vision is reduced by harsh environment. It integrates an ultrasonic range sensor with an eccentric-mass vibrating motor to detect and alert the user of potentially hazardous low-hanging obstacles.

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Author's Profile

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