International Journal of Electrical and Electronic Engineering & Telecommunications

ISSN 2319 – 2518 www.ijeetc.com
Vol. 4, No. 2, April 2015

Research Paper

ROUTE GUIDANCE SYSTEM FOR BLIND PEOPLE USING GPS AND GSM

Vaishali Adagale[1]* and Sanjivani Mahajan[1]

*Corresponding Author: Vaishali Adagale, ✉ vavaishali3@gmail.com

In current scenario mobility appears to be the most challenging issue in the visually impaired population. With about nine persons out of ten having strong difficulties. Navigation in the blind population raise problems related to direction (knowing where one is and being able to go to the desired destination) and mobility (example: obstacle avoidance, maintaining consistent headings, estimate distance and angles). Assistive technologies based on Global Positioning System (GPS) could provide them with a remarkable self-sufficiency. Unfortunately, GPS accuracy, Geographical Information System (GIS) data and map-matching techniques are adapted to vehicle navigation only, and fail in assisting pedestrian navigation, especially for the Blind. In this paper, we have intended an assistive device for the Blind based on adapted GSM, and fusion of GPS and vision based positioning (Jafnie Evangeline, 2014).

Keywords: GPS, GSM, Ultrasonic senor, ARM-7

INTRODUCTION

God has gifted a sense to human being which is an important aspect in our life is vision. We are able to see the beauty of nature, things which happen in day-to-day life with the help of our eyes. But there are some people who lack this ability of visualizing these things. They encounters many difficulties to move on with their daily life. The problem gets worse when they move to an new location. Visually impaired people face many difficulties when moving in an unfamiliar public places. This focuses on scheming a device for visually impaired people that help them to travelling independently also it must be easy to use. As we all know life for any disabled person can become very wretched since they are constantly dependent on others. To reduce their reliability we have come up with the design of GPS based blind person assistant (Nandhini *et al.*, 2014).

Background

There are 285 million people globally that have some level of visual impairment. In Recent

[1] Dr. D Y Patil School of Engineering, Department of Electronics and Telecommunication Engineering, Charoli (Bk), via-Lohegaon, Pune 412105, India.

survey source, India is having the world's largest number of visually impair people. There are 37 million blind people across the globe, over them 15 million people are from India. The practice of the blind navigation system is very less and not efficiently used for Indian environment. The blind traveler have to depend on any other guide like blind cane, people information, trained dogs, etc. Visual function can be classified by four tiers: normal vision, moderate visual impairment, severe impairment, and complete blindness. Legally blind refers to a person who has less than 20/200 vision in either eye, or a limited field of vision. Many visually impaired people use walking sticks and guide dogs to move from place to place. For this group of population; the objective is often to complete tasks in the least obstructive method. A guide dog is trained to guide its users to avoid the accidents from objects and barriers. When a visually impaired person is using a walking stick, they wave their walking stick and finds the obstacle by striking obstacles ahead of them (Nandhini *et al.*, 2014).

Motivation

In current scenario mobility appears to be the most challenging issue in the visually impaired population. Navigation in the blind population raise problems related to orientation (knowing where one is and being able to go to the desired destination) and mobility (example: obstacle avoidance, maintaining consistent headings, estimate distance and angles). Assistive technologies based on Global Positioning System (GPS) could provide them with an outstanding autonomy. Unfortunately, GPS accuracy, Geographical Information System (GIS) data and map-matching techniques are adapted to vehicle navigation only, and fail in assisting pedestrian navigation, especially for the blind people. In this paper, we designed an assistive device for the Blind based on adapted GSM, and fusion of GPS and vision based positioning (Jafnie Evangeline, 2014).

Problem Definition

1. This project will explore current technology, specifically the Life pilot GPS devices, as a promising aid for both support and encouragement to the blind and partially sighted as they struggle for an independent life. It will focus on identifying the features that should be included in such a device, as well the feasibility of having that technology succeed in the market (GPS Technology to Aid the Blind and Partially Sighted in Copenhagen, 2007).
2. As mentioned earlier GPS/GSM tracking system are used to track person or vehicle in many systems. It has been found that all these tracking systems are costly than the proposed system. Some countries have developed the personal tracker which is applicable for schools kids and also for vehicle tracking system, patrolling soldiers at border sides to track their location. Still many countries don't have tracking system has developed as the cost of implementation is too high. So the proposed system will overcome all the problems, and people can use this system in their home or companies to track their location on Google maps as specific software as the cost of the system is too low.

Objective

The paper main objective is to provide an assistive system to blind people which will make them comfortable to walk in any unfamiliar environments. We are going to develop a system that works efficiently well in outdoor. Current navigation device for the visually impaired focus on travelling from one location to another. This focuses on designing a device for visually impaired people that help them to travelling independently also it must be easy to use. The proposed device is used for guiding people who are blind or partially sighted. The device is used to help visually impair people to move with the same ease and confidence as a sighted people. The device is linked with a GPS to identify the location of the blind person. Moreover, it provides the voice alert to avoid obstacles based on ultrasonic sensors. An emergency button is also added to the system in case of any panic situation (Nandhini *et al.*, 2014).

MATERIALS AND METHODS

There are several methods and devices used to guide visually impaired persons. Several research works are being performed by many institutions throughout the world to offer the best navigational robot in terms of cost effectiveness. This section gives a brief review on various navigational aids for blind individuals.

Blind and visually impaired people are at a disadvantage when they travel because they do not receive enough information about their location and orientation with respect to traffic and obstacles on the way and things that can easily be seen by people without visual disabilities. The conventional ways of guide dog and long cane only help to avoid obstacles, not to know what they are. Navigation systems usually consist of three parts to help people travel with a greater degree of psychological comfort and independence: sensing the immediate environment for obstacles and hazards, providing information about location and orientation during travel.

Today in the market different technologies like GPS, GPRS, etc., are used to navigate visually impaired people. The studies of various published international papers have been done. Before more technologically advanced solutions to mobility aids are discussed it is useful to outline basic properties of the traditionally used primary aids and explain their main properties and limitations.

White Can

The most popular mobility hand held aid. It is usually foldable and adjustable to the height of the user. A blind person using swing-like movements, “scan” the path in front in approx. 1 m distance (near-space protection). The cane requires about 100 hours of training for skilful use, e.g. detecting drop-offs, walking up and down the stairs.

Advantages: Cheap, light-weight constructions available, effectively informs of shorelines, landmarks and obstacles at ground-level, notifies others about visual disability of its user.

Disadvantages: does not protect from obstacles at torso and face level

Guidance of Dog

A specially trained dog assisting the blind in obstacle avoidance, but usually not aiding in

way finding (unless travelling a familiar path), e.g., the dog is trained to stop before obstacles, reacts to commands on walking directions. In spite of their great usefulness, guide dogs are a rarely used aid-only about 1% of the visually impaired use it. Most guide dog owners do not simultaneously use the dog and the white cane.

Advantages: Good in following familiar paths, good overall obstacle avoidance, trained for selective disobedience when sensing danger to his owner.

Disadvantages: Very costly (training cost approx. $40k in the USA), guide dog service period is on average 6 years, regular dog up-keeping costs and lifestyle changes.

Human Guide

A blind person walks hand in hand with a sighted guide.

Advantages/Disadvantages: The most obvious, but in practice not a permanent solution for aiding the blind in mobility and navigation. A blind person lacks privacy and can have a feeling of being a burden to his or her guide.

Navbelt

The Navbelt consists of a belt, a portable computer, and an array of ultrasonic sensors mounted on the front of the belt. The user wears a “fanny pack” on the abdomen and a portable computer as a backpack. Eight ultrasonic sensors, each covering a sector of 15°, are mounted on the front pack, providing a total scan of 120°. The computer processes the signals that arrive from the sensors, and applies in the robotics obstacle avoidance algorithms.

GPS-Global Positioning System

Earth has 24 GPS satellites, atleast 4 are always visible. GPS receiver calculates location using Triangulation method. 66 Channel GPS receiver interfaced via NMEA Protocol. The smart antenna can track upto 66 satellites at a time.Fast time to first fix, Superior sensitivity, and Low power. Less than 10 m Accuracy. 57600 bps UART interface. Up to 10 Hz update rate. Built-in micro battery to preserve system data for rapid satellite acquisition. LED indicator for fix or no fix.

GSM-Global System for Mobile communication

The SIM900D is a complete Quad-band GSM/GPRS solution in a SMT module which can be embedded in the customer applications. Featuring an industry-standard interface, the SIM900D delivers GSM/GPRS 850/900/1800/1900 MHz performance for voice, SMS, Data, and Fax in a small form factor and with low power consumption. With a tiny configuration of 33 mm x 33 mm x 3 mm, SIM900D can fit almost all the space requirements in your M2M application, especially for slim and compact demand of design. SIM900D is designed with a very powerful single-chip processor integrating AMR926EJ-S core. Quad – band GSM/GPRS module with a size of 33 mm x 33 mm x 3 mm. SMT type suit for customer application. An embedded Powerful TCP/IP protocol stack. Based upon mature and field-proven platform, backed up by our support service, from definition to design and production.

Blind People Tracking Devices

The days when man used to navigate his way in unfamiliar environments with the help of

simple compasses is long gone. Some of the already existing Location Based Service (LBS) providing systems are also been used by the blind persons. Drishti, an Integrated Navigation System for Visually Impaired and Disabled is based on wireless pedestrian navigation system. It integrates many technologies including wearable computers, voice recognition and synthesis, wireless networks, Geographic Information System (GIS) and Global Positioning System (GPS). GPS-GSM Mobile Navigator combines the GPS's ability to identify location along with the ability of the Global System for Mobile Communications (GSM) to communicate with a base station in a wireless fashion. The navigator is a microcontroller-based system equipped with a GPS receiver and a GSM module. The working principles of the above Location Based Service systems have been utilized in the invention of a route guidance system for the Visually Impaired.

Assistive Technology

The motivation of the project is the interdisciplinary research of a very complex topic of assistance of orientation and navigation of visually impaired people, in a known or unknown indoor environment. Assistive Technology is a generic term incorporating technology, equipment, devices, appliances, services, systems, processes and environmental change (Environmental Modifications) used by people with disabilities or older people to overcome social, infrastructural barriers, to actively participate in society and to perform activities easily and safely. From the point of view of visually impaired people the perception of the surrounding environment is very important, even essential, in order to facilitate their mobility. Assistive technologies for environmental perception and for navigation in the surrounding environment are advancing day by day. In the last decade a variety of portable navigation systems have been designed to assist people with visual disabilities during navigation in the indoor/ outdoor known/unknown environments (STIPER, electronic cane for navigating in indoor environment, AudioMUD, SMART Vision, VONAVS, E-Glass, BLI-NAV, Tyflos). Another important aspect concerning visually impaired people is the need for common information and its fulfillment by using modern assistive technologies: audio transcription of printed information, accessing documents and books, music software, communication and information access, computing, telecommunications, tactile access of information, speech, text and Braille conversion technology.

Assistive technology for navigation and orientation of visually impaired Navigation of visually impaired people raises questions about orientation, the appropriate route selection, objects and obstacles detection and avoidance. The advancement of technology has allowed the implementation of various equipments helping visually impaired people in their navigation, such as different obstacle avoidance, localization of objects/obstacles, guidance support systems to extend the basic support provided by means of guide dogs and use of the white cane. Most existing systems do not replace the use of guide dogs and the white cane, but are helpful in taking decisions in navigating/orientation in unusual situations.

Electronic systems used in navigation can be grouped into three categories:

- Electronic help for traveling (electronic travel aids, ETAs),
- Electronic orientation aid (electronic orientation aids, EOAs),
- Position location (position locator devices, PLDs).

Problem Statement

Blind people suffer a lot to move from one place to another. They depend on sticks or other people to reach their destination. In previous papers EOA and ETA are designed to improve mobility for blind people. Under certain climatic condition EOA performance can even drop to 30 to 50 meters error. In this paper we designed an assistive device based on artificial vision and geo located previous navigation systems.

RESULTS AND DISCUSSION

Tracking system is becoming more and more important in large cities such as in various applications including tracking of school kids and people can watch them by staying in their home. From this tracking system, the current location of a person will be displayed via Google earth with the help of GPS database and GSM. Thus, we can easily monitor the human being anywhere on the earth with high accuracy.

An attempt has been made to make a portable device which is exclusively designed for visually impaired people. It will allow the visually impaired person to travel through an unfamiliar environment with ease. It can be said that the project provides Silicon Eye for visually impaired people.

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