SHORT PAPER
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PREDATOR-The Blind Vision

Mobile Assistant as a Navigational Aid for Blind Children to identify Landm

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ABSTRACT—Wireless Sensor Networks found lots of applications in day to day human life. We want to use the technology for helping blind people to live in the world without seeking help from others. To walk freely in the busy environment make an attempt for us to incorporate WSN technology in to the lives of blind children. Obstacle detection, Location sensing and path finding with vibration and audio alert to the child makes his/her path clear towards the destination. This paper 'Predator' proposes a vision for the blind child to identify landmarks and gives better solutions for prediction and autonomous actions during emergency conditions.

INDEX TERMS:
Obstacle Detection, Location Sensing, Path Finding, Particle Filter, NMA Algorithm.

1. INTRODUCTION

A Blind Child needs more concentration to travel without the help of a Guide, even in a well known route. Like fro home to school and vice versa, a child deprived of visual stimuli must base his/her special orientation as feeling the surface properties with feet, estimating the distance to potential obstacles from the echo of their own footsteps. ,recognizing subtle smells or sound characteristics of particular places or counting steps to the point of changing the direction of movement, if there are no other clues. A momentary distraction of attention, unexpected obstacle, unnoticed important signal or mistake while counting steps may result a loss of orientation and force a blind child to seek help from other people .Unaided walking in unknown environment, even when surrounding the place of living usually exceeds the possibilities of the blind.

The paper aims at guiding the child on a pre-defined path. This is done with the help of a GPS system which determines the geographical location and uses it to determine the next location co-ordinates of the child using particle filtering algorithm. The child is alerted with the help of audible messages using a Voice Synthesizer. Lastly the project aims at making a blind child walk independently in an outdoor environment.

As the interest in the area of wireless sensor networks goes high, the navigational sensors for path finding and Ultrasonic transmitter and receiver for obstacle detection and particle filters for prediction and mapping have been used in this paper. The child can be alerted through audio and vibration. Simulation will be executed on Tossim simulator which runs on TinyOS for wireless sensor networks. The hardware device is completed and the construction of the device will be done at the short span of time

The remainder of the paper is scheduled as follows .Section II describes the problem formulation, Obstacle detection and location Sensing and path finding and finally the Performance Analysis.

LITERATURE SURVEY

The survey made here is to present the background knowledge about the various obstacle detection methods and devices.. Out of all Laser, camera, Sonar devices we choose sonar for the obstacle detection purpose.

In the paper" An ultrasonic obstacle detector based on phase beam forming principles" ultrasonic waves were used to identify the distance between the obstacle and the user. The paper "The electronically guided walking stick for the blind" can be used only in the closed premise. An obstacle detection system using a light stripe identification based method" describes how to differentiate between true and false light stripes depending on their time of appearance and this method is not much suitable in snowfall, fog, bright sunshine or uneven grounds.

" Auditory guidance with the Navbelt-A computerized travel aid for the blind" explains how a blind traveler can walk through an unfamiliar environment. In the paper "Wearable obstacle detection system for visually impaired people" the system is fixed on the cloth and the nearest obstacles can be determined using a stereoscopic sonar system and the user can be alerted of the closed obstacles. The paper" sypole: A mobile assistant for the blind " gives idea to study the text in day to day life. None of the paper gives the correct and perfect solution for the blind children to walk in an unfamiliar environment and in an unexpected scenario.

The Sonic Pathfinder is an audible electronic mobility aid designed for use by individuals who are blind or have low vision. This electronic obstacle detector gives the user advanced warning of objects which lie within his or her travel path. Researchers at the Georgia Institute of Technology have developed SWAN (an acronym for 'System for Wearable Audio Navigation'), This system might also be used by firefighters or soldiers in situations where their vision is impaired. None of the papers give a complete solution which combines obstacle detection, location sensing and path guidance for blind children.

II. PROBLEM FORMULATION :

An innovative obstacle detection system classifies the obstacles in the form of static obstacles and dynamic obstacles gives an indication to the location sensing system, which in turn receive the location coordinates from GPS with 1 to 3 meter tolerance. This can be made accurate by using a particle filter algorithm. The vibrational and hearing alert can be done through headphones to the child to choose the navigational path. If any problem occurs in an unavoidable circumstance, the child's path will be intimated to the caretaker through automatic SMS and dialing with a specific ring tone. The child's path is made to appear visually in the GPRS enabled mobile phone using graphical display.

The system we propose possess following features:

- Obstacle detection using sonar.
- Detection of hanging obstacles
- Path guidance using GPS
- Provision of remote assistance in case of an circumstantial hazard
- Auditory and vibratory alert signals through headphones

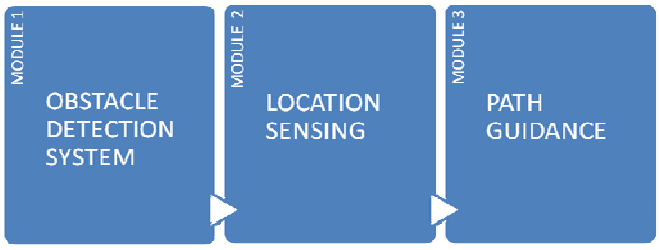

Fig: 1 A Novel path finding Technology for the Blind

The safe path finding mechanism involves the entire trajectory of the child's movements on earth, when the child is in an outdoor environment. As the roaming area is specified, then the entire area map is downloaded on to the mobile phone of the caretaker of the child. A set of specified paths in which the child's expected roaming area is taken as

Si where I ranges from 1 to n.
Si =i(1,2,3…….n)
The child's walking style varies with height and mobility.
Mh = Height of M children.
Mm = Mobility of M children.As height varies with respect to age, age is considered here as an indirect measure of mobility. Mobility is considered as the stepwise movement of the child.
Mh * Mm = Walking style

The stepwise movement of M children are analyzed based on the above matrix. An average stepping algorithm is introduced in to the GPS receiver, and the instructions are given to the child for making the next movement.

The entire child navigation problem consists of five modules.

1,Obstacle Detection system :

The OBS is used for classifying the obstacles into three categories.

1.Moving Obstacles
2.Non.Moving Obstacles
3.Hanging Obstacles

2. Location Sensing System:

GPS Receiver is used for identifying the landmark of the child. Accuracy of the location coordinates is improved by incorporating the LOTS algorithm.

3.Path Finding:

The particle filter algorithm is used for future path prediction. From known path coordinates of GPS to reduce the tolerance of 1 to 3 meter into 0.5 meter accuracy.

4.Alert/Alarm Mechanism:

An audible alert signal for further navigation to be given the child in an obstacle found condition .An vibrational alert signal for an unexpected scenarios will be given to the child.

5.Pathtracker/SMS/Ringtone dialing Mechanism:

A geographical indication of the path of the child must appear in the GPRS enabled mobile phone. An SMS alert signal will be given to the caretaker, if the child meet any accident. A ring tone dialing mechanism will be enabled to the caretaker/parent/nearest hospital/police station.

All these five modules are integrated in the GPS/GSM/GPRS enabled path finding system, so as to protect the child from environmental conditions and to provide a secure outdoor guidance system in an outdoor environment.

MODULE 1: OBSTACLE DETECTION

This module aims at detection of obstacle using SONAR technology. The presence of an obstacle is determined using the same and in occurrence of such an event the proper function from the corresponding module is invoked.

For this job it employs a transmitter and a receiver to determine the obstacle. If any obstacle is within the SONAR's range then the transmitted waves get reflected back to the receiver and the distance of the obstacle from the child 's position is known.

The distance from the obstacle is determined using the following formula:

D=VT/2
Where D=distance from the obstacle
T=time taken to transmit and receive the reflected wave
V=velocity of the sound.

MODULE 2: LOCATION SENSING

This module is used to determine the geographical location of the child on the earth using GPS. The GPS receiver is receives information from satellites. This information is in the form of longitude and latitude co-ordinates. These are then converted to a two dimensional co-ordinate system.

Once this is done the position of the obstacle is determined via Particle Filtering algorithm. This is then mapped to a digital map of the corresponding location. This information is then uploaded in to the website.

The turn matrix which consists of the co-ordinates of the turning points is used to decide the increments to be made in the corresponding co-ordinates. The module determines the next location co-ordinate of the child and makes proper decision when turn has to be made

MODULE 3: PATH GUIDANCE

This module is used to guide the path of the child in order to avoid the collision from the obstacles and take the proper turn on his way.

The purpose is fulfilled by invoking the proper audible messages to the child with the help of Voice Synthesizer.

III. SAMPLE OUTPUTS:

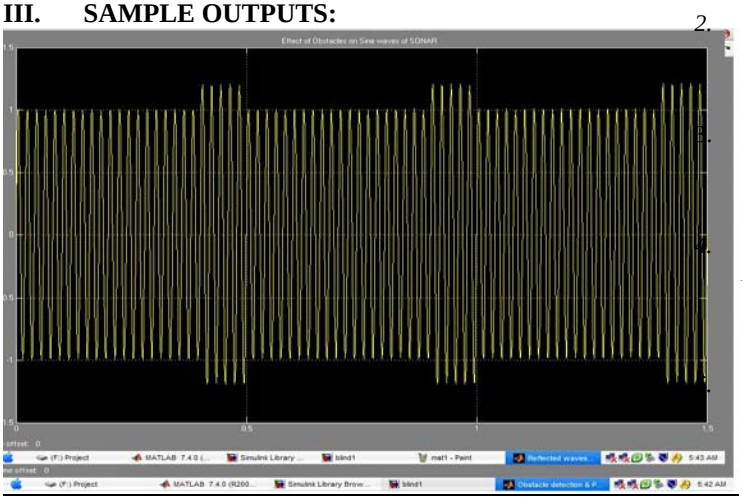

Fig 2:Sonar obstacle detection

Fig3:Motion of a child in a path

IV.CONCLUSION AND FUTURE ENHANCEMENTS:

We present a system-level approach to the problem of localizing and tracking a human user who is blind assumed to be carrying a portable terminal. The terminal estimates its location by using any number of different sources of localization information available to it. In outdoors GPS information obtained from satellites and whereas when indoors ultrasonic and RF beacons are used. We have further combined these approaches with additional sensors enabling inertial navigation to be used to improve localization accuracy and coverage of the system. The terminal communicates its estimates to a backend server located in the network, which in turn gives users back information about their surroundings The system also supports the creation of location-based services such as service discovery based on physical proximity.

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