Blind People Navigate Independently Using ZigBee Technology

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Abstract:-- The blind person present in the bus station uses the ZigBee unit which is recognized by the ZigBee in the bus and it indicates that the blind person is present in the station. Due to this reason bus stops at the particular location. The desired bus that taken by the blind is notified to him with the help of speech recognition system HM2007. The blind gives the destination name using microphones and the voice recognition system recognizes it. The ZigBee transceiver in the bus sends the bus number to the transceiver with the blind and the bus number is announced to the blind through the headphones. The blind takes the bus parked in front of him and when the destination is reached it is announced with the help of voice synthesizer which produce the audio output.

Index Terms:— ZigBee, GPS, blind, GSM..

I. INTRODUCTION

The main theme of this paper is to help a blind person and visually impaired person through a long term plan for traveling in familiar or unfamiliar atmosphere. So for this purpose to develop a system with independent mobility which moving in an unknown surrounding is really a great and real challenge. As lots of technologies were developed for to navigate a people for independently like white cane, guide dogs etc. also lots of techniques are available like as given in table 1.

Table 1: Various types of systems developed

Sr. No.	System developed	Number of Devices used
1	Smart Vision System	RFID, GPS, LPC2148 Voice circuit Camera
2	Secure & Safe Mobility Network	smart phone RFID micro chips
3	Outdoor Pedestrian Mobility	a cane or walking stick guide dog
4	System for Wearable Audio Navigation	a laptop a tracking chip GPS sensors, 4 cameras headphones
5	GSM-GPS based system	RFID GPS GSM
6	WSN with ZigBee	Speech Recognition System Voice Synthesizer GPS ZigBee

As per review it is clear that today across the world approximately 37 millions of people were blind over which 15 millions from India. Due to which most people's are dependent on other peoples or different instruments which are easily available. But beyond this, the visually impaired person likes to navigate independently. To provide a solution to this problem a ZigBee technology System is proposed, which detects an obstacles and also through this system a person is easily moved from one place to another independently.

II. LITERATURE SURVEY

In this paper [1] author proposed an embedded based system to detect obstacle or object and also guide through with audio instruction. The embedded system mainly reduce the size, cost of the product also increase the reliability & performance. It used Ultrasonic sensor, Infrared sensor and a microcontroller as a computer on a chip, for controlling electronic devices. The system is useful in indoor as well as outdoor conditions.

In this paper [2] author, main thing set to help the visually impaired person when that person travelling independently. So the GPS is used for identification of location and then it provide voice alert when any obstacles occur. For this system, RFID is installed in public place with emergency button which is integrated with blind person also.

In [3] author main focus on; to help the impaired person gave a system ETA. The Electronic Travelling Aid is fixed to stick of visually impaired person and if any object is detected then it gave alerts through speakers. Also to find the location of blind people, GSM & GPS are used.

In [4], developed and evaluates a system for easy navigation of blind person with the use of GPS, voice and also to detect obstacle used of ultrasonic detection as compared to already existing devices like Guide dogs, white canes etc.

In [5] this paper, gave an overview on a visually challenged people using android devices "Talking signage" is implemented. This system used mobile phone with Android application which gave intimation through voice message about the surrounding which is employ for any environment through the use of RF. The proposed architecture gave best practices as compared to other systems.

In [6] the author proposed an Ultrasonic Navigation system is with by giving notification through audio, to secure and help the blind people from an obstacle for easy navigation, The implementation of this system shows that it guides the visually impaired person is secure, reliable and also cost effective one.

III. ZIGBEE TECHNOLOGY

Today with the advancement in technologies various technologies are used like Watch dogs, Walking canes to overcome the problem. But due to limitations of these technologies they are not efficient in some cases like traffic and also if that people wants to travel in public transport with long distances. So in order to overcome that problems related to these technologies a possible proposed wireless system using ZigBee which guide the people and bus number notification gave to that people which is to used.

As we know that in today's communication world there are numerous high data rate communication standards were available, but none of these meet the sensors' and control devices' communication standards, which requires low-latency and low-energy consumption with lower bandwidths. A ZigBee is a wireless technology developed to overcome these limitations and also of Wi-Fi & Bluetooth. It's a system which has excellent characteristics with best communication for different applications related to embedded system. The below figure 1 represent the ZigBee technology

Fig. 1: ZigBee Technology

ZigBee communication is specially built for control and sensor networks on IEEE 802.15.4 standard for wireless personal area networks (WPANs), and it is the product from ZigBee alliance. This communication standard defines physical and Media Access Control (MAC) layers to handle many devices at low-data rates. The date rate of 250 kbps is best suited for periodic as well as intermediate two way transmission of data between sensors and controllers [7]. ZigBee is low-cost, low-powered mesh network widely used for controlling and monitoring applications within the range of 10-100 meters. This communication system is less expensive and simpler than the other proprietary short-range wireless sensor networks as Bluetooth and Wi-Fi. The overview of ZigBee modem is as shown in below figure 2,

Fig. 2: ZigBee Modem

a. Operating Modes of ZigBee [7]:
In ZigBee two way data is transferred in two different modes, Non-beacon mode & Beacon mode. In a beacon mode, the coordinators and routers continuously monitors active state of incoming data so that more power is

consumed. Also in beacon mode, the routers & coordinators do not sleep as at any time any node can wake up as well as communicate. However, it requires more power supply and its overall power consumption is low because most of the devices are in an inactive state for over long periods in the network.

In a beacon mode, when there is no data communication from end devices, then the routers and coordinators enter into sleep state. Periodically this coordinator wakes up and transmits the beacons to the routers in the network. These beacon networks are work for time slots which means, they operate when the communication needed results in lower duty cycles and longer battery usage. These beacon and non-beacon modes of ZigBee can manage sensors data, Light switches and repetitive data types [7].

b. ZigBee topologies:

ZigBee system supports different kinds of topologies, but most commonly used are star, Mesh & cluster tree. The overall performance of each of topologies is as shown in below figures,

[i] Star: In this topology, each node is connected to coordinator node and the communication is taken out through ZigBee coordinator. It is not reliable in nature as if the route is failed then the communication between different nodes is also failed.

[ii] Mesh topology: In mesh, each device is communicated with other device which is in radio range and also with the help of multi-hop. It is flexible in nature. In this topology message can be transferred between different nodes through multiple path from source to destination.

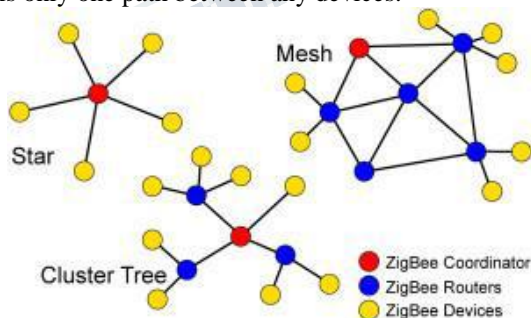[iii] Cluster tree: It is one of the topology of ZigBee in which there is only one path between any devices.

Fig. 3: Topologies in ZigBee

c. Applications of ZigBee Technology:

In various fields, ZigBee technology is used like smart grid monitoring, industrial & home automation etc. which shows in every field it plays a vital role. The below figure 4 shows the various fields where this technology used,
i) Industrial Automation: In manufacturing and production industries, a communication link continually monitors different parameters & equipments. Hence ZigBee considerably reduce this communication cost as well as optimizes the control process for greater reliability.

Fig. 4: Applications of ZigBee Technology

ii) Home Automation: ZigBee is mainly used for controlling home appliances remotely as a lighting system control, appliance control, heating and cooling system control, safety equipment operations and control, surveillance, and so on.

iii) Smart Metering: ZigBee remote operations in smart metering include energy consumption response, pricing support, security over power theft etc.

iv) Smart Grid monitoring: ZigBee operations in this smart grid involve remote temperature monitoring, fault locating, reactive power management, and so on.

IV. PROPOSED SYSTEM

The below points shows the expected steps performed to help and to navigate a blind people through easy way.

The number of steps followed by the blind people for easiest navigation is as,

1: Start
2: Speak the desired destination which to reach
3: Give the desired bus number of destination
4: Detect the bus using WSN.
5: Whether it is desired bus number,

i. If yes: Passenger gets the indication to get desired bus, then the GPS module keeps track of desired location. Then finally output get to person regarding desired location through earphones. Otherwise go to step 5.

ii. If No: wait for the desired bus to arrive. 6: Stop.

V. EXPECTED RESULTS

In this paper, to blind people for easy navigation, Blind Navigation system is used. Through this system to detect the object in the path of destination, blind people follow audio instructions. So we can hope that such system, allow blind person to develop much helpful representations through travelling. Also with the help of this system blind people is able to walk without using stick which used for indoor as well as outdoor.

VI. CONCLUSION

This paper mainly focuses and described a system to transform visual in to auditory information. The main functionality provided by this system is clear path indication to blind people and also environment identification. This visual information through the ultrasonic sensor is transformed into auditory information. We expect that this transformation system will reduce the training time needed to earliest use of a white stick and guide for visually challenged people for easy navigation.

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