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Indoor Environment Navigation for Blind with Voice Feedback

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Abstract— this paper presents assistive system for visually impaired with voice feedback which focuses on independent movement of blind people who suffer in an unknown environment with no assistance. This system has Radio Frequency Identification (RFID) for the path guidance identifying certain paths for the navigation which give features such as location identification. This proposed system on the user side include a RFID reader module with an integrated microcontroller, zigbee transceiver for transmitting the tag's information and for playing information to the blind person were on the server side zigbee transceiver for communication. For the direction identification technique, RFID passive tag is employed on the path and for location recognition required tools and r building will be embedded with passive RFID tags. A data unique to each object and path location is on the server. The RFID reader reads the RFID tags and transmits the data by Zigbee to the server PC which in turn locates for the received Tag ID in the database and gives respond to the user with its identification data which is played at the blind person side by converting it from text to speech with the help of SAPI module.

Index Terms— Radio frequency identification (RFID), zigbee, Tag ID, server PC, wireless, database, SAPI module.

1. INTRODUCTION

This project mainly focuses on We describe a navigation and location determination system for the blind using an RFID tag grid. Each RFID tag is programmed upon installation with spatial coordinates and information describing the surroundings. This allows for a self-describing, localized information system with no dependency on a centralized wireless infrastructure for communications. We describe the system and report on its characteristic performance, limitations, and lessons learned. This project mainly focuses on visually impaired group of people who were all usually out off the big companies' scope. Since the number of this group is small, the big companies don't focus mainly on investing in its needs. This project will surely act like a visual indicator to them. In such a way it's a navigation and location determination system for the person with visual impairment using RFID tags. Each RFID tag is programmed upon installation with and information describing the surroundings. With an established RFID infrastructure blind peoples will gain the freedom to explore and participate in activities without external assistance. An established RFID infrastructure will also enable advances in robotics, which will benefit from knowing precise location. In this Project, an RFID-system with an RFID reader integrated into the user's handling with a CPLD circuit design to the user's earphone, which incorporate APR9301 Voice recorder analog IC. An emphasis is placed on the architecture and design allowing for a truly integrated pervasive environment with minimal visual indicator in future to the outside observer.

2. LITERATURE SERVERY

The literature collected on the subject of the project work is based on the research papers. The research papers collected are summarized as bellow

1) A.M. Kassim, H. I Jaafar, M.A. Azam, N. Abas, T.Yasuno, "Design and Development of Navigation System by using RFID Technology," IEEE System Engineering and Technology, pp. 258-262,19 - 20 Aug. 2013. In this modern era, independent mobility for blind and partially sighted people is an important objective to achieve. There are many assistive way to help visually impaired people namely, Guide Dog, White Cane as well as the tactile paving which is a

very common assistive tool throughout the world, support the visually disable person walk in the correct path from one place to another. Therefore, RFID technology is introduced in this project to support the visual disable people more efficiently in outdoor activities. The system has been developed based on the integration of RFID wireless technology and voice system which assembled on the traditional white cane in order to help the visual impairment to identify the surrounding landmark via verbal notification. The tactile detection by RFID system composed by RFID system integrated on traditional white cane and RFID TAG which installed on the tactile paving where the TAG stored unique information uses to navigate/notify the user once they scan/tap the tactile paving by the designed white cane. The proposed RFID integrated white cane is successfully designed and evaluated the range of RFID tag which can be detected.

2) Richard F. Joseph, Anand A. Godbole, "An Intelligent Traveling Companion for Visually Impaired Pedestrian," 2014 International Conference on Circuits, Systems, Communication and Information Technology Applications (CSCITA), pp.283-288, 2014. A navigation system that will guide the blind and the visually impaired pedestrian with ease. The system will adapt to the user's behaviour and will also provide the user with shortest path from the source to the user's chosen destination in the building. RFID technology is used to track the user's current location. The user carries his own PDA with the application installed in it and a RFID reader with him. RFID tags are deployed in the building. On detection of the RFID tag by the RFID reader as the reader comes in vicinity of the tag, the reader sends the tag information to the PDA using Bluetooth Technology. The PDA based user device provides the user navigation instructions in an audio form and the user can also select the preferences provides by giving input in form of speech. The system will be a blend of Optimal Routing and Users Preference. The PDA consist of the ACO algorithm that will help in the optimization of A* algorithm which will work as the prediction algorithm.

3) A. M. Kassim, M. H. Jamaluddin, M. R. Yaacob, N. S. N. Anwar, Z. M. Sani and A. Noordin, "Design and Development of MY 2nd EYE for Visually Impaired Person" 2011 IEEE Symposium on Industrial Electronics and Applications (ISIEA2011), September 25-28, 2011, Langkawi, Malaysia. This paper discussed on design and development of electronic device by using warning system for visually impaired person usage which is called 'MY 2nd EYE'. This electronic device is designed to support and help the visually impaired person around this world to have their own confident in order to travel from one place to another place. This project is about developing of warning system by using a vibration motor as a warning device via microcontroller that received input from distance measurement sensor when detecting obstacle. The vibration motor is a best solution to warn the blind person because it uses touch sense of human when the system is run. In this system, there are four pieces of vibration motor are mounted to the gloves at different locations. Each location will have its own function that show different direction such as front, left, right and down. In this project, the effectiveness of the system gives command the direction of obstacle existence is very important and have been confirmed through simulation and experiment.

4) Abbas M. Ali, Md Jan Nordin, "Indoor navigation to support the blind person Using weighted topological map", 2009 International Conference on Electrical Engineering and Informatics (IEEE) 5-7 August 2009, Selangor, Malaysia. This paper introduces a new approach of an electronic cane for navigation through the environment, using only vision system to help the blind people. By computing weights between already stored images and the real scene of the environment. The system gives advices for the blind person to select the right direction. This advice depends on a weighted topological map in the form of an appearance graph. Navigation on this graph involves Importance value from one node to other until the goal node is reached. Where a mono camera cane-held gives information in front of the blind person. The system will give a wide range indoor navigation and may be used to outdoor navigation. The identification of different scenes to the blind person has done with in a session. These sessions divide the image database into parts like bedroom, corridor,….etc. The proposed scheme employs SIFT features to represent scene containing many objects in the environment.

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5) Kassim A.M., Jamri, M.S., Aras, M.S.M, Rashid, M.Z.A Yaacob M.R "Design And Development Of Obstacle Detection And Warning Device For Above Abdomen Level" 2012 12th International Conference on Control, Automation and Systems Oct. 17-21, 2012 in ICC, Jeju Island, Korea. This paper discussed on design and development of obstacle detection and warning device which is used for above abdomen level of human in order to support and guide the visually impaired person. This electronic device is an innovation product to support and help those visually impaired person such to have their own confident to travel independently. In the developed obstacle detection and warning device, the distance measurement sensor is used to detect the obstacles and headphone is used as the warning device to give the obstacle information to the user. The distance measurement sensor's input is processed via main controller and gives the warning signal to the headphone. The power supply is came from battery and also acquire from alternative energy such as solar energy in order to charge the battery. The proposed warning system is to combine the vibration method with audio method. The vibration method is the best solution to warn the visually impaired person because it uses touch sense of human when the system is run. In this paper, the effectiveness of the system gives command the direction of obstacle existence is very important and have been confirmed through simulation and experiment.

3. PROPOSED SYSTEM

[1] Tag Detection Algorithm

A. Particle Filtering Method

Various tag detection algorithm have been used till now. Particle filter (PF) method is used for tracking indoor rfid tag. The system uses a Particle Filter (PF) to combine rfid data from the RFID system and image data from the webcam or accurately identifying position of vehicle by using particle filter method [1].

B. K-Nearest Neighbor Algorithm

The localization uses the KNN algorithm to estimate the visible position of target tag which is nearest to that reader. In order to achieve accurate location sensing of object, this utilize a novel localization algorithm that employ detected changes in a tag readability to deduce the presence of neighboring tags [4].

C. Trilateration Positioning Method

This method is used to determine the position of tag or reader using range information. In this a new algorithmic approach for passive RFID localization in indoor environment which is based on elliptical trilateration and fuzzy logic [5].

D. Real Time Location System (RTLS) Algorithm

It is used to automatically identify and track the location of objects in real time usually within a building or other contained area.

RTLS is more efficient than other because,

1) It required less no. of iterations.
2) It will provide the security bonding.
3) It gives the guarantee of data packet delivery.

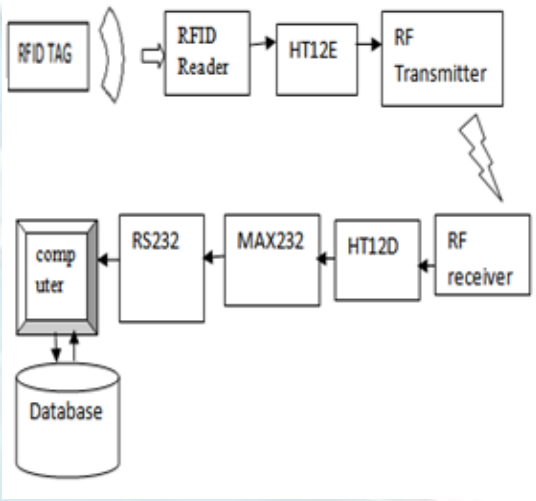

Fig 1:- Elements of RFID System

4. CONCLUSION

In the designing of our projects with an established framework for reliable and accurate location sensing, the challenges of communicating to the user with an awareness of their surroundings need to be addressed**.** It has certain advantages like required less no. of iterations, providing security, and also give the assurance of complete data packet delivery.

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