

System engineering approach for assisting physically challenged and geriatric persons

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Abstract

The embedded application aims to provide the needful for the physically challenged people those who find difficulties in taking care of themselves in their day to day activities. A small survey has been undertaken at Cuddalore and Chennai of Tamilnadu regarding the problems faced by old aged physically challenged people. From their discussions and observations, it has been analyzed that old aged people have chronic disorders such as hearing, vision impairment, balance disorder, health disabilities etc. The microcontroller based data acquisition system is used to develop suitable applications such as medicine reminder system, guiding the location and object for blind people.

Keywords: Microcontroller; RFID Module; Wireless Protocol; GSM Module; SMS.

1. Introduction

There is a rapid growth and advancement in the living standard with the smart phone communication technologies. The heterogeneous systems are characterized such that they fulfill the necessity of high speed communication using the internet and satellite technology. In this fast moving life there is an increased demand for accessing more compressed data. It is surprising that individual communicate more using sign languages rather than voice communication. As an example we could see the day gets start by an morning salutation with images popped up in mobiles via various applications. In the earlier versions before smart phones were invented there were pagers based messaging system through which many corporate companies shared their information via messages.

This work discusses the need for a simple and reliable wireless technology developed to support the visually impaired persons. Such a attempt would assist visually impaired people to access certain parameters in their vicinity and make their activities to carry out much easier.

The system has produced a variety of new mobile services. There are many research reports which provide variety of methods for mobile assistance and area location for visually impaired people. Here we have are mainly focused on simple environments outdoor, indoor, and partial outdoor based activities.

An aging society is widely considered to be one of the main socio-political challenges of the 21st century information and communication technologies provide a greater solution for elderly people to live independently for longer period of time [1].

An optimized design technique[2] for assisting blind people for two instances one for the indoor navigation and the other one for the outdoor navigation particularly for pedestrian crossing in the street and also for benefit of old aged population .have been discussed in literature.

Smart phone based medicine scheduler cum remainder and monitoring have been addressed in literature [3] which discussed the helpfulness for patients those often forgot to take medicine in time, or a wrong medicine which might have happened out of their fear takes the wrong medicine apart from the prescription a solution has been provided such as the this application also keeps the intake record of the medicine consumed for later review by the health care persons.

Martín López-Nores et al [4] have validated a system that achieves the tasks by coupling recent advances in smart packaging and residential networks. Integrated sensor network with high precision particularly designed for patients for monitoring drug delivery, dosage and names of the drug prescribed by providing no chance of being mistaken in medicine consumption.

Shyam Patel et al [5] have put forward the application of wearable electronics with communication in order to perceive the goal of remote monitoring of individuals in the home with the unique concept of development of home robot to assist the patients and also to provide telepresence in the home environment.

S B Sebesi et. al., [6] has discussed that the no of elderly people has increased and emphasized on the need for wearable suits and Specific issues of the design for the aged people and disabilities simulation and tele-monitoring of the elderly.

2. The proposed system

For the case of visually impaired and physically challenged people the major problem faced by them is in terms of navigation in indoor and outdoor surrounding which becomes great challenge for them particularly in the initial stage.

Several experimental solutions have been proposed to deal such issues with variety of complexities. This paper presents simple solutions for an indoor as well as outdoor navigation system that is

customized for specific persons rather than being a common application.

2.1. Schematic of the PIC microcontroller

The schematic of the development board is shown in fig 1. It has 5 ports associated with the microcontroller for interfacing. 22µF Frequency oscillator is used to trigger the controller.

10k resistors and 10 µF capacitors is used for controlling and storing the supply respectively. Power connector to get the supply from AC / DC voltage

2.2. Hardware selection

There exists a lots of microcontroller in the market. Each does the same work. But a question arises why this specific controller is used. The solution to this is any microcontroller can be used for designing a system but it's a waste of resource. For example if a system uses only CAN protocol, there is no use of the system with LAN or other architecture. So according to the specification the system design is chosen. In this project PIC 18F is used throughout the whole system. So as said before there are some features that are to be considered while choosing a system such as memory, peripheral support, compact, efficiency, power consumption and the major of all those is cost effectiveness.

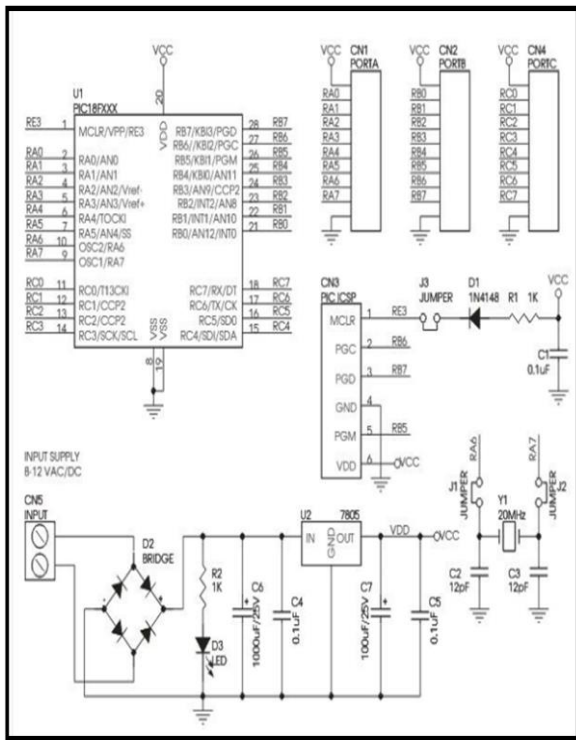


Fig. 1: Schematic of Hardware.

For communication protocol MiWi is used over Bluetooth, as the frequency range is high for MiWi. Also the power consumption is low for MiWi when compared with Bluetooth. That is MiWi uses 23mA, 29mA for transmission and reception correspondingly whereas Bluetooth uses 65mA, 35mA for transmission and reception. So the impact factor such as power, range, cost is good over MiWi and it is used for this project.

2.3. Navigation module

The proposed navigation modules utilizes the standard wheel movement chair fitted with motors. The system is equipped with obstacle sensor and hence battery operated for indoor navigation. The design of the module is also customized as per the persons reports. The motors can be controlled through voice based messages for motion in forward and backward directions and also

functional commands such as Go, Stop, forward, reverse can be instructed. Many of the wheel chair have an joystick which can be operated but for people with disabilities such as army person who have lost their arms could find difficult to use the joystick. Hence an simple approach of voice based commands could be an simple solution for the application.

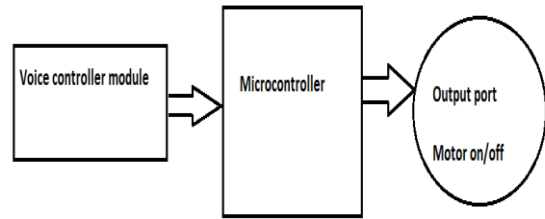


Fig. 2: Shows the Proposed Voice Controller Based Navigational Module Interfaced with Wheel Chair.

Wtv-SR Voice Recording Module

Up to 7 kinds of operating modes: MP3 mode, one to one key mode, parallel mode, one record one play key mode, Audio-book mode, two

- Wire serial mode and three-wire serial mode.

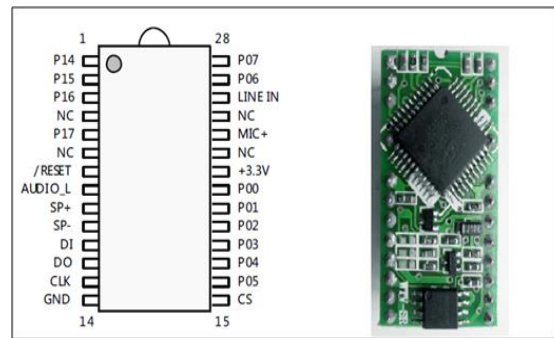


Fig. 3: Voice Recording Module.

2.4. Medicine reminder system

The medicine reminder system is designed for the old age people. As in day to day life the old age homes are increasing and care takers find difficult to manage all of them. Even in our house for those are working professionals find no time to manage time to time in their busy schedule as well as in working hours. So this system will be much more helpful for them. The system consists of a motor it is controlled by a micro controller as shown in fig 4. The pills are for the timely basis for eg Morning, Evening is to be filled with the corresponding chambers of the box. By which the controller operates the motor to open the corresponding chamber of the box for the corresponding time.

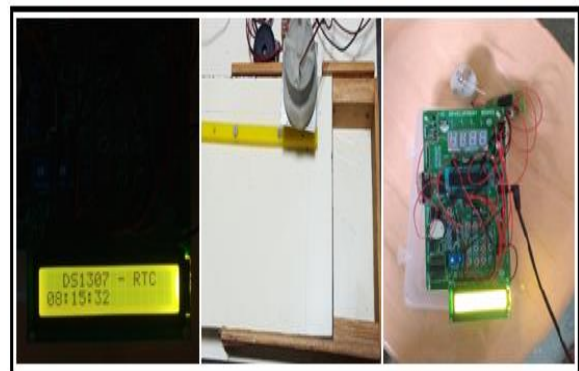


Fig. 4: Medicine Reminder System with RTC.

As shown in Fig.4 this system consists of a motor that is attached to a medication box. The time that is being displayed in lcd is controlled by the timer controller. This is programmed in such a way that when desired time arrives the motor makes the medical disposer box to open the appropriate chamber. Then it makes to close after a certain period of time. And vice versa for the other chamber. By which the medication for the corresponding time can be made into the chamber for the old aged people.

2.5. Object identification module environment

This is a system for object identification. This is the major problem of most of the blind people. They cannot identify the object if misplaced. This system consists of a mote and remote unit as show in Fig.5. The receiver is fixed in a object and the transmitter is fixed with the wheel chair. Wherever the object is i.e either in room1 or room2 if the wheel chair moves towards the object it gives intimation to the used that they reached the object. By which they can find any object easily by placing the receiver to the mostly used object. Using the voice module the data/voice is stored by which if the victim moves nearby the object the controller intimates by saying near the object and if not by away from the object. As it is a indoor application this will be useful as they no need to roam much to find the object. It can be easily identified.

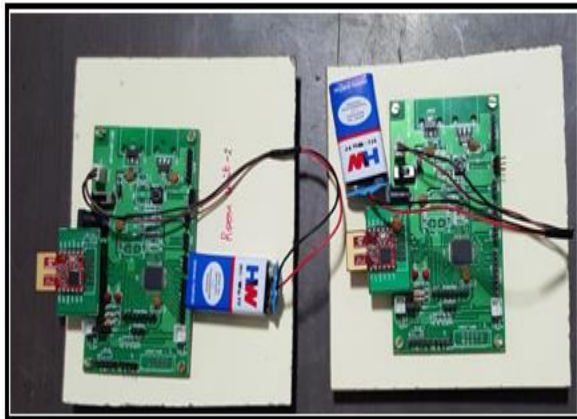


Fig. 5: Object & Location Identification Module.

The MiWi module in the system acts as a transmitter and receiver. It has been coded in such a way that which of the MiWi should act as receiver and which one should be the transmitter. That is the master and the slave. The master is placed with the victim and the slaves with the objects of various locations. When the transmitter transmits the signal location to the receiver, it recognize which of the slave id is being sending the signal and the corresponding slaves id via voice is played for the victim to identify the object. It recognize by Received Signal Strength Indication (RSSI), the signal frequency that is being transmitted from transmitter to the receiver.

3. Location identification

This system is meant for location identification by which the blind people knows whether they are in a correct location. That is in indoor, if they need to migrate from one place/room to other they find difficult to move without the help of care taker. With the help of this system they can move without any help. It consists of a remote unit and fixed unit i.e. transmitter and receiver. The transmitter is fixed in the rooms and the receiver with the wheel chair. Each transmitter is coded with a voice indicating the room name.

So if the victim decided to move to a room, he/she can move with it and if they are nearby the corresponding room the transmitter intimated by voice saying "you are nearby corresponding room". Note: System 2 & System 3 are designed and programmed in such a way that the user can use them according to their needs only by

changing the voice module using the provided data sheet that is easy to use

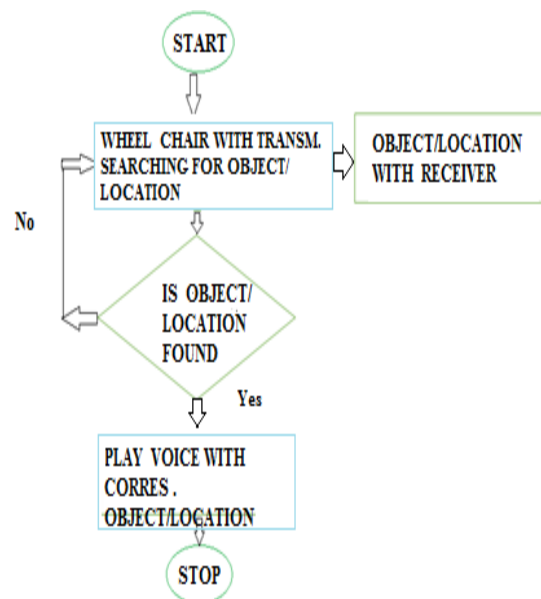


Fig. 6: Flowchart for Object/Location Identification.

4. Device control using MEMS

This is the system for old age people as well as for the physically challenged people because they find difficult to control the house held devices. So from the place they can control any sort of electrical devices using gesture. It is designed using MEMS controller. By gesture movement the MEMS sensor detects the coordinates and control the corresponding device that is connected with it. Here the MEMS sensor used is LIS2DH. It is a low power consuming sensor which acts on a range of 1Hz to 5.3 KHz. This sensor senses the motion of which the victim is made. Then accordingly the coordinates are being captured.

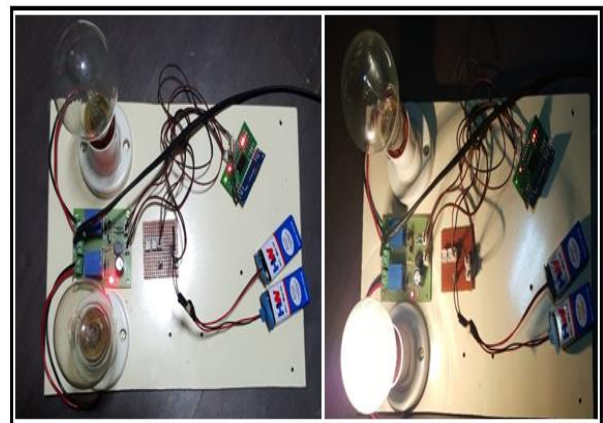


Fig. 7: Device Control Using MEMS.

This is connected to the port of the microcontroller. The sensor detects the coordinates and communicate with the controller about the gesture or direction there are various systems used for this device control such as using gesture camera that identifies the exact motion of the victim but the cost of which is too high to afford. Here in this system the MEMS sensor is just configured and added with any of the module that a system uses, simple to use, cost effective. This is the advantage over the other systems.

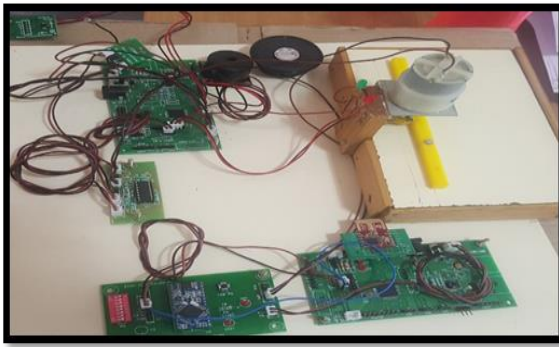


Fig. 8: Overview of Complete Setup.

5. Conclusion

This study provides a broad overview of state of the art techniques used for navigation system for visually impaired people. It concludes that navigation system have not achieved large scale exploitation mainly due to unaffordable cost, accuracy, usability. It additionally includes medicinal reminder system and device control remotely for impaired people.

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