IOSR Journal of Electronics and Communication Engineering (IOSR-JECE)
e-ISSN: 2278-2834,p- ISSN: 2278-8735.Volume 10, Issue 3, Ver. I (May - Jun.2015), PP 57-62
www.iosrjournals.org

Wheelchair Navigation System Based On Voice for Physically Challenged

Milind N. Potdar, Dr. Mrs. S. S. Lokhande
E & TC Department Sinhgad College of Engineering Pune 411041, India
E &TC Department Sinhgad College of Engineering Pune 411041, India

Abstract:*Today's world contain of a large variation of people. Mostly disability person is depends upon other for their living. But in the today's fast developing world, people is busy in work so that they don't have enough time for physically challenged people.The main aim this system physically challenged people can move inside the home without any trouble. In this system voice recognition system used for physical challenge people so person move from one place to another place with the ease. In the voice navigation system voice from physical handicapped match with the predefined store voice then the chair will move with accepted direction. According to the received voice, the wheelchair is automatically understood end point and the wheelchair moves according to the path which is predefined in system. It is contains obstacle avoidance technique.*
Keywords*-wheelchair, elderly, physically challenged, voice, accelerometer, key control.*

I. INTRODUCTION

Today's world consist of a huge variety of persons. Some of them depend on others for their life activity. But in today's fast growing world, no one have time ,everyone is busy and there are less people to care for the increasing number physically challenged people. Research is shown that until quite recently disabled people were socially isolated. Whether their situation was physical, emotional or mental, all met the same attitudes. They were kept off from social gatherings because they needed special consideration or people to take care of them. These miserable conditions made think of bringing out a system which take account of personal security features and can be used by these misfortunate people so that they can navigate without difficulty and without external aids.

Normally common image of disability is the people in wheelchairs. People used wheelchair when they find themselves unequipped to move without external help. They required personal assistance might be due to ageing, physical limitations, medical conditions or other issues. The physically challenged people who use a regular wheelchair for direction finding, usually requires an external person to move around. The elderly people or physical challenged person may be left alone at home and they find tough to move inside the room. Here arises the necessity of an automated home navigation system, such wheelchair which can be used by the elderly and the physically challenged people move without the support of an external person. The projected Home Navigation System can be an activated using voice which is recorded into system. Researches have shown that the such persons forget the route to the different rooms in the home. This difficulty is also solved in Home Navigation System as it navigates automatically. There is an option in system to customize it with voice. In this system for detecting room at each room door fix with IR sensor which is continuous transmit a specific data. Each IR sensor fix at door transmit a different data so that room can identify and receiver is fixed on chair which is receives a data another important feature is that the key control, accelerometer and personal security of the person who is using the wheelchair is also taken care. If person cannot talk then person can use key control to move inside the home if physical unable to use voice recognition and key control then person can use accelerometer for navigation which depends on head movement of person. All the accept of physical disability taken into consider that wheelchair become universal for physical handicapped person. This reduced problem for person. If the person feels uncomfortable or insecure, he can available the emergency service like police or hospital by making use of the GSM module.

II. Design Criteria For Wheelchair

The design of a navigation system of a wheelchair has been advanced taking into account the conceptual work and in particular the criteria of usability, acceptability, efficiency, security and costs. In particular, information and guidelines on how to increase the design of assistive technology products contained in the USER fit .The usability criterion was followed by designing the navigation module for the design of the user interface. In fact, the use of this to permits a rapid and low-cost substitution of the user command devices, which depends on the types of remaining functional abilities of the user, without the need to re-adapt the other modules of the system. The user interface was advanced to be flexible and to have a low level of difficulty with respect to the controls/activities vital to the user. The suitability of the system has been considered, in an indirect way, and

mainly by means of initial talks. These discussions regarded systems which had a similar difficulty to the wheelchair. Though the system has not yet been authenticated with the users, the functional conditions of the navigation module were distinct on the basis of the discussions, so it can be assumed that the modalities of control of the whole system will be accepted by the target population. A flexible design approach has been implemented to increase the efficiency of the system. The use of a commercial wheelchair for the user has been chosen. The use of appropriate included internal and external sensor systems and the probability of tailoring the guidance of the system to dissimilar classes of severe disabling pathologies have also been considered. The choice of commercial products designed for the exact purpose of locomotion for people with disabilities also appropriated into account the security aspects. Aspects regarding stability and maneuverability of the wheelchair were takings on at the origin. Further security aspects were added to the standard levels allowed by the commercial wheelchair integrating internal and external/environmental sensors which can imprisonment information about the environment with a high level of dependability. This permitted the overview of a number of autonomy levels that assure avoidance of the various obstacles present in a nanostructured user environment, thus improving the security levels of the whole system. The superior of a commercial wheelchair was also made for reasons of cost decrease. Though the whole system is not cheap, care was paid to decrease the cost of adapting the system to the user's level of disability as well as the costs of re-adapting the system in circumstance of changes in the users' functional skills in time. These phases were attained by referring to standard communication protocols between the mobile base and the user interface, and by awarding the navigation module with different levels of autonomy.

III. Home Navigation System

Home navigation system contains various modules which are help for developed the navigation system. The a number of module of the system are discussed in detail.

A.Voice Capture Module

In that voice are capture voice that are being produced by the person using wheelchair. In which produced are taken up and given to voice recognition module for recognition with the predefined voice.

B.Voice Recognition Module

This module receives the various voices from the voice capture module and compares it with the various voices that are preloaded into the system when the system was customized by the user. It compares with all the voices and if a match is found, instructions are given to the motor control module to turn or move in that particular direction in which the user wants. The module is equipped with Speech recognition circuits from Images Scientific Equipment's. Speech Recognition circuit is assembled and tested. The circuit performs speech recognition independently in a standalone mode.

C. Security Module

In case person feeling unsecure or uncomfortable then he will call emergency service like hospital or police. By producing the required voice to avail this module, the voice recognition module starts the personal security module. This module is used by physical handicapped person when they are alone at home and they need immediate attention. It will call police or SMS to relative of the user or to the hospital nearly.

D.Key control Module

This another facility provided to wheelchair person if physical handicapped person unable to use voice recognition module then person can use key control. This module contains forward, reverse, left and right control key.

E. Accelerometer Module

In case person unable to use voice module and key control then person use accelerometer module. Using this module person give forward, reverse, left and right commend by head movement.

F. Motor Control Module

This module works on the feedback received from the commands received from Voice recognition module. The motors used are dc motors. The motors can rotate through various directions and its speed and direction of rotation is controlled by ARM7. The ARM7 receives commands from the Voice recognition module and works accordingly.

Fig1:-Hardware Setup

IV. Algoritham And Working

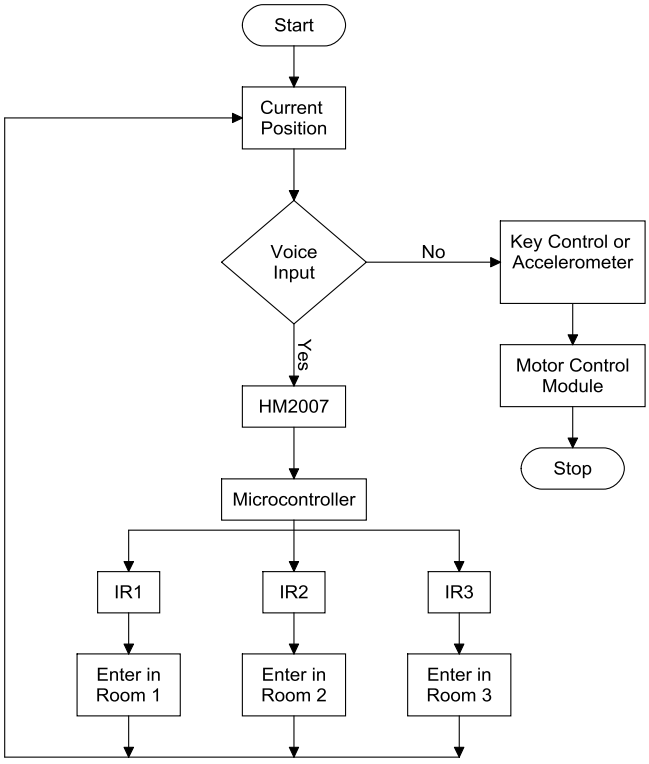


Fig2:-Flowchart Of The System

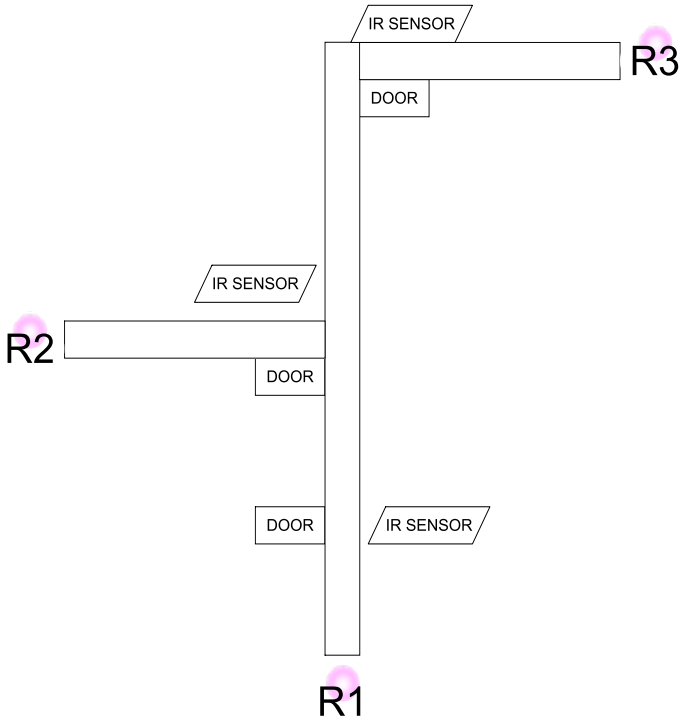
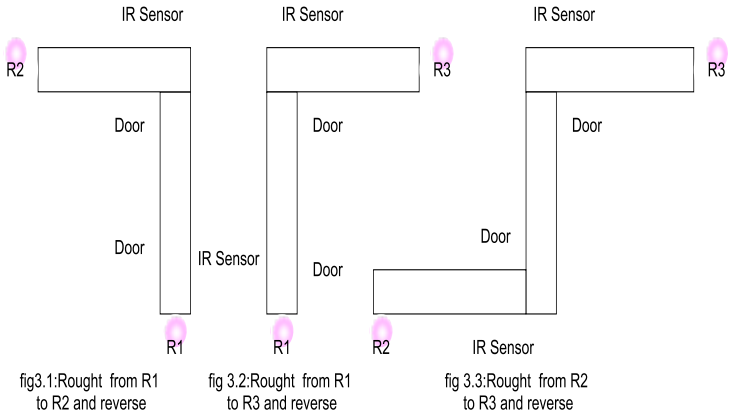


Fig3:-Path Used For Home Navigation System



When the speech for a specific room is spotted then the IR module is activated. The wheelchair moves straight until a particular IR sensor sensed as shown in Figure3. By analyzing the received data from the TSOP the system determines if the destination is the particular room in the house dictated by the voice and then enters the room and stops. The obtained data from TSOP is matched with the predetermined data bits stored in the system, which indicate the destination room and checks if there is a match. If there is a match, the wheel chair enters the room and stops. If it is a mismatch, wheelchair goes straight until the end point room is reached. Figure 4 shows the structure of a demo room. It consists of three rooms namely the kitchen, living room, and bed room. Each room has a door and a TSOP is attached to each door. Three rooms are defined R1, R2 and R3 as shown in the figure 4. As per our suggestion the route is identified rooms R1,R2 and R3. The wheel chair move in straight line form its fix starting point when chair reach at R2 room's door it detects room R2 from IR sensor.

A.Block Diagram

Once the system is on the go, the voice capture module waits for the input from the person. Then the input for capture module is voice of that person, that voice from the person which will compare with recorded voice in module. The voice capture and recognized. The capture voice gives the particular location of place like kitchen, hall, restroom etc. The voices indicate any particular room in the house, then the navigation module takes over the control of the wheel chair. Through the navigation module the motors are driven in particular routes and thus the wheel chair moves to the specific room is reached. Same process followed at room R1 and R3. In other words, the wheelchair can detect the room's position only after reaching the junction. Even though

this is the limitation of our projected system. When the voice for a particular room is identified then by recognition module is activated. It turns left when obstacle is detected and goes in straight direction until it senses the line. By examining the data getting from the TSOP the system defines if the destination is the specific room in the home dictated by the ordered and then go in the room and stops. The received data from TSOP and the programmed data bits are compare with stored data in the system, which shows the destination room and checks In module if there is a match.

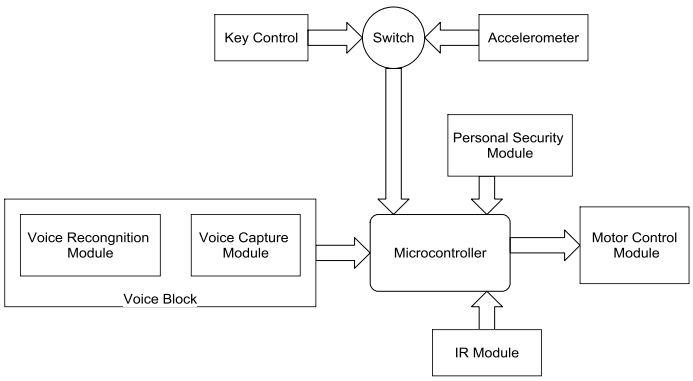


Fig4:-Block Diagram For System

If there is a matching, the wheel chair go in the room and stops. If it is a mismatch, then wheelchair follows line again until the particular room is reached. It consists of four rooms as namely the kitchen, living room, bed room and drawing room kitchen, living room, bed room and drawing room. Every room has a entrance and a TSOP is joined to every entrance. Different figure3 shows junction A,B,C and D. As per our program the rote is detected as bold black line with junctions A, B, C and D. This line must be dragged inside the home for the wheelchair to travel along the line. The code for every room is programmed set in the microcontroller which is operates by the TSOP. The uses the code by wheelchair to identify the room. Suppose that the voice detected is kitchen. If obstacle is detected in path so it turns left and goes straight direction and again an obstacle is detected from the obstacle detection module. Again it turns left and moves straight direction and comes from corner to corner to bold black line.Consider that the wheelchair person reached to line between junction B and C. The wheelchair can either goes in the right direction towards junction C or left direction to junction B. If the wheel chair route to junction B then kitchen is detected as per the system. If it route to C, then the wheelchair detect that the kitchen is behind with the TSOP code and starts route to B. In other words, the wheelchair can identify the room's position only after reaching the junction. Even though this is the drawback of our projected system, we want to takings of this limitation in the succeeding version. The VNSA and NBA algorithms show a important role in detecting the lines and the rooms. wheelchair detect that the kitchen is behind with the TSOP code and starts route to B. In other words, the wheelchair can identify the room's position only after reaching the junction. Even though this is the drawback of our projected system, we want to takings of this limitation in the succeeding version. The VNSA and NBA algorithms show a important role in detecting the lines and the rooms.

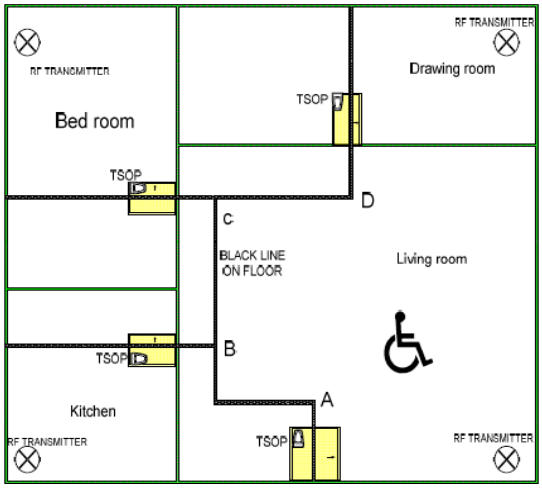


Fig5:-Sample Room Structure.

IV. Conclusion

This paper is based on automated voice based navigation system which can be used by anyone who requires the help of others for their day to day life for locomotion. It is controlled using voices, it can be regarded as a very user friendly system. IR sensor are used for proper locomotion in combination of transmitter and receiver It has some special features integrated into it like the personal security module, key control and accelerometer. Using key control and accelerometer forward, reverse, left and right operation control. Key control provides four keys for operation and accelerometer depends on head movement. GSM module send emergency message if require. This is very useful since the elders or the physically challenged needs medical aid at any time during the day. This low cost setup is very helpful mainly for the physically challenged people. Multi-control feature increase efficiency of system.

References

[1] S. Fioretti, T. Leo, and S. Longhi, 'A Navigation System for Increasing the Autonomy and the Security of Powered Wheelchairs',IEEE Transactions On Rehabilitation Engineering, Vol. 8, No. 4,December 2000

[2] Rajat Garg, N.Shriram, Vikrant Gupta, and Vineet Agrawal Department of Electronics and Communication Engineering VIT-University, Vellore- 600014, India "A Smart Mobility Solution for Physically Challenged" ICVES 2009

[3] Richard C. Simpson, M.S. and Simon P. Levine, Ph.D.Rehabilitation Engineering Program, Department of Biomedical Engineering University of Michigan, Anna Arbor, MI, USA "Adaptive Shared Control of a Smart Wheelchair Operated by Voice Control"2007

[4] Alex Mihailidis, Pantelis Elinas, Jennifer Boger, and Jesse Hoey" An Intelligent Powered Wheelchair to Enable Mobility of Cognitively Impaired Older Adults:An Anticollision System" IEEE transactions on neural systems and rehabilitation engineering, vol. 15, no. 1, march 2007

[5] Yutaka Satoh, Katsuhiko Sakaue National Institute of Advanced Industrial Science and Technology (AIST) "Development of Omni-directional Stereo Vision-based Intelligent Electric Wheelchair"

[6] Chang Gung University Chang Gung University Kwei-Shan, Tao-Yuan, 333 Taiwan "Human-Oriented Design of Autonomous Navigation Assisted Robotic Wheelchair for Indoor Environments"

[7] Yoshinori Kunotl, Teruhisa Murashimat , Nobutaka Shimadat and Yoshiaki Shirait Department of Computer-Controlled Mechanical Systems, Osaka University 2-1, Yamadaoka, Suita, Osaka 565-087 1, Japan "Interactive Gesture Interface for Intelligent Wheelchairs"

[8] G. Bourhis and P. Pino "Mobile Robotics and Mobility Assistance for People with Motor Impairments: Rational Justification for the VAHM Project" IEEE TRANSACTIONS ON REHABILITATION ENGINEERING, VOL. 4, NO 1, MARCH 1996