

An Ameliorated Methodology of Smart Assistant to Physically Challenged Person using IoT

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Abstract: Ubiquitous devices are becoming a part of peoples day-to-day life. Smart devices not only aid to peoples life but also are becoming a crucial part of physically challenged and aged people. Death ratio of handicap people raises rapidly the need for safe and independent mobility for the elderly and physical challenged people is of prime concern. The key issue of handicap people is, they cannot have instance help when they are in any trouble. In market there are many types of wheelchairs available but, they are only useful for move or travel one place to another (like joystick wheelchair, automatic or semi-automatic wheelchair). In our project we provide the primary need to the handicap people. The Key feature of system is to get Instant help to the disable person. Using the Accelerometer sensor we detect the fall of person. We also provide the help button to the wheelchair which is helpful to get instant help to the user or Buzzer is provided to notify nearest people. Android application is use for the all types of notification. Using the GPS the live location of wheelchair is track. The location is display on android application. The main purpose of system to get instant helps to the handicap people and reduces the death ratio of this people.

Keywords: Smart Wheelchair, Accelerometer, GPS, Smart Phone, Real time, Buzzer.

1. Introduction:

There are thousands of people in India, who are facing disability in movement. They face discrimination on regular basis which takes many forms. These people are considered more as a liability than an asset to the society.

Since they encounter discrimination, they tend to alienate themselves from the society as they feel unwanted and rejected. The wheelchair is providing with accident and fall detection system and it also provide an instant help to the handicap people when it needs. Our system is real time system which contains the live tracking of Smart Wheelchair. Smart wheelchair has gained a lot of interests in the recent times. The machines can also be used in old age homes where the old age persons have difficulty in their movements. The devices serve as a boon for those who have lost their mobility.

Different types of smart wheelchair have been developed in the past but the new generations of wheelchairs are being developed and used which features the use of smart devices and hence leaves a little to tinker about to the user who uses the wheel chair. The project also aims to build a similar wheel chair which would have a sort of intelligence and hence helps the user on his/her movement.

Based on our experience, method used and some issues related to the application of the behavior based approach to realize an intelligent wheelchair and possibly other assistive technologies are discussed.

A wheelchair is a chair with wheels used when walking is difficult or impossible due to illness, injury or disability. Wheelchairs come in wide variety of formats to meet the specific needs of there users. They may include specialized seating adaption, individualized controls and may be specific to particular activities, as seen with sports wheelchairs and beach wheelchairs. The most widely recognized distinction is between powered wheelchairs, where propulsion is provided by batteries and electric motors and manually propelled wheelchairs, where the propulsive force is provided either by the wheelchairs user or occupant pushing the wheelchairs by hand.

2. Problem statement:

Implementation of accident and emergency detection by the wheelchair for physically challenged and aged people. Death ratio of handicap people raises rapidly, the need for safe and independent mobility for the elderly and physical challenged people is of prime concern.

3. Literature survey:

- In this research, the development and testing of an intelligent wheelchair controller are presented. The system has been designed to help disabled and quadriplegic patients who have lost the ability to control their upper and lower limbs to use an electrical wheelchair without using joystick controller. The controller includes two sub-controllers operating in parallel which are voice and head tilts controllers.
- Mobility-assistive device such as powered wheelchair is very useful for disabled people, to gain some physical independence. . Using 4 IR sensors we can avoid the risk of collision and injury and can maintain some safer distance from the objects.
- Conventional wheelchair which operated by hand cannot be used by people with hand-foot impairment, as well as electric-powered wheelchair that need to be controlled with hand. For those with hand- foot impairment, conventional wheelchair can be assisted by assistant to help pushing and to maneuver. One drawback with this approach is the assistant will have limited movement and will have fatigue from pushing a wheelchair.

4. Proposed system:

The main aim of this project or application is to facilitate and increase the ability of disable people who can not function or move well. Using this wheel chair will allow handicapped people to move freely and independently without depending on others for their movement as a daily routine. This can be realized and optimized with use the smart phone device as an intermediary or interface. In this project GUI has been designed for interaction with the disable person. This project uses Arduino kit Microcontroller circuit and DC motors to create the movement of wheel chair and IR Sensors to detect the obstacles in between wheelchair and the way of direction.

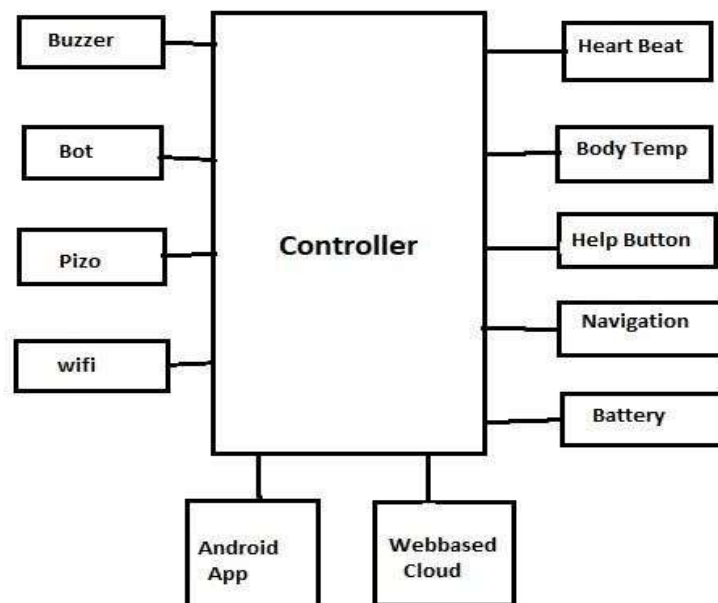


Fig.1: Block Diagram of Android based Wheelchair.

This project will provide disability weight innovative solutions to handle the wheel chairs to use android applications . This project describes a wheelchair which can be controlled only by using the android application The main focus of this project is to simplify the movement of the disabled people and old or young people who cannot move properly so with this we can facility them to lead them live freely without any problem. This project includes two part which is software and hardware. It is realized that for input of human action we are using Android phone as an intermediary. In this project, Arduino kit (ATmega328p) is used as controller to control the movement of wheelchair based on the human touch as an input. The five basic movements of a wheelchair to be utilized by the user.

The Five operations perform by the wheelchair are described as following:

- 1) Moving forward
- 2) Moving backward

- 3) Turning to the right
- 4) Turning to the left
- 5) Stop condition

5. Mathematical model:

Let 'S' be the system of wheel chair

Where

$S = \{I, O, P\}$

Where,

$I =$ Set of input (information of user and location, alert)

$O =$ Set of output (detect accident and inform to nearest police station, user and relatives) $P =$ Set of technical processes

- Let 'S' is the system S
 $= \{ \dots \dots \dots \}$
- Identify the input data S_1, S_2, \dots, S_n
 $I = \{ \text{(current location, alert, accelerometer data)} \}$
- Identify the output applications as O
 $O = \{ \text{detect accident and inform to nearest user and relatives} \}$
- Identify the Process as P

6. Implementation plan:

An implementation methodology is a collection of practices, procedures and rules that must be applied to perform a specific operation to provide deliverables at the end of each stage. The eight principles listed below is built from a collection of procedures to establish an effective implementation methodology framework. This framework provides flexibility to react and adapt to the unique requirements of every project, incorporating the principles of:

1. Project Management & Planning
2. Scope & Requirements Specification
3. Risk & Issues Management
4. Communication & Training
5. Quality Management
6. Post-Implementation Review
7. Documentation G
8. Experience

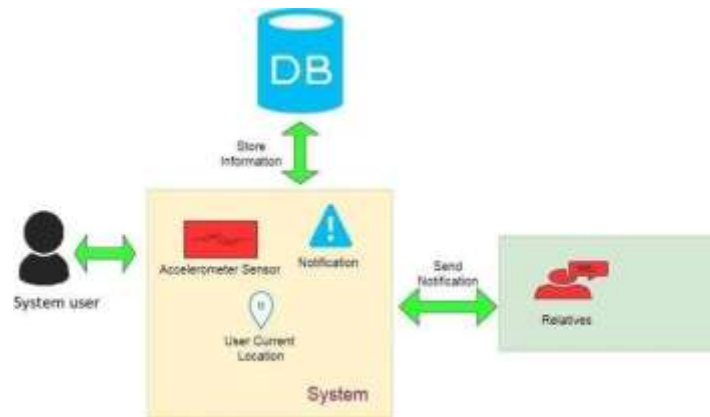


Fig.2: System Architecture

7. Components Required:

7.1. Bluetooth Device: Bluetooth device is a main component from which the connection is to be made. It provides security as one device is connected at a time. Frequency is of 2.4GHz. It is much more cost effective. Used for serial communication between android device and the wheelchair.

7.2. Accelerometer: An accelerometer is an integrated device that measures proper acceleration, the acceleration experienced relative to free fall. Single- and multi axis models are available to detect magnitude and direction of the acceleration as a vector quantity, and can be used to sense orientation, acceleration, vibration shock, and falling. Micro machined accelerometers are increasingly present in portable electronic devices and video game controllers, to detect the position of the device or provide for game input. It is capable of measuring how fast the speed of object is changing. It generates analog voltage as the output which is used as an input to the control system. The accelerometer used in this automated system is ADXL335. It is a three axis accelerometer, which senses the tilt in two directions only.

7.3. GPS: GPS is the abbreviation of global positioning system. There are several kinds of GPS having the same basic function and that is to track the accurate location of the device. The tracking is done by the emission of radio signals from the satellites. The GPS receiver receives the radio signals from at least three satellites so that it can provide accurate data. It is used in different fields such as agriculture, astronomy, automated vehicle, cellular telephony, emergency services, navigation, telematics and so on.

In our system, the GPS is used to track the location of the handicapped people who use wheelchair for their regular movement. We have used a GPS module to receive the coordinates from the satellite.

7.4. Smart Phones: For navigation of the wheelchair, dual methods using traditional joystick and popular smart phone are employed. The joystick is used as standby to the phone when the wheelchair goes beyond internet connectivity area. Smartphone is basically a mobile phone based on mobile OS (operating system) such as Android iOS or Windows. It has more advanced features than an ordinary mobile phone. Android OS is emerging as a popular operating system in mobile phones, tablets and computers.

7.5. Raspberry Pi: This is incorporated for cognitive operation. The Raspberry Pi is a single board computer which will be used to design many embedded applications. It does not have built-in hard disk or solid state drive, but for booting and persistent storage it uses an SD card. Built-in Wi-Fi is available for data transfer and we can also update the programming by connecting to the processor anywhere from the world. By using Wi-Fi adapter or USB Ethernet, it can be connected to any network. The operating system used in Raspberry Pi is Linux-kernel. In our project we are using this for the purpose of cognitive applications.

7.6. Wheelchair battery: The battery used in this work is wet type. To create electrical energy, we required chemical reaction between lead and sulphuric acid which use wet batteries. It has higher maintenance rate but are lighter than AGM (Absorbed Glass Mat) or Gel batteries.

7.7. Wheels: Wheelchair has two rear wheels. Universal wheel is fixated in wheelchair base in front both wheels have the same diameter. The two rear wheels are drive using two DC motor connected to each wheel. The instructions are passed through micro-controller to the motor, the wheels rotated in the specific direction.

1. To develop wheelchair system by using Visual Basic for wheelchair control.
2. Design and develop an android app through which we can operate a movement of wheel chair Using android device.
3. To implement and use the system so that users voice as an input to control the mobility of wheelchair.
4. Helps to implement movement for disabled people and aged people who can't move properly.
5. 5. Less Complexity and Hardware to mount.
6. Can be mounted on the existing wheelchair.
7. Wireless control helps to monitor the wheelchair.
8. Reduces manpower and dependency on other human drive.
9. Wheelchair is compact and economical.
10. It provides smooth movement for physically challenged people.
11. Low power consuming and easy to operate the wheelchair.

8. Advantages:

This project describes the design and develop. We are providing GUI for a wheelchair application which is based android app. A Scope of Project. our work, we are designing intelligent wheelchair that is aware of its surroundings so that it can assist its user in a variety of tasks. The goal of this smart wheelchair project is to enhance an ordinary powered wheelchair using sensors to perceive the wheelchair's surroundings.

Two prototype autonomous wheelchairs based on commercially available motorized wheelchairs have been built using behavior-based AI. The initial prototyping went very rapidly and the size of the software is significantly smaller than control program for similar vehicles operating in the real world environment implemented using conventional AI and robotics methodologies.

9. Result:

It is a overall implementation of hardware system. The main components are : Smart Wheelchair, Accelerometer, GPS, Smart Phone, Real time, Buzzer etc. there are particular devices used for interfacing every device with each other perfectly. So that the wheels of the chair move as per the user's requirement.

10. Future scope:

Advancement in this wheelchair are possible.

1. If the person wants to move somewhere, all they have to do is look in the direction. The user interface trace out the path you want to drive, you would simply wink twice with your left or right eyes and the wheel chair start driving, to stop wink again.
2. Introducing home automation in the system would be an added features of the wheelchair where a disabled person can turn on/off home appliances without getting up from his position.
3. Finding a way to automatically change the battery with the help of motion of the wheelchair.

11. Conclusion:

New engineering developments offer opportunities to develop smart wheelchair assertive technology that can improve the lives of many people who use wheelchairs. In on wheelchairs: we are developing a *Machine Interface Control System for Motorized Wheelchair* ", M.Tech. Thes is Department of Biotechnology and Medical Engineering, NIT Rourkela ,p.no 2-3, June 2013.

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