

An IoT based Smart Wheel Chair for Physically Challenged

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Abstract—Now a day's wheelchairs are a necessary median for the leg disable people and they require someone to push them so that it moves, a remote controlled wheelchair is another type but it requires a remote and can be problematic sometimes with the loss of remote or battery problem. The Idea is to help people with Leg disability or moving issues, for them a modern day Wheelchair that is smart and designed so that they can easily move around with their own control on the chair. This is primarily designed to be different from a normal remote controlled wheelchair for single person use and monitor purpose for another person that is staying away.

Index Terms— Arduino, Smart wheel chair, Python, Dc Motor.

I. INTRODUCTION

Now a days the people are moving in speed and using the new Technologies that occur in the market, But these days we

forget that there are people who need attention as they cannot move fast or with their own, such people with leg disability

depend on someone else for their daily work and needs, Such people require help from the same technology that is helping the normal people and this help can be provided by giving them access to that technology which can give them the ease of movement along a place where a man can do all his needs and move around with utilizing the required tools which are sufficient for them. These people with leg disability are ones we can help by giving them a gadget with "SMART WHEELCHAIR" feature that gives them that ability to move with their finger movement through a touchpad feed with the required movements Forward, Backwards, Left, Right which are the main controllers to travel. Movement [1] with this wheelchair is made possible through a DC motor providing the power from underneath with a battery connected to it. An Arduino can be used here as an interface to whom the input signal is connected and transmits the signal to the direction controller A GPS tracker is provided below the seat that is activated through a touch and an application can be used to track and see the position of the Wheelchair.[2]

A. Prototype

Shows the flow of how the data is provided as an input and if true or Valid, it is then validated and response request is generated as an output which helps user get the required direction and go that way. Consist of the

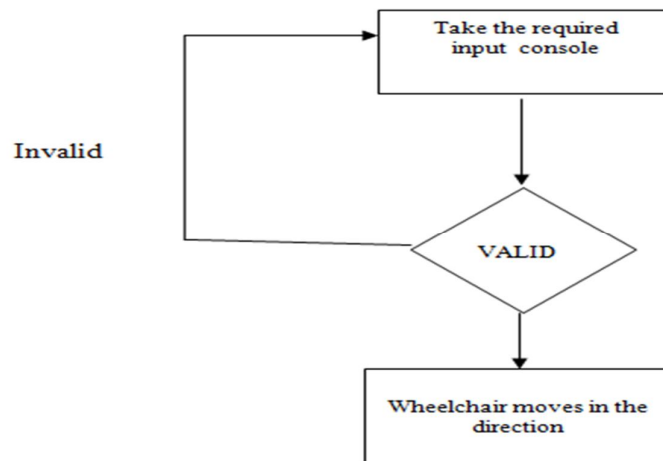


Figure1.1 Wheel chair

main functional parts and how they are undertaking the request command and responding to the various processes Here, as the direction is swiped, Input is analyzed and passed to the arduino board [4] which generates the required output and all that can be connected within a network that can be monitored by a person away.

This type of wheelchair can be given to a particular person who has a leg disability and observed that he can move easily with his own will anyplace anytime.

These type chairs are really required in the modern world and so it is termed as the SMART CHAIR[5]

This chair works firmly and actively with the proper function of the DC motor and battery provided by It can give good results with proper command on inputs and pressing the pad gently. It can also be long lasting if used slowly and not exceed the limit of use and not using it harshly.

Its performance can be tested and known with the code of Program in PYHON language used.[4] The control of the chair is to be monitored as it can go off or speed up with malfunction, so any malfunction may be released with proper testing and observation.

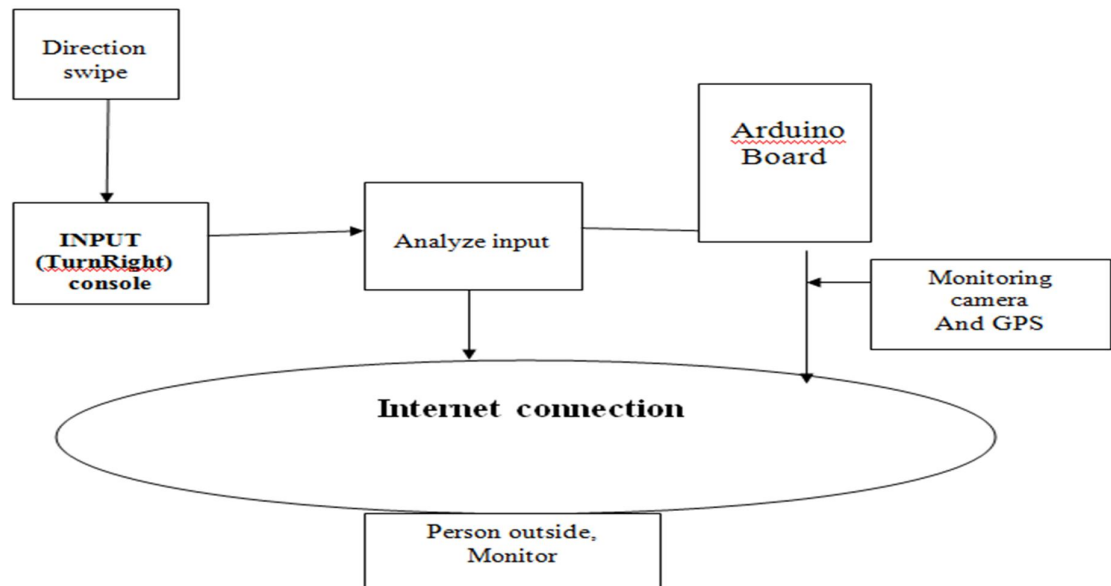


Figure1.2 Wheel chair working diagram

The following are the differences between Normal wheel chair and smart wheel chair

B. Normal Wheelchair

Requires manual work to push the wheels by hand, or another person to push the chair for him, Best wheelchair will be a remote controlled one but it consist of issues of speed and time also its lifetime. People on these chairs cannot be left alone for long as they have to be monitored for needs and emergency[6]

C. Smart(IOT)Wheelchairs

They require only one person that is person on the chair for full operation This chair is digital motioned through a touchpad on right hand side so an automatic swipe helps movement hence no manual work People on this chair can be

left alone as it contains a monitor system that has a GPS and a webcam that traces the movement of chair. That movement can be monitored through Internet by another person sitting far away as well

II. TECHNOLOGY AND ALGORITHM

The main Software and Hardware components used here are

A. Python

is an open source programming language. Speech module has been used for voice control. A GUI has been created using Tkinter module. Serial communication is done using pyserial. Whenever a particular command is detected a particular characters transmitted serially to the microcontroller[11]. The microcontroller takes the necessary decision depending on the character received.

B. Optical Pad control

For those people who are paralyzed below legs and are able to use their upper body, This is the best wheel chair as the Optical pad on the right side consists of 4 directions FORWARD[10], BACKWARDS,LEFT,RIGHT and a STOP. These are the basic direction that helps movement and control the input through touching with fingers.

C. DC Motor

The motors used are DC motors[8]. The motors are chose because after using spur gear it is able to provide enough torque to move the wheelchair on load with speed that is enough for a go movement[9] and no too fast

Motor specifications.

Torque 17 Nm

Voltage Rating 12 V

Power Rating 17 Watt

No Load RPM 60

On Load RPM 45

No Load Current 2.5 A

On Load Current 3.5 A



Figure 2.1 DC motor

D. Monitoring Camera

This is a new and important feature which helps a person through a distance, monitor the movements of person on chair, this feature is a new addition to these modern wheelchairs and can be of a real use when in need of assistance to person on wheelchair. A webcam is attached to the back of wheelchair showing[5] the view which the person riding sees.

E. ARDUINO

Arduino has always been a powerful and an easy to use learning/developing platform when it comes to open source hardware development. In today's modern world, every hardware[7] is powered by a high-level general purpose programming language to make it more effective and user friendly. One such language is Python. Python is an interpreted, object-oriented, high-level programming language with dynamic semantics with high-level built in data structures, combined with dynamic typing and dynamic binding, make it very attractive for Rapid Application Development. Combining the power of Arduino and Python[12] will open doors to lots of possibilities since python[2] has an increased productivity with its ability to interact with other platforms like openCV.

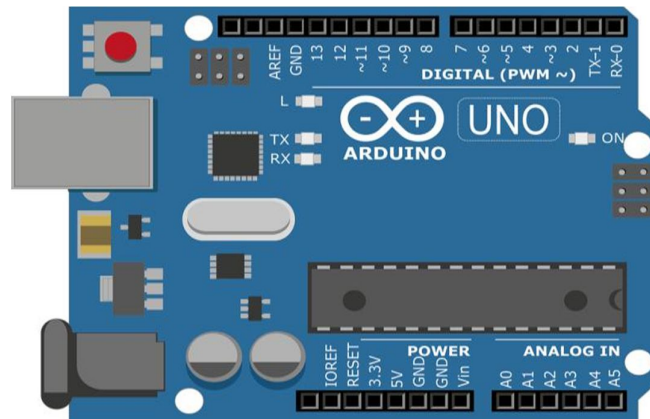


Figure 2.2 Arduino Uno3 board

An Arduino here acts as interface and takes the incoming inputs and send its to analyze for the required output. Here we ensured that the parts used for our Arduino wheelchair[8]. Here is a comprehensive list of all the parts with their specifications[7].

1. Aluminum 6061 Extruded Bar stock
2. Scrap piece of steel sheet metal 1.1 - 1.2mm thick
3. Cytron 12V 17RPM 194.4oz-in Spur Gear motor
4. Motor mount bracket Screws and nuts - multiple sizes
5. Set screw: 8-32 size and thread
6. Heavy duty limit switch
7. Arduino UNO(we used this as we had one lying around.
8. L293D motor driver IC
9. LM2596 buck converter IC
10. LM7805 voltage regulator IC

F. Tracking Device

A tracking device is placed on the chair[11] and its movements can be monitored from far away as well through an application so that it dose not go too far or fast

G. Emergency Button

This is the latest feature considers a worst case scenario so for such condition an emergency red button will be provided. When pushed[12], it will beep and call and hence the person monitoring or having contact with person on chair through Internet can properly call and discuss the problem

Algorithm

Step 1:- The person is to be made comfortable to sit on the chair

Step 2:- Once he is seated the chair is adjusted to his need of operation

Step 3:- Movement or starting of the chair needs a check of forward mark so that it starts moving, therefore the man has swipe forward on the touchpad for its initial movement

Movement = Arduino + touchpad

Step 4:- That forward finger gesture is recorded in the pad and taken through the Arduino which is programmed with python and the output for that forward gesture is provided back starting the wheels and movement

Forward = Python + gesture + wheel movement

Step 5:- Just like this, the Arduino is an Interface and with programs on python the basic movements front, back, left, right are made easy

Step 6:- The DC motor supplies power to the wheelchair that is enough and not too fast but good for a normal walk or movement like 12 Volts

As per the above steps we can move wheel chair from one place to another without issues.

III. CONCLUSION

It is one of the best type of technologies according to today's world and we are using it in a proper way by giving them the ability to walk who cannot walk like People having leg amputated due to sugar, Handicapped people, People with Knee fracture or replacement surgery ,Old people who wish to walk Thus Modern Technology used to help the needy is the best part and best cause of using it and these are modern techniques with modern ways for the people living in this modern time to use the modern wheelchair.

Future Work

1. In the Future, We can increase lifetime of these chairs with proper coding
2. Increase the speed of the chair from the normal speed now.
3. Increase its ability to move along with less battery required and swipe control faster.
4. Monitoring GPS can be increased with the tracking distance that is far track

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