

MOTION CONTROL OF THE WHEEL CHAIR

A. Arutselvi¹, M. M. Pravin Kumar², M. Dinesh Kumar³, P. Kettararavinthnathan⁴

¹Assistant Professor, Saranathan College of Engineering, Trichy, India.

^{2,3,4}Student, Saranathan College of Engineering, Trichy, India.

Abstract- A smart automated wheel chair is one in which motors are used for accelerating the wheel chair. The main aim of this automated wheelchair is to avoid the dependency of physically challenged and aged people over the other peoples. This gives the confidence and the mental strength to them to lead a Normal life like others. A typical robotic switch is used for easy motion control of the wheelchair, which gives easy applications of two finger handling. The LabVIEW programming software which runs over a hardware myRIO is used for the useful conversion of the joystick signal into a suitable mechanical action. LabVIEW (Laboratory virtual instrument engineering work bench) is a graphical programming language that uses an icon instead of lines of text to create an application

Index Terms- LabVIEW, MYRIO, DC MOTORS, Driver circuit.

I. INTRODUCTION

Physically challenged peoples with locomotive disabilities needs another person's helps to move from one place to another even for their daily habits like eating, bathing etc... This leads to the situation of dependency over others. It creates the disability patients to often call her surroundings peoples so; they don't call in sometimes for their works it leads to be very bad conditions for disability persons.

In order to avoid that problem in real time faced by the disability persons we have designed a motion control of the wheel chair by using the following hardware and software components. In these motion control of the wheel chair operated by the disability or locomotive persons can move freely from one place to another by using the robotic switch.

On the other hand, some markets are used a technique called electromyography signal (EMG) for controlling the wheel chair performing by using the shoulder moments. Han et al. [4] used four EMG Electrodes on the Sternocleidomastoid muscle in order to detect

Three shoulder movements (both shoulders up, right shoulder

Up and left shoulder up), it results in a average success only.

Unfortunately some disabled people may not be able to move their shoulders and bodies. It becomes the failure conditions in this way to control the moment of the wheel chair.

For those conditions we have used a robotic switch to control the moment of the wheel chair. We have placed two switches to control the directions of the wheel chair.

DIRECTIONS OF WHEEL CHAIR:

- FORWARD –Both the switches are to be pressed in forward directions.
- REVERSE-Both the switches are to be pressed in reverse directions.
- LEFT –Left side of the switch is in off conditions.
Right side of the switch is in on conditions.
- RIGHT- Left side of the switch is in on conditions.
Right side of the switch is in off conditions.

HARDWARE COMPONENTS:

- Driver circuit
- Power supply
- Wheel chair
- Robotic switch
- myRIO
- DC motor

DRIVER CIRCUIT:

In this motion control of wheel chair we have used a dual motor driver circuit with following features .it helps to run the motor at the speed of necessary rpm. It can drive two motors simultaneously. Two-motor operation is accomplished by hooking one motor between OUT1A and OUT1B, and the other motor between OUT2A and OUT2B. It has four operating modes forward, reverse, brake and tri stated (high impedance). it can able to accept the voltage of 5volt and 12volt power supply with ground.in these motion control we have an trigger voltage of 5volts and output voltage given to the 30 rpm gear motor is 12voltage dc supply to pull the wheel chair.

SPECIFICATIONS:

The TIP127 is very popular Darlington pair PNP power transistor. It is rated at 100V 5Amp. It has gain over 1000 and has typical power dissipation of 50W.

- Typical Gain: 1
- Maximum VCE : -100V
- Maximum collector current: -5A
- Maximum
- powerdissipation:50W
- 2Voltage 5Amps
- Type (TIP127,TIP 122)is used

- Type (TIP127,TIP 122)is used



Figure 1: Driver circuit

POWER SUPPLY:

In this motion control of wheel chair we used a lead-acid battery of 12 voltage dc battery. It is supplied as a input to the driver circuit of the system. Lead acid storage batteries cells consist of:

- lead peroxide (pbO₂),
- sponge lead (Pb),

- Dilute sulfuric acid (H₂SO₄).

In which electrical energy can be stored as a chemical energy is then converted to electrical energy required.



Figure 2: power supply

WHEEL CHAIR:

Wheel chair is a normal sitting chair which has wheel attached to it both at rear and front of it. It is mainly used for the disabled persons, who cannot move with their legs, to move from one place to another around their living area without the help of another person or their guardian. It is mainly used for disabled persons or paralytic persons with special features at low of cost. In this chair we have used a wiper motor to carry the patients effectively.



Figure 3: Wheel chair

ROBOTIC SWITCH:

The robotics switch we have implemented in our project is a latch when pressed type switch. These switches can be used to change the directions like both reverse and forward. These helps the disabled patients to move freely by changing the directions in the robotics switch without the help of any humans it consists of 6 pins at internal space of the robotic switch. In that robotic switch two pair of pins are cross linked , in order to move the motion control of wheel chair in both forward and backward directions.in these motion control of wheel chair we have used two robotic switches, it helps the patients to move forward ,backward ,left and right directions. To move the wheel chair in forward directions we have to press the both robotic switch in front directions, similarly if we want to move in backward directions we have to press both switches in backward directions. For left direction, right side of robotics switch is pressed. For right directions, left side of robotics switch is pressed.



Figure 4: Robotic switch

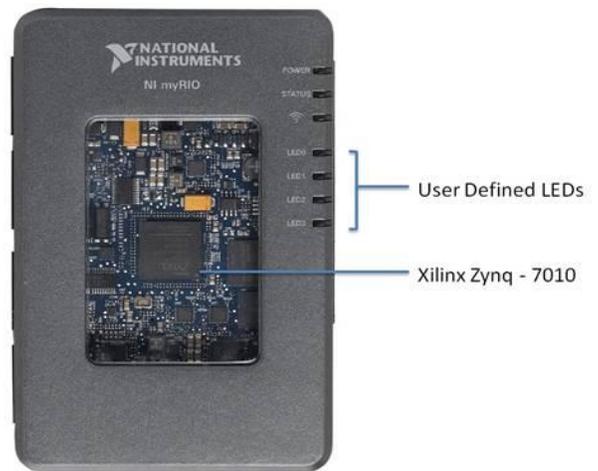
MYRIO:

It is a type of hardware device works under the package of LabVIEW package. 1. LabVIEW Environment Basics—examine the most important building blocks for any LabVIEW application, including the front panel, block diagram, palettes, controls, and indicators. 2. Graphical Programming Basics—see how to connect functions and work with a variety of data types when constructing applications.

3. Common Tools—View a collection of important tools and common user functions that all users should know.

4. Debugging Tools—Learn how to use simple tools and techniques to understand the behavior of code and address problems or bugs.

It is a hardware device works under the LABview software package developed by the national instruments.It is used to acquire the real time signals.Signals can be acquired and processed in LabVIEW and the generated signals can be used in real time. It consists of two expansion ports (MXP) connectors A and B carry identical set of signals and both have 34 pin outs and a mini system port (MSP) called Connector C. it provides the connection with computer through USB or wireless connectivity.NI-myRIO has 3.3v, 5v,+/- 15v power output.



**Figure 5: myRIO
Dc motor:**

There are three main components of motor used in these ultrasonic based safety system vehicles are:

1. Motor
2. Rotary to linear motion converter mechanism
3. Parking switch.

This mechanism is used to convert rotary motion to linear motion and the motors are driven at low or normal speed just if the dash switch is being is still on. The motor we used in our project is a 30RPM gear motor. The voltage & current ratings are 12V &

5A respectively. Through this motor we can able to drive the motor as a normal and high speed operations by connecting through the different terminals in the battery. In normal mode of operation, the dash switch is in the normal or low speed, position, and internal other two terminals are connected. Hence the current is flow through the motor. In high speed mode of operation the dash switch is in the high speed position, and current is flow through the motor. This is basically the same configuration as the normal mode, except the power flows through the high speed brush rather than the normal speed brush.



Figure 6: DC motor

SOFTWARE COMPONENTS:

- LabVIEW

LabVIEW:

LabVIEW is a dataflow programming language .It is also called as a virtual instrument. When creating a new VI we have a front panel and block diagram. The front panel window I the user interface for the VI. The block diagram object includes terminals; sub VI, Functions, constants, structures and wires. LabVIEW consists of mainly three parts for the user interfacing, they are: Front panel, block diagram and connector panel. LabVIEW 2014 is implemented in our project which is useful for interfacing the myRIO, which in turn can easily interface many hardware and software components easily. Thus LabVIEW acts as a useful interfacing component & avoids the usage of components of larger size.

CORE OF LabVIEW CONCEPTS:

1. LabVIEW Environment Basics—examine the most important building blocks for any LabVIEW application, including the front panel, block diagram, palettes, controls, and indicators.
2. Graphical Programming Basics—see how to connect functions and work with a variety of data types when constructing applications.
3. Common Tools—View a collection of important tools and common user functions that all users should know.
4. Debugging Tools—learn how to use simple tools and techniques to understand the behavior of code and address problems or bugs.

BLOCK DIAGRAM:

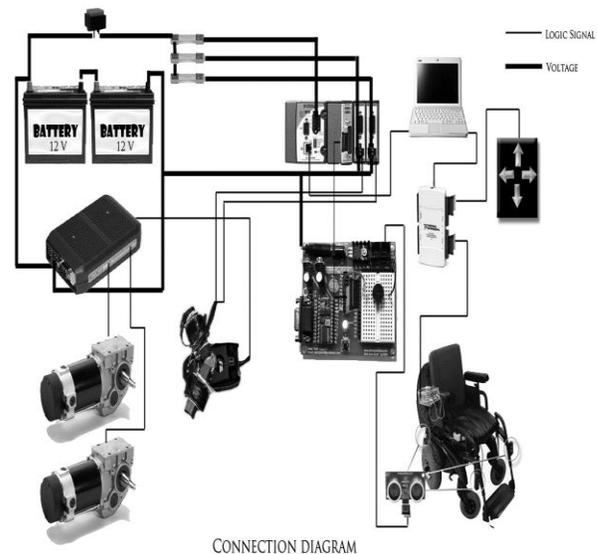


Figure 7: Block diagram of motion control of wheel chair.

Motion control of the wheelchair is shown in the above figure. In the motion control of the wheel chair is done with the following components, such as myRIO, LabVIEW program , driver circuit and the robotic switch. When the robotic switch is pressed by the disabled persons the signal is sent to the myRIO and then the signal is sent to the driver circuit. Finally motion of the motor is controlled and action of the wheel chair is according to the patient’s action on the robotic switch. To move the chair in forward directions the patients wants to press both switches in

forward. For backward direction the patients wants to press both switches in reverse direction. For left side, right motor in on condition and left in off conditions .For right side, left motor in on condition and right in off condition.

CONCLUSION

Thus the motion control of the wheelchair has been implemented successfully. The main objective of the project of control the motion of the wheelchair is achieved using LabVIEW and myRIO.

SIMULATION AND RESULTS:

BLOCK DIAGRAM

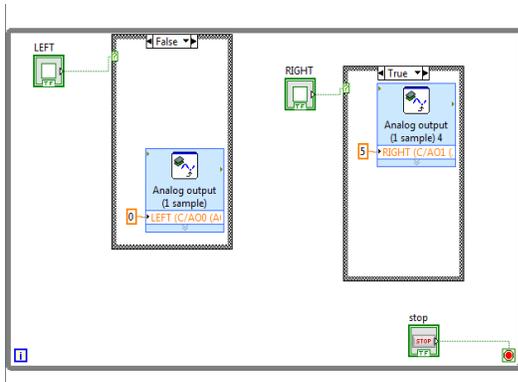


Figure 8: Block diagram of motion control of wheel chair.

FRONT PANEL:

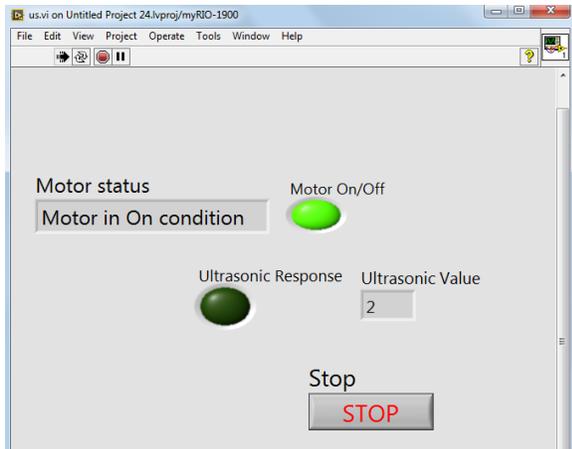


Figure 9: Front panel of motion control of wheel chair.

In block diagram the analog output is coming from the myRIO given to the driver circuit and then it is given to the motor for the motion of the wheel chair. The front panel represents the status of the motor whether it is in on or off conditions. And also represents the status of the sensor value.

REFERENCES

- 1.N.I. Katevas, N.M. Sgouros, S.G. Tzafestas, G. Papakonstantinou, P. Beattie, J.M. Bishop, P. Tsanakas, D. Koutsouris: The Autonomous Mobile Robot SENARIO: A Sensor Aided Intelligent Navigation System for Powered Wheelchairs, IEEE Robotics and Automation Magazine, Vol. 4, No. 4, Dec. 1997, pp. 60 – 70.
- 2.G. Bourhis, O. Horn, O. Habert, A. Pruski: An Autonomous Vehicle for People with Motor Disabilities, IEEE Robotics and Automation Magazine, Vol. 8, No. 1, March 2001, pp. 20 – 28.
- 3.M. Mazo: An Integral System for Assisted Mobility (Automated Wheelchair), IEEE Robotics and Automation Magazine, Vol. 8, No. 1, March 2001, pp. 46 – 56.
- 4.Takeshi Saitoh, Noriyuki Takahashi and Ryosuke Konishi, "Oral Motion Controlled Intelligent Wheelchair", SICE Annual Conference, Kagawa University, Japan, pp:341-346,2007.
- 5.Mantjarvi,J.,Kela,J.,Korpipaa,P.,Kallio S.,Savino,G.,Jozzo L. and Marca,D. "Accelerometer-based gesture control for a design environment", Personal Ubiquitous Computing, Springer London(2006),pp:285-299.
- 6.“A Wearable Head- Mounted Sensor-Based Apparatus for Eye Tracking Applications” IEEE International Conference on Virtual Environments, Human-Computer Interfaces, and Measurement Systems Istanbul, Turkey, dated 14-16 July 2008.