ISSN (Online) 2395-2717

International Journal of Engineering Research in Electrical and Electronic Engineering (IJEREEE)
Vol 3, Issue 11, November 2017

Implementation of Low cost, Reliable and Head movement controlled Wheelchair for Physically Challenged people

[1] Mamatha G M, [2] Divakara A P, [3] Chandrashekar, [4] Legeswaran V, [5] Teli Rekha Appasaheb
[1] Assistant Professor, [2,3,4,5] U G Scholar, Sri Sairam College of Engineering, Anekal

***Abstract*: -- An automated system is developed to control the motor rotation of a wheelchair based on the head movements of a physically challenged person sitting on a chair. The people who are affected by diseases like (loss of limbs-legs/hands, due to accidents or by birth) that they cannot move their body parts except their head. In order to facilitate these people for their independent movement a wireless head movement control system has been designed and implemented. An accelerometer is fixed on the person's head, based on the head movement the accelerometer drives the wheelchair.**

***Keywords* — Head movement controlled wheelchair, accelerometer, Arduino UNO board, high torque motors, ASK Transmitter and Receiver, Motor drive circuit, Joystick.**

I. INTRODUCTION

For human being mobility is the prime substance and need for several activities, physically challenged people find difficulty in achieving mobility to do a given task, it is necessary for day to day activities like travel around, travel to work, and other activities. The need to facilitate mobility for physically challenged people drives us to design an embedded system which can provide the transportation and local mobility. Hence we came up with the project "LOW COST, RELIABLE, AND HEAD MOVEMENT CONTROLLED WHEELCHAIR FOR PHYSICALLY CHALLENGED PEOPLE". This project is meant for physically challenged people (loss of limbs - legs/hands- and-legs - due to accidents, by birth, effected by certain diseases like polio, quadriplegia and so on.) to facilitate a smooth and reliable form of mobility in their life to carry out their day to day activities.

II. LITERATURE SURVEY

In [1] the authors have designed and implemented the "AUTOMATIC WHEELCHAIR FOR PHYSICALLY DISABLED PERSONS" here joystick control is considered. In automatic control user just need to press keys for saved destination, then the wheelchair will automatically move into the direction of saved destination by using encoder wheels. In [2] the authors have designed and implemented the "WHEELCHAIR FOR PHYSICALLY DISABLED PEOPLE WITH VOICE, ULTRASONIC AND INFRARED SENSOR CONTROL" based on voice recognition system and ultrasonic and infrared sensor system. Here the speech is recognized by the HM2007 IC. In [3] the authors have designed and implemented the "HEAD MOVEMENT CONTROLLED WHEELCHAIR" With 8051 micro controller. Here the wheelchair is move based on the head tilts.

III. DESIGN

To design and implement an electronically controlled, real time wheelchair for physically challenged people, where the Electronic control to the wheelchair is achieved by head movement of the person sitting on the wheelchair, with additional controls for local (inside house) mobility is achieved by joystick/keypad and a line following track with dedicated path to certain location in Home (like Bedroom, Toilet, TV room, and Kitchen). The wheelchair is facilitated with safety features like automatic detection of physically challenged person on the wheelchair, Emergency controls (priority based manual override, emergency stop and system failure indication), and back drive distance monitoring as the salient features of the proposed wheelchair.

IV. METHODOLOGY

The Implementation of the wheelchair for physically challenged people will be done in real time, which includes high torque motors to carry out the load of the person on the wheelchair and load of the wheelchair itself.

1. Head Control Unit: Initially we will start with the design of a daughter board to map Arduino UNO (control unit) with the interface as MEMS accelerometer, wireless transmission unit and power supply unit.
2. PCB Design and implementation of head control unit and its interface will be made.
3. Base Control Unit: Configuration and selection of high torque motors for real time will be performed for a certain load to carry (say: 70 kg of weight).

ISSN (Online) 2395-2717

International Journal of Engineering Research in Electrical and Electronic Engineering (IJEREEE)
Vol 3, Issue 11, November 2017

4. Based on the motor selected gear system (1:1) for the wheelchair will be designed (if necessary).
5. The motors selected are electronically controlled and necessary supply for the motor is provided by a DC supply source which will be interfaced to motors via motor driver.
6. PCB Design and Implementation of motor driver at the wheelchair system will be made.
7. PCB Design of daughter board with Arduino UNO for the base control unit (wheelchair system) and its interface will be carried out (wireless receiver unit, emergency control unit and automatic detection of physically challenged person on the chair and motor drive unit).
8. Coding both head control unit and base control unit will be done part by part (testing each module like accelerometer, wireless transmission and reception unit, distance monitoring, motor drive testing) and implementation the same will be carried out.
9. Assembling the entire module to one and testing the wheelchair for the required behavior of the proposed project.

V. BLOCK DIAGRAM AND EXPLANATION

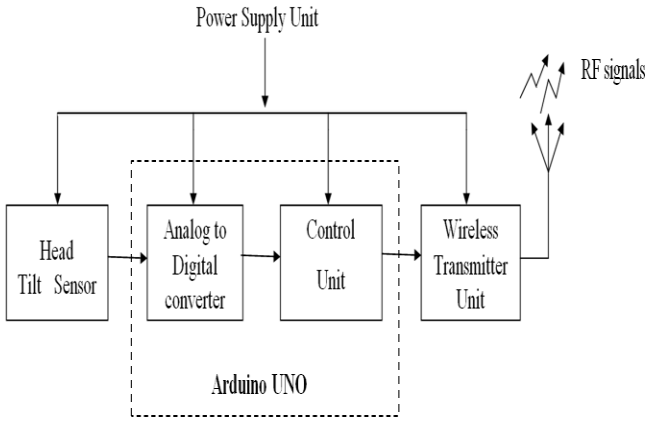


Figure1. Block diagram of Head Control Unit

Figure 1 shows the block diagram of Head Control Unit, this is consists of Head tilt sensor which is used to sense the head movement motions and it is placed on persons head. The analog signals from tilt sensor is given to Arduino UNO board and with the suitable programming the signals are calibrated and the control information is sent to base control unit via a wireless transmission unit interfaced at head control unit. The power to head control unit is provided by a small 9V DC battery. This unit is very compact and less weight so that it can be mapped to helmet/Cap as the physically challenged person can wear it.

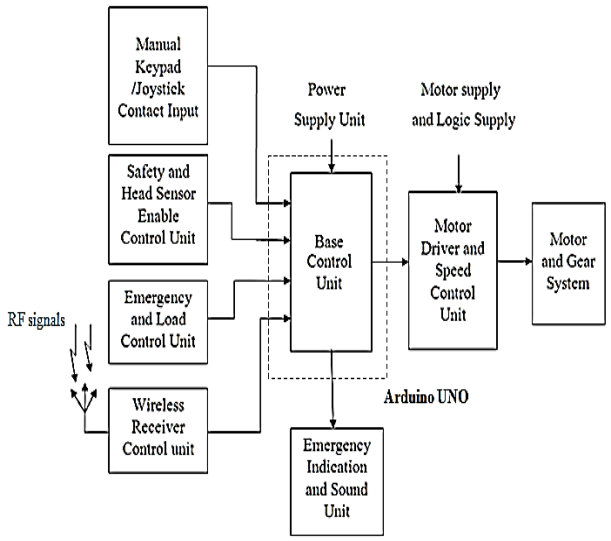


Figure2. Block diagram of Base Control Unit

Figure 2 shows the block diagram of base control unit, here the signals from Head control unit are received from wireless module, based on the wheelchair status and the control signal received , a new set of control signals are generated to drive the motor and then the wheelchair is driven as per the desire of the physically challenged person. Arduino UNO board does not provide a sufficient amount of current to motors so that the motors can carry appropriate load and hence we are making use of a real time high power motor driver to drive the motors. Additional safety features like Emergency stop and manual override is provided so that in case if head control unit malfunctions and to take a necessary action by others an alert sound in generated in case of such emergency. With all these features, this wheelchair can also be controlled by joystick/ Keypad which is mounted on the wheelchair. For better control and home automation we have internally designed a line following application for wheelchair so that local mobility (home internal movements) can be achieved.

VI. OUTCOME RESULTS

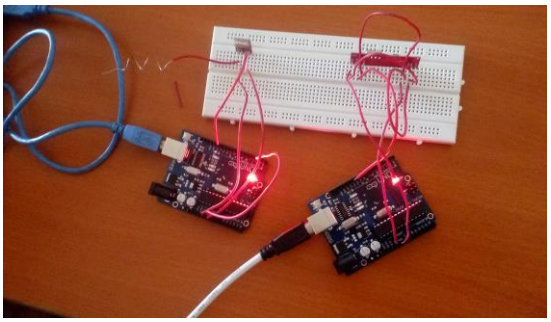
I. Motorized wheelchair is controlled and driven as per the head movements of the physically challenged person on the proposed chair.
II. Wheelchair is embedded with the salient features for security and reliable for the person on the wheelchair and works in real-time.
III. Line tracing facility in the proposed project optimizes the head movements or manual override in local

ISSN (Online) 2395-2717

International Journal of Engineering Research in Electrical and Electronic Engineering (IJEREEE)
Vol 3, Issue 11, November 2017

mobility, which is an advantages compared to other existing system.

IV. Low cost implementation of the real time wheelchair with the above facilities mentioned.



VII. CONCLUSION

This head movement controlled wheelchair moves accordance with the direction of the head tilts. We that this system is increase the mobility of the physically challenged people. This system has proven to be of simple implementation and of low cost.

REFERENCES

[1] Mr. Kunjan D. Shinde, Mr. Raghuram K. M. "Head Movement Controlled Wheelchair", a project works at Dept. of E &CE, SDMCET, Dharwad, and June 2012.

[2] S. Tameem sultana and N. Kali Saranya, "Implementation of Head and Finger Movement Based Automatic Wheel Chair".@ Bonfring International Journal of Power systems and Integrated Circuits,Vol.1,Special Issue, December 2011

[3] Mr. Vijendra, P. Meshram, Ms. Pooja A. Rajurkar, Mr. Dhiraj Banewar, "International Journal of Advanced Research In Computer Science and Software Engineering".@ Volume 5,Issue 1,January 2015

[4] Puneet Dobhal, Rajesh Singh, Shubham Murari "Smart Wheelchair For Physically handicapped People using tilt sensor and IEEE 802.15.4 Standard Protocol".@ Conference on Advances in Communication and Control Systems 2013 (CAC2S 2013)

[5] Thomas Rofer and Christian Mandel and Tim Laue "Controlling an Automated Wheelchair via Joystick/Head-Joystick Supported by Smart Driving Assistance" 2009 IEEE 11th International Conference on Rehabilitation Robotics Kyoto International Conference Center, Japan, June 23-26, 2009

[6] G. Pires, N. Honório, C. Lopes, U. Nunes, A. T Almeida "Autonomous Wheelchair for Disabled People" Proc. IEEE Int. Symposium on Industrial Electronics (ISIE97), Guimarães, 797-801.

[7] Anoop K. J, Inbaezhilan, Sathish raj, Rama seenivasan, Chola Pandian " Designing and Modeling of Voice Controlled Wheel Chair Incorporated with Home Automation" International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering (An ISO 3297: 2007 Certified Organization) Vol. 3, Special Issue 2, April 2014

[8] Dr.Shaik Meeravali, M. Aparna "Design and Development of a Hand-glove Controlled Wheel Chair Based on MEMS" International Journal of Engineering Trends and Technology (IJETT) – Volume 4 Issue 8- August 2013