



## International Journal of Control Theory and Applications

ISSN : 0974-5572

© International Science Press

Volume 10 • Number 18 • 2017

### Wireless Wheelchair Controlling device: aid for handicap

Satish Kumar<sup>1</sup>, Aishwarya Chauhan<sup>1</sup>, Piyush Pariyambud<sup>2</sup>  
and Rajesh Singh<sup>1</sup>

<sup>1</sup> Department of Electronics Engineering University of Petroleum and Energy Studies, Dehradun, India,  
Emails: satishindian163@gmail.com, chauhanaishwarya15@stu.upes.ac.in, rsingh@ddn.upes.ac.in

<sup>2</sup> Department of Instrumentation and Control Engineering University of Petroleum and Energy Studies,  
Dehradun, India, Email: piyushpariyambud@gmail.com

**Abstract:** Wireless home automation network is combination of sensors and actuators that monitor and manage the applications for user comfort and manage home more efficiently. A system which send data to home to external home and establish a communication to external home to make home user more comfort. These types of system are interconnected by means of a data bus to control the various product and subsystem within a home or commercial building.

The paper presented here emphasizes the use of Bluetooth communication to create a wheelchair that uses WWCD. Wireless wheelchair controlling device is a device that controls movement of wheelchair using Bluetooth action. The sole purpose of device proposed is the aid of handicap.

**Keywords:** WWCD

arduino uno, ultrasonic sensor , bluetooth, motors, camera, remote control

#### 1. INTRODUCTION

Wireless home automation network consist of sensors and actuators that monitor and manage applications for home user comfort and manage home more efficiently [1].

A system which send data to home to external home and establish a communication to external home to make home user more comfort. This type of system is connected by means of a data bus to control the various system and subsystems within a home or building. Various actuators, multiple terminals are allow for the input of commands by various device such as touch screen voice reorganization system. The system functions can be immediately controlled by the user utilizing a device that provides input to system [2].

Due to advancement in digital network technology, idea of home automation has been introduced. New technologies enhance the connectivity of devices within the home for home automation. Moreover, with the

rapid increase of internet, the remote controlling of devices has been made easier from anywhere. A home automation system is and Wi-Fi network based upon ZigBee are developed through a common gateway. ZigBee remote control has been integrated with the home automation [3].

Due to advancement of field of electronics, various smart appliances are set to develop the idea of a smart home. They are given rise to a Network in home environment where all the appliances is connected to a controller. This controller also controls them. Bluetooth technology is most suitable for this purpose. Bluetooth technology can be used in home automation and networking environment. Its purpose is to control the device wirelessly same as remote [4].

Mobile based home automation system is efficient, secure and has low cost. This design is based on Arduino BT board. Home Appliances is connected to input and output port of Arduino BT board via relay. Cell phone is used to send command to Arduino BT board and further the command is transmitted to home appliances. Cell phone and Arduino BT board is connected wirelessly. This design is used to control various home device and have low cost. To allow accessing to authorized user, password protection can also be used [5].

The paper is basically an investigation to compare characteristics of wheelchair propulsion. The velocity and cycle distance along with cadence was tested and the result obtained is proposed in this paper. The test was performed over tiled floors, carpeted floors and a difference in velocity in cycle distanced was observed. One of the arms of the wheelchair was instrumented with a force transducer. The paper raised a question on the independent working of wheelchair with such propulsion outside the hospitals [6].

This paper presents the study of the impact of power wheelchair when given to the handicap youth. The aim of the study was to undermine the pros and cons of the act of providing power wheelchair. The wheelchair helps in betterment of the mobility of such people but along with that it brings more chances of being prone to road tragedies. Power wheelchairs were provided and survey was conducted. The power wheelchairs provided independence and improved their quality of life [7].

The evolution of wheelchairs since sixth century to the twenty first century is described. Therefore paper provides us with the historic preview of the structure, complexity, design of wheelchairs along with the eluting requirements of the users. Innovations in technology led us to transformation of the wheelchair keeping in mind their medical capabilities. At times these equipment are not enough to meet the users need or are over equipped, therefore a study has been conducted to look into the real needs [8].

The known use of manual wheelchairs is in nursing home for older adults. Study is basically conducted to quantify that usage. There was a diversity obtained in the use of wheelchairs by older adults in the nursing homes. The method of assessment to gather the data is implemented in this paper along with some comparisons and a balanced survey [9].

A descriptive and developmental study was conducted further leading to an assessment which was further named as wheelchair propulsion test. The test analyzed the manual wheelchair users and their push frequency along with their reliability. In this test they were asked to effectively wheel for 10m and the time along with cadence were measured and the study was conducted. The test took into account the velocity and other such factors [10].

The paper implemented and introduced a hand free wheelchair for the movement of disabled. In this the wheelchairs are electrically driven and depend upon the muscle contraction taking each as an input. The electromagnetic signal associated with the driver were monitored and translated to commands that an electronic instrument such as wheelchair would understand and work upon. These wheelchairs require less effort and are more efficient [11].

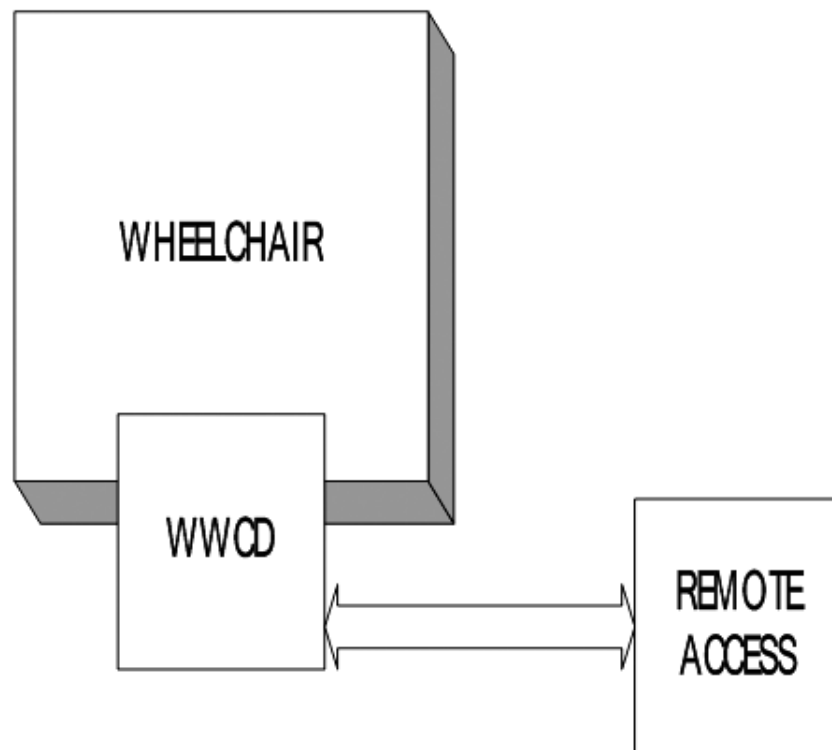
Human computer interface, electromagnetic gram, voice and directional gestures are used for the construction

of a wheelchair and the construction along with boon and bane is explained in this paper. The wheelchair obtained will be an intelligent robot wheelchair meeting the needs of the disabled. The wheelchair will be controlled by the user and hence causing less mobility issues for them [12].

## **2. BACKGROUND OF THE RESEARCH**

Tragedies are the part and parcel of life. Many a times we fall prey to accidents or situations which cause threat to our lives. These tragedies at times cost us with the impairment of our body parts making us handicap and placing a halt in our lives. These halt doesn't stop our lives but the pause they give is sufficient enough to cast a shadow in ones future. Losses of this kind cannot be mended completely but its impact can be reduced. Such a step was taken in sixth century and a wheelchair was invented for the people who are not able to walk due to one or more reasons. Such equipment as a wheelchair provides legs to those who are unable to move or whose mobility has been hampered. Due to technological advancement during the centuries, the wheelchairs have been revolutionized. Modifications according to the needs of the handicap are being implemented. Such a modification is proposed in this paper. The purpose is clearly to introduce a modification in the traditional wheelchair which will help the handicap people to live their lives with a brighter perspective. The use of Bluetooth is implemented to give these wheelchairs a new direction and will lead handicaps to organize their ride their own way without the help of manual aid.

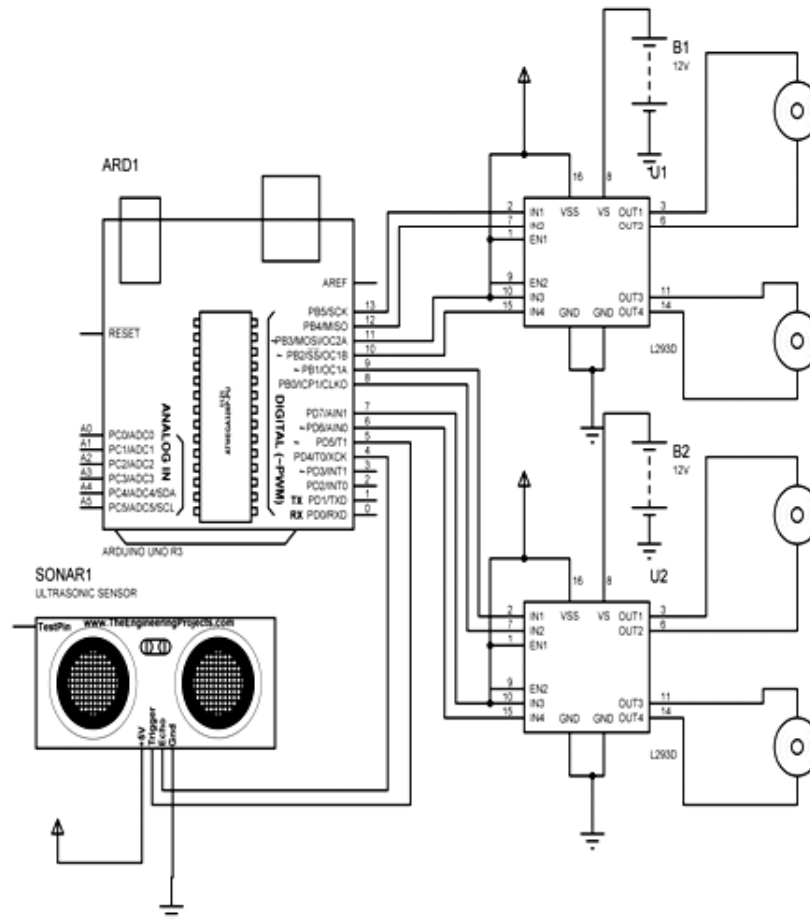
## **3. FLOW DIAGRAM**



Our idea is to create wheelchair which consists of WWCD which is control by Bluetooth communication. The WWCD consists of a microcontroller camera, ultrasonic sensor and motor. Much clear flow diagram is given below.

The diagram is of WWCD (wireless wheelchair controlling device)

#### 4. SYSTEM DESCRIPTION



#### 5. WORKING

The wheelchair will have a smart WWCD attached to it which will make it accessible to a remote user. The WWCD will include a camera, ultrasonic sensors, motors and ARDUINO UNO controller. A wireless remote will be used to guide the wheel chair to the desired location using the help of ultrasonic depth sensors to detect the obstacle in path making it follow the shortest possible path. The two wheels are for backward movement and rest are to for turning purpose. The view of the camera attached with the wheel chair could also be used by the user to guide the wheel chair. WWCD will make use of Bluetooth communication to connect the wireless remote to the wheelchair. Strength of the signal will be the base for the direction of approach of the wheelchair.

#### 6. RESULT AND DISCUSSION

Result of the above produced wireless wheelchair controlling device (WWCD) is the betterment of handicap people and give them a sense of independence.

The liberty is now given to the handicap people to track their path, to plan their own rides, their own way. Needing a person always by your side to take you to one place to another is the worst possible harm one can cause to himself. We plan to live our lives our way but when it becomes dependent on others to make you do things, causes a lot harm to mental health. The physical impairment not only becomes the obstacle but the mental harm adds on to the problems. A remote control wheelchair will not only provide handicap people a

sense of independence but will also provide them with a sense of freedom. The freedom to control their own actions. This freedom will work for their rebuilding their life from bits. A Bluetooth communication channel will provide an ease to the users and an easy pathway to communicate with their chairs.

## **7. FUTURE SCOPE**

A GPS system can be introduced to trace the location of the wheelchair. It will help the relatives of the user to trace its location. A GSM module can also be added to detect the problems in case of malfunction of WWCD. The system can also be modified to send the SOS to the registered phone numbers in case of any accident.

## **8. CONCLUSION**

The conclusion of the above produced paper which emphasizes on WWCD which is a wireless wheelchair controlling device is providing a ray of hope to the handicap to create their own way, their own life. Such a sensitive wheelchair will help the disabled to improve their mobility and such an accessible communication channel describes its relevance in practical usage. The use of technology to provide affordable wheelchair will increase the availability of the wheelchairs to maximum handicap people enhancing their lifestyles.

## **REFERENCES**

- [1] Gomez, Carles, and Josep Paradells. "Wireless home automation networks: A survey of architectures and technologies." *IEEE Communications Magazine* 48.6 (2010): 92-101.
- [2] Launey, Reuel O., et al. "Expandable home automation system." U.S. Patent No. 5,086,385. 4 Feb. 1992.
- [3] Gill, Khusvinder, et al. "A zigbee-based home automation system." *IEEE Transactions on Consumer Electronics* 55.2 (2009): 422-430.
- [4] Sriskanthan, N., F. Tan, and A. Karande. "Bluetooth based home automation system." *Microprocessors and Microsystems* 26.6 (2002): 281-289.
- [5] Piyare, Rajeev, and M. Tazil. "Bluetooth based home automation system using cell phone." *Consumer Electronics (ISCE), 2011 IEEE 15th International Symposium on*. IEEE, 2011.
- [6] Newsam, Craig J., et al. "TEMPORAL-SPATIAL CHARACTERISTICS OF WHEELCHAIR PROPULSION: Effects of Level of Spinal Cord Injury, Terrain, and Propulsion Rate1." *American journal of physical medicine & rehabilitation* 75.4 (1996): 292-299.
- [7] Ingvor Pettersson, Lars Hagberg, Carin Fredriksson, Liselotte N Hermansson. (2016) The effect of powered scooters on activity, participation and quality of life in elderly users. *Disability and Rehabilitation: Assistive Technology* 11:7, pages 558-563.
- [8] Cooper, Rory A., Elaine Trefler, and Douglas A. Hobson. "Wheelchairs and seating: Issues and practice." *Technology and Disability* 5.1 (1996): 3-16. {3}
- [9] Karmarkar, Amol M., et al. "Manual wheelchair-related mobility characteristics of older adults in nursing homes." *Disability and Rehabilitation: Assistive Technology* 5.6 (2010): 428-437.
- [10] Askari, Sussan, et al. "Wheelchair propulsion test: development and measurement properties of a new test for manual wheelchair users." *Archives of physical medicine and rehabilitation* 94.9 (2013): 1690-1698. {5}
- [11] Felzer, Torsten, and Bernd Freisleben. "HaWCoS: the hands-free wheelchair control system." *Proceedings of the fifth international ACM conference on Assistive technologies*. ACM, 2002.
- [12] Moon, Inhyuk, et al. "Intelligent robotic wheelchair with EMG-, gesture-, and voice-based interfaces." *Intelligent Robots and Systems, 2003.(IROS 2003)*. *Proceedings. 2003 IEEE/RSJ International Conference on*. Vol. 4. IEEE, 2003.