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Implementation on Wheelchair Control through 3 Modes via Android App

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ABSTRACT: Smart Wheel Chair is automatically controlled device designed to have mobility with the help of the user command. This reduces the user's human effort and force to drive wheelchair. The wheelchair is also provided with obstacle detection system which reduces the chance of collision. Smart wheelchair has gained a lot of interests in the recent times. These devices are useful especially in transportation of handicap people. The machines can also be used in old age homes, in hospitals, on railway stations as well as air ports. Different types of smart wheelchair have been developed in the past but the new generations of wheelchairs are being developed and used which uses artificial intelligence, robotics and various new technologies. The project aims to build a wheel chair which would have a kind of intelligence and hence helps the user on his/her movement.

KEYWORDS: Wheelchair, Microcontroller, Android phone, Bluetooth module, Arduino**.**

I. INTRODUCTION

Many people, who need to move around with the help of some artificial means, whether through an illness or an accident, are continually increasing. These means have to be increasingly sophisticated, taking advantage of technological evolution, in order to increase the quality of life for these people and help them to stand on their own feet. Nowadays, many handicapped people face problem to control wheelchair by themselves. Sometimes they need other people to help them. This project will provide a new way to control the movement of wheelchair such as turn direction to left, right, forward and stop. The overall wheelchair operation uses DC motor and motor driver module combines with microcontroller system for instance controlling board. Android-based wheelchair controller that consists of android device and a control box that can be attached to standard wheelchairs to control the movement by using a DC motor. Bluetooth is used as transceiver of sensory and command information between the android device and microcontroller. There are 4 options for basic movement of a wheelchair to be controlled by the user.

On one hand, wheelchairs are designed for people who are physically challenged and/or have disabilities that make it harder for them to walk. With the development of semiautonomous wheelchairs, users can now choose from an array of multimodal control options available to control the wheelchair, depending on their level/type of disability. There are already several ways to control wheelchairs, from the traditionally self-propelled wheelchairs to the electrically powered wheelchairs. The electrically powered wheelchairs are the norm and require users to control it with a joystick. The joystick may have additional controls to tailor to the user's ability to access multiple control modes. Likewise, for users who are unable to use a joystick, various alternatives are available such as sip-and-puff controllers, which work by sipping or blowing into a sensor that translates it into movements of the wheelchair. Wheelchairs can also be controlled with voice recognition by speaking the commands out loud.

Bluetooth is a global specification for a small form-factor, low-cost radio solution providing links between mobile computers, mobile phones, and other portable handheld devices, as well as connectivity to the Internet. The Institute of Electrical and Electronics Engineers (IEEE) has given the IEEE 802.15 standard. Its main strength is its ability to simultaneously handle both data and voice transmissions. A mobile computer equipped with Bluetooth technology, for example, could link to a similarly equipped mobile phone to connect to the Internet. Multiple Bluetooth units form a Wireless Personal Area Network, called and up to seven client devices.

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II. RELATED WORK

A In system, "Smart Wheel Chair with Android Control", [1] author designed a wheel chair which will move in two modes possible. Those modes are joystick and android phone connected with Bluetooth. For switching between two modes we are using a toggle switch. When we will select joystick mode, at that time wheelchair will be controlled using joystick only. Directions for joystick are forward, right, left and stop. Joystick mode is useful for everyone in the society. In Android controlled mode, user will have to install application in his/her phone.

In the project [2] authors are trying to include sensors with an android platform to develop an automated wheel chair which can help the patient to control the direction of the wheel chair based on accelerometer, to detect the obstacles, and touch recognition by using android software.

In paper [3], author implemented an automatic wheelchair which has various advantages. It is operating with three different modes i.e. keypad mode, remote mode and Android mode. Also there are two types of sensors which increase accuracy of wheelchair. This Wheelchair will be economical and can affordable to common people. We can also add new technology in this wheelchair. A system for reliable recognition of speech and face and also GSM based navigation system will be a boon for the project. This system can be made highly efficient and effective if stringent environmental conditions are maintained. The setup for maintaining these environmental conditions will be a onetime investment for any real life application. The running cost of this system is much lower as compare to other systems used for the same purpose.

Most of the physically disable individual [4] satisfies their movement through motorized wheelchair. The scenario is unusual for the disables of developing countries because of their economic conditions. Moreover traditional powered wheelchair is not comfortable to all segments of the disable society because of their complexity. Several researchers have used sophisticated technologies to operate wheelchair such as voice controlled, head gesture controlled, remote controlled wheelchair for providing better flexibility. For being sophisticated technology Android is being used in mobile, TV or in smart watches.An app with mitigating required controlling facilities is implemented here that may provide a flexible movement of the certain disable community. This paper focuses on the system of PWM based Android Controlled Wheelchair.

The development of an android-based wheelchair controller was fully functional base on the objective which are targeted before started the project [5]. Finally all the combination circuits and the DC scooter motor were embedded to the wheelchair. This project gives an idea on how to combine all the circuit board, DC scooter motor, and electronics components together in one whole system. As a future improvement, replacement of the DC scooter motor with the DC motor with geared is recommended because to more accurate. Paper [6] presents the preliminary evaluation of different powered-wheelchair control modes for individuals with severe motor impediments. To this end, a C400 Permobil wheelchair has been updated with a control command communication interface and equipped with a scanning laser sensor to carry out the automation algorithms that are part of the robot operating system framework. A pilot test was performed with three different modalities; hand-joystick mode, tongue-joystick mode and autonomous mode.

Manual or electrical wheelchairs are satisfying for most of the low and medium level disability case where patients can use the wheelchair independently. However, in severe cases, it is difficult or impossible to use wheelchairs independently. In such cases wheelchair users often lack independent mobility and rely on somebody else handle the wheelchair. Researchers involved in wheelchair are aiming at designing smart wheelchairs to solve such problems. Paper [7] is to review the recent studies on smart wheelchair systems. It aims to evaluate the current available technologies and to discuss new future directions for our on-going research project. The list of tasks we can accomplish at the touch of our small screen goes well beyond making phone calls. For people with significant physical disabilities, however, use of smartphones is a challenge due to the nature of these touch-based devices. These technologies are designed for interaction using the fingers and an array of gestures such as swipes, pinches and taps.

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Design presented in [8] places people with limited hand skills at a disadvantage. More recently, interface technologies have emerged that allow integration of smartphones with the drive control system on a power wheelchair, to include joysticks, switches and other alternative controls. For users with limited motor skills, accessing smartphones through the power wheelchair has many potential advantages, to include control of both chair and phone using an existing, successful method of access.

The main objective of VOICE CONTROLLED WHEEL CHAIR SYSTEM [9] project is recommended to control a wheel chair by using speech recognition module. The system is designed to control a wheel chair using the voice of person. The objective of this project is to fascilate the movement of people who are disabling or handicapped and elderly people who are not able to move well.

The goal of the system will allow certain people to live a life with less dependence on others for their movement as a daily need. Speech recognition technology is a key technology which will provide a new way of human interaction with machine or tools. Therefore the problems that they face can be solved by using speech recognition technology for the movement of wheel chair. This can be realized and optimized with use the smart phone device as an intermediary or interface. In this project interfaces has been designed therefore to develop a program for recognize speech also controls the movement of chair and an application which can handle or manage the graphical commands. This project uses arduino kit Microcontroller circuit and DC motors to create the movement of wheel chair and Ultrasonic Sensors to detect the hurdles in between wheelchair and the way of direction. [10]

III. PROPOSED SYSTEM

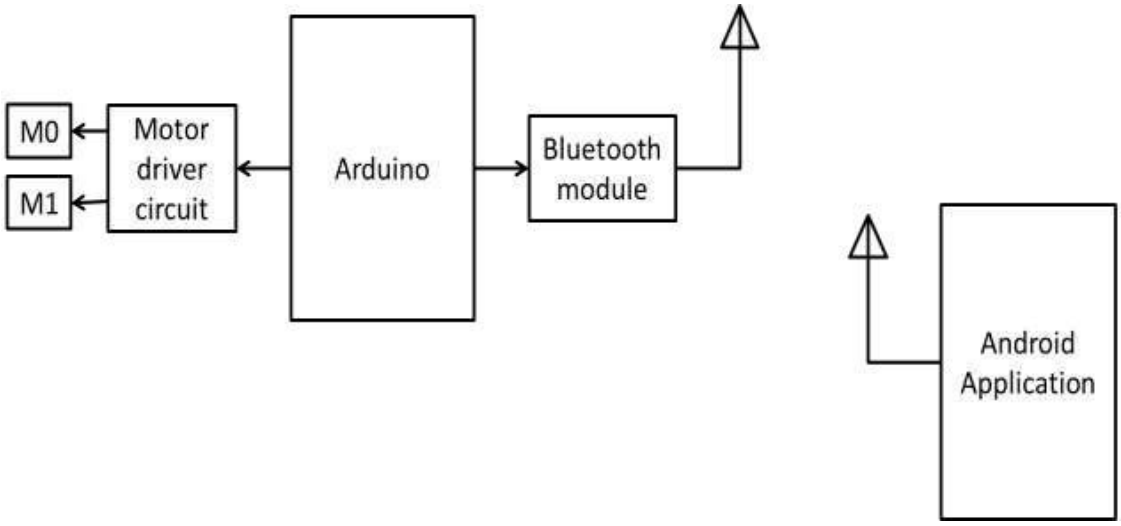

FIG.1 BLOCK DIAGRAM OF PROPOSED SYSTEM

Motor Driver circuit is primarily used in autonomous robotics. Most microprocessors operate at low voltages and require a small amount of current to operate while the motors require a relatively higher voltages and current. Thus current cannot be supplied to the motors from the microprocessor. This is the primary need for the motor driver IC.

Wheelchair can be controlled through modes using Android app. the three modes are as follows:

1. Using keyboard: keyboard of mobile is used for controlling the direction of wheelchair
2. Using tilting motion: as per change in motion of gyroscope of mobile, direction of wheelchair is controlled.

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3. Using Bluetooth module: Bluetooth module is used to control the wheelchair. Signals are passed from mobile to arduino via Bluetooth communication. This signal contains the data that possess message of control of wheelchair.

IV. RESULT

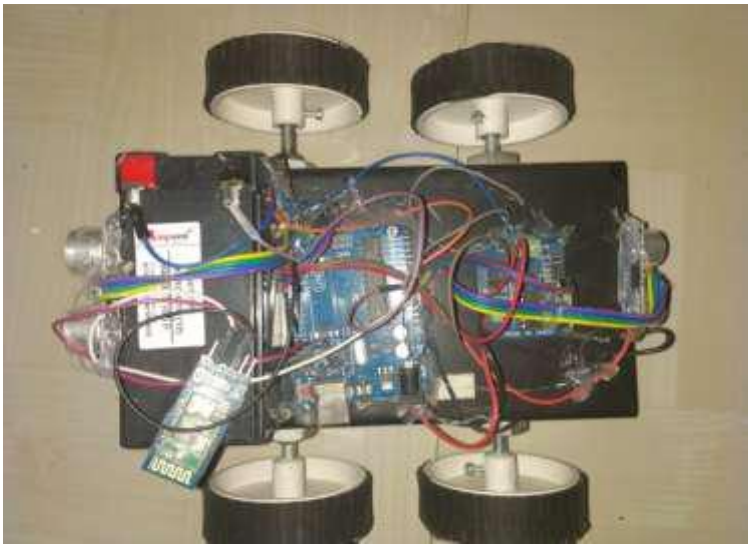

Fig.2 hardware model of proposed system

Fig.3 Voice Control

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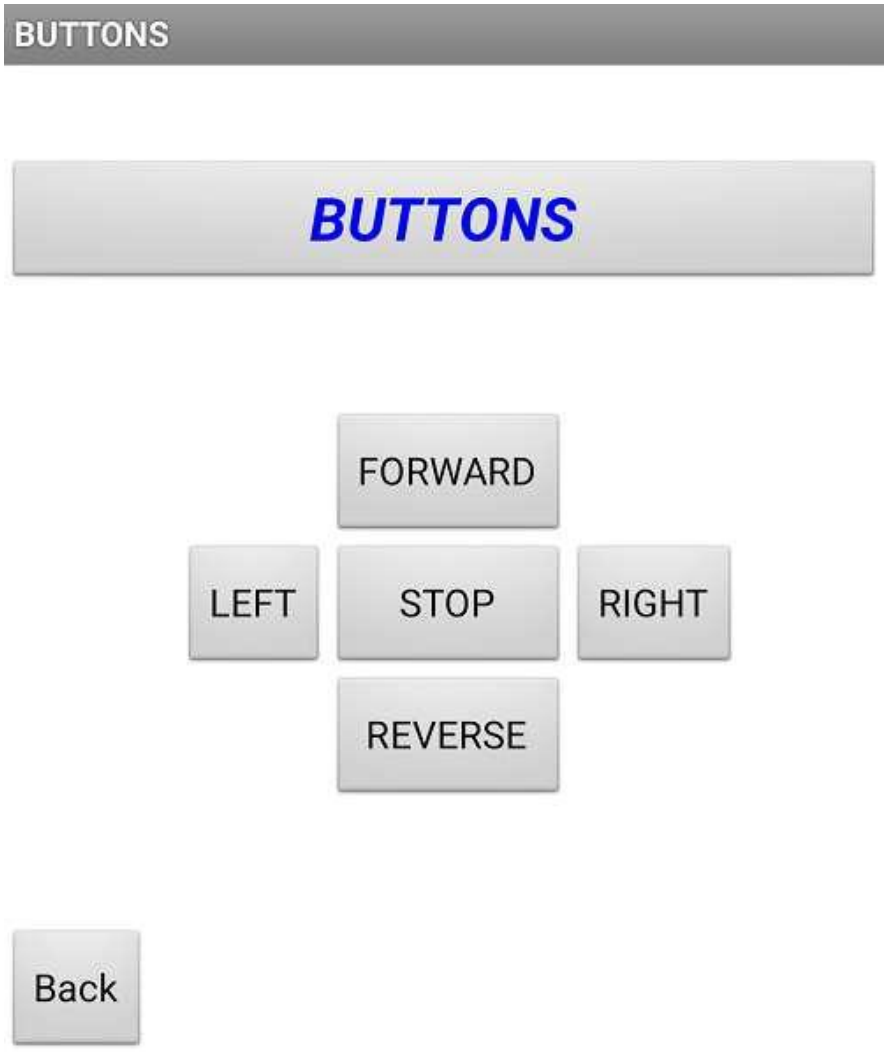

Fig.3 Button through control

V. CONCLUSION

This project elaborates the design and construction of Smart Wheel Chair with Android control. The circuit works properly to move as the command given by the user. After designing the circuit that enables physically disabled to control their wheel using an android application in their smart phones and it has also been tested and validated. The detection of any obstacle is successfully controlled by the microcontroller.

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