Review of Automated Wheelchair for Physically Handicapped.

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***Abstract*— This article describes an intelligent automated wheelchair that operates based on the user's commands. Disabled people cannot move from one place to another by themselves. They constantly need someone to help them move the wheelchair. This automated system makes them more independent. The user-controlled system makes them more independent. A user-activated wheelchair can provide easy access for physically challenged people who cannot control their movements. Few patients such as quadriplegics, cerebral palsy, and multiple sclerosis are dependent on other people to move from one place to another and therefore do not have freedom of movement. This automated wheelchair helps them drive their wheelchair without assistance. This system can be controlled by simple commands entered by the user. The Arduino will drive the motors depending on the direction specified in the commands. Input recognition is done using Bluetooth technology in mobile phones that are connected to the Bluetooth module on the wheelchair.**

Keywords—user control, quadriplegic, cerebral palsy, multiple sclerosis, Arduino.

I. INTRODUCTION

People with arm and hand disabilities find it difficult to use a normal wheelchair because their hands are unable to control a normal wheelchair and cannot move it in any direction. Therefore, the automated wheelchair is designed to overcome the problems that these people faced and enable them to control the wheelchair. The cart will be controlled using commands via the given inputs. The Arduino will take care of all the directions the user wants. The instruction for each direction is written in the form of a program in the Arduino itself. The user command to the wheelchair will be given via Bluetooth technology using a mobile phone and a BT module located on the wheelchair. The output from this module is then received by Arduino. An already-written program in the Arduino helps the Arduino convert this user command into a significant force and move the wheelchair accordingly. Thanks to the wheelchair control system, disabled people become more independent. The wheelchair system consists of Bluetooth technology that transmits the command entered by the wheelchair user. Basic motion functions include forward and backward, turning left and right, and stopping. Many affected patients cannot move any of the limbs below the neck. Therefore, manual or even joystick-controlled wheelchairs have already been invented for these patients. So, the development of a automated wheelchair solves the issue of mobility of quadriplegic patients and makes them independent of mobility.

II. LITERATURE REVIEW

Stephen Farfler [1] In 1955, a professor named Ralph Crlizer created the first self-propelled motorized wheelchair. The German, who was only 11 years old at the time, developed the device after breaking his back. In 1983, Jack Reacher of Bath, Texas, created a wheelchair that was named after his home city. He had designed it with two large wheels and a small one. It became the most popular wheelchair during the 1900s.

In 1950 [3] a folding wheelchair known as the Model 8 was invented. It was commonly used in hospitals and nursing homes. The device can be operated by a patient or an assistant using a metal rim.

John Donoghue and Braingate [5] invented a new wheelchair technology designed for patients with very limited mobility who would otherwise have difficulty using a wheelchair themselves. The Braingate device is implanted in the patient's brain and connected to a computer so the patient can send mental commands to make any machine, including wheelchairs, do what he wants. The new technology is called BCI or Brain-Computer Interface.

TTK Rehabilitation Research and Device Development Center [6] “The standing wheelchair named Arise was like a sore body, creating pressure points leading to pressure ulcers, reduced circulation, and dependence on others for basic needs. The standing wheelchair includes two prototypes standing and sitting. This wheelchair will prevent the patient's muscles from cramping.

Desai et al. [7] Wheelchair controlled by hand gestures. This project was designed for physically challenged/disabled people using hand movement or hand gesture reorganization. With the help of a wheelchair, a physically disabled person can move to the desired place by himself using hand gestures that control the movement of the wheelchair. When a person suffers from an unfortunate event such as leg problems, it is necessary to use a device such as a wheelchair to offer mobility to the patient with the problem. There has been a huge change in wheelchair technology. However, significant progress has not been able to help a quadriplegic navigate a wheelchair without assistance. Some patients cannot control the wheelchair with their hands due to a lack of energy.

Ashutosh Prakash [8] People have disabilities in their hands, feet, and lower limbs that prevent them from performing

normal tasks. There are many technologies to overcome this problem. To solve this problem, several apps in the market help disabled people complete their tasks. The proposed design supports a activation system for the physically challenged with manual control. If a person is handicapped, he is dependent on others for his daily activities, such as orientation. The proposed user controlled wheelchair would bring more comfort to the disabled. The technology can also increase the safety of users using conventional joystick-controlled wheelchairs by preventing collisions with walls, fixed objects, furniture, and other people.

III. Proposed System

The purpose of this article is to develop a wheelchair that will move according to the user's commands. This system works based on the command of the wheelchair user. The system is fully dependent, as the user does not need any other person to help him move the wheelchair. The user has five commands to make the cart move. The user's commands are recognized in the first step. Once the command is recognized, it is converted to equivalent instructions that control the system. This system consists of two main modules called App Recognition & Control Module and Motor Control Module. User Input recognition is done using the user interface recognition module. The output of this module is routed to the Arduino, which uses the motor driver IC to drive the motors. The user-activated wheelchair works with a Bluetooth control system, Panic alarm module, Arduino, and motors.. It can receive users' commands and not be bothered by surroundings.

The control will be placed according to the convenience of the user. The output is in the form of user's signals and is transmitted to the user recognition module, which acts as an interface between the control and the Arduino. The Arduino then receives the output from the user recognition module and converts it into binary codes. The system is unable to understand any language other than binary codes. The generated user command is thus converted into a machine-intelligible form. Arduino UNO is connected with motors to drive the wheelchair anywhere. Motors are responsible for moving wheelchairs. So the motors take input from the Arduino and depending on the type of instruction the motor moves accordingly.

This system uses two motors connected to a motor drive. Five different commands can be given to the motors: forward, reverse, left, right, and stop. The movement of the cart depends only on these five commands. The cart only responds to these five commands given by the user to perform any functional movement. To recognize commands, the user recognition processor must be trained with a word spoken by the user who will be operating the wheelchair. The system would recognize the command given to it and therefore act or react accordingly. Once the command is given through the Bluetooth Controlled App, it is hardly necessary for the system to respond immediately.

IV. Scope of Project

This system will be a automated wheelchair for the physically challenged. This system will be designed to control the wheelchair based on the user's command and control the movement according to the operator's command. The input command will be transmitted through a Bluetooth application and will be converted into a binary format using a user input recognition suite. So, this binary format will be checked by the binary code fed to the microcontroller if the statement is executed as true. More specifically, this system is designed to allow the administrator and users to give commands to the wheelchair. The cart executes these commands within seconds. Overall, its basic controls will be left, right, stop, go, and reverse. It's a automated wheelchair.

V. Advantages

- Quadriplegic and cerebral palsy patients who lack strength can easily handle this system.
- Using Arduino makes system programming easier and thus reduces software and hardware interface problems.
- The system can be controlled using synthetic user commands.

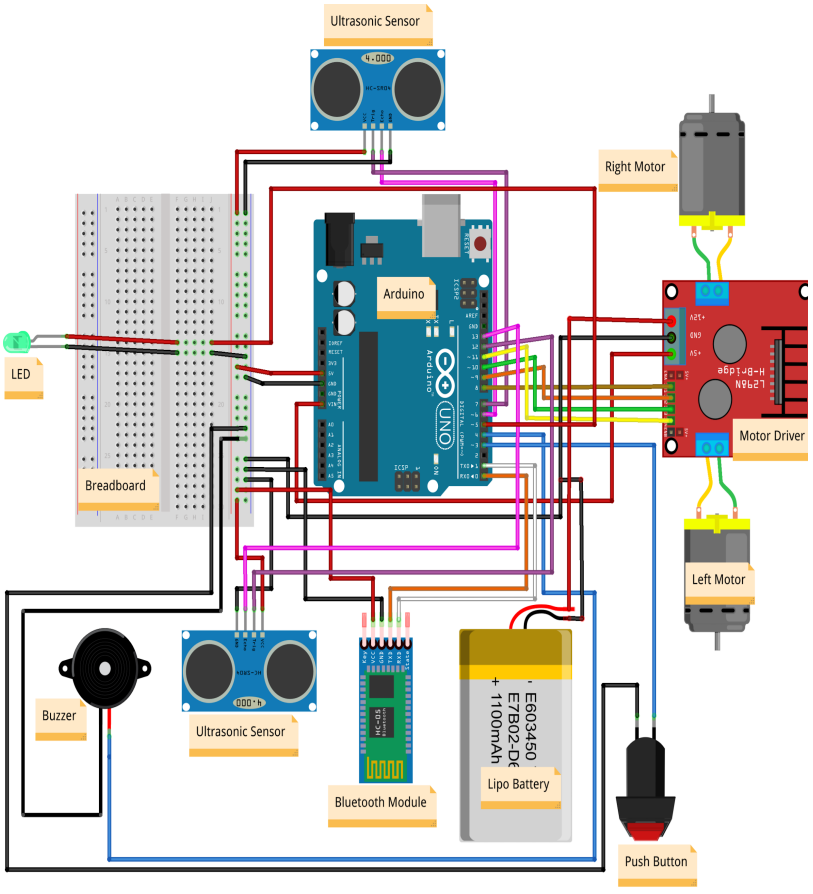

Fig.1 Automated Wheelchair Interface.

VI. System description

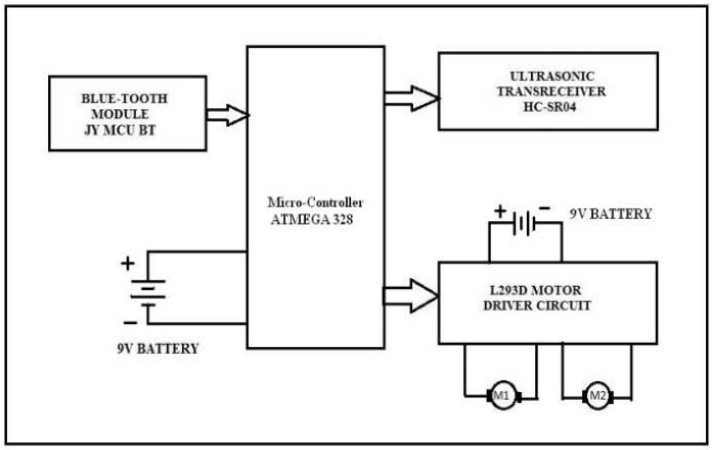

Fig 2: Block Diagram of the System.

The diagram above shows a block diagram of the system showing the connections between each block or module of the system. All modules are mounted on the deck to facilitate wheelchair movement. This includes components that are placed closest to the user for convenience and ease of use. In general, the user's input level affects the accuracy of recognizing the result of a given command. The system is activated by a user command word created by the user using this BluetoothControlled interface. The command of the user using this system is already trained and stored in the module. So, when the user enters a command, the module compares it with an existing command and outputs if the user's command and the command match. Some people can't even use properly. For these, a value can be used instead of using normal as a command. These are normal commands that any person can make. This makes the command entry process easy and the system can be used even by people with cerebral palsy. In this system, some advanced commands are designed to be used by the severely disabled. The functionality of the cart is based on the user recognition unit, which is the heart of the system. Five types of movements are considered, forward movement, backward movement, left movement, right movement, and stop. The system starts by applying power to the speech recognition circuit. The direction of movement of the wheelchair depends on the user.

VII. Hardware

- Arduino Uno
- Bluetooth module
- Motor Driver
- Buzzer
- DC motor
- Battery
- Capacitors

In this system, many capacitors would be used to eliminate the errors that occurs while issuing and interpreting commands. Too much complications is generated during the movement of the system, so capacitors are used to eliminate it.

VIII. Conclusion

The design and implementation of a automated wheelchair for the disabled are designed using Arduino and a user interface recognition module to control the movement of the wheelchair. The direction of movement of the wheelchair can now be selected using user's commands. Compared to the current market, the design reduces production costs and provides great competitiveness with other types of electric wheelchairs. Only a person's synthetic user command is required to operate the wheelchair. A system is implemented that can directly improve the lifestyle of a physically disabled person in the community. This project has many advantages, such as safety for users who use a regular wheelchair, as it prevents collisions with walls, solid objects, furniture, and other people. So, all the disadvantages of a normal wheelchair are overcome by this "Automated Wheelchair".

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