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Design and Fabrication of Real Time Voice Operated Wheelchair cum Bed

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ABSTRACT

This project opens a new hope to the physically challenged people. Freedom of mobility is the dream for every patient especially in the case of people suffering from cases such as quadriplegics and multiple sclerosis. Although many types of mobility equipment are available for these type of patient there is no independent means of mobility device for these patients since they cannot drive a joystick or manual wheelchair. In order to aid these types of patients we are developing voice operated wheelchair cum bed. The movement of the wheelchair cum bed is controlled by the voice of the user through Android phone. This wheelchair can be driven to the preferred direction with minimum effort. The user requires only less training to use this wheelchair. Technically this wheelchair is integrated with a voice recognition module to identify the voice, a microcontroller which can be programmed other supporting hardware components and a motor driver L293D.The proposed microcontroller-based voice operated wheelchair cum bed would bring more convenience for the disabled people.

Keywords: *Smart wheelchair cum bed, Arduino UNO, Bluetooth module HC-05, Android phone, Motor driver, Disabled and elderly people.*

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I. INTRODUCTION

The need for automatic Wheelchair is especially present in care of immovable people (people with persistent vegetative state, paraplegia, stroke and spinal cord injuries), where the care requires a lot of time and manpower. This report is the result of a design and development of an automated multifunctional Wheelchair that would perform all functions present in today's Wheelchair (Wheelchair with adjustable portion of back rest and leg rest and also convert to bed to wheelchair and vice versa and also remote control with which we can provide all necessary movement) as well as new functions of appropriate Wheelchair sections (leg positions adjusting). It is expected that this new automatic Wheelchair would enable people's better medical care, and would greatly reduce time and manpower to the old-age home staff.

Health monitoring is essential to our daily lives. The use of various specialized sensors in hospitals has increased recently because of efforts to enhance patient outcomes and overall construction efficiency. Modern hospital beds serve more purposes than simply providing sleeping space for patients. To make the people who are bed ridden more comfortable and at ease. The voice-controlled wheelchair convertible bed that can be operated via voice commands is described in the proposed system along with its design and prototype development. The bed has unique characteristics that set it apart from other beds. Moreover, the bed may be transformed into a chair position using voice instructions. Therefore, this study proposes a wheelchair that may be operated by the user's simple vocal instructions and discusses the design and development of a voice controlled automatic wheelchair. What will happen if wheelchair starts moving with audio input like forward, backward, left and right? The disabled person can move anywhere he wants without the help of second person and independently. There will be no need to use hands for moving the wheelchair. We are trying to implement this concept through our project "Smart wheelchair".

The name itself indicates the meaning the wheelchair which is intelligent. This wheelchair takes commands from user and according to that it moves in required direction. The person who is unable to move chair by hands can move this wheelchair just by giving the commands. This is the boon for paralyzed people. Hence using this chair, the patient can go anywhere independently. This is economical and fully automated. Hence physically disabled people can use this wheelchair easily and live their life happily.

II. LITERATURE SURVEY

David L. Jaffe, et.al. [1] Have discussed about electric wheelchair is controlled by the head position. When a person turns the head to left or right distance is calculated with the help of ultrasonic after that command is given to the motor and speed of the motor is also controlled. In this another method is used to control the wheelchair is by voice recognition unit. This is very helpful for the disabled for person who are unable to move their hands. Calculating the distance with the help of ultrasound is difficult by turning the head alone without knowing the final destination.

Anwar Al-Haddad, et.al. [2] Have explained about method is based on the Electro Oculogram signals, Wheelchair movements got controlled. In this method, the right and left operations are used to move in those particular directions respectively. The user will look at the particular destination, were using his/her eye movements, the controlling unit got started. Then the wheelchair will attain the designation correctly.

Rosalie H. Wang, et.al. [3] Have reviewed about case study is taken among 371 people for 7 hours, discussed about the anti-collision power wheelchair. Whether it is help for those who are using it. Even though using the anti-collision power wheelchair they have depended on other for other works Wheelchair is not providing 100 percentage independence.

Mohammed Hayyan Al Sibai, el. at. [4] Have discussed one-arm drive wheel chair. They also designed their project to provide an intuitive & user interface it also allows the user to travel at speed above 2.25 m/s (5.00mph). In addition to the kinematic variables as transnational, rotational and turning, the other parameters like the moments of inertia and mass needed to be estimated. Wheelchair distinct components include are allowed to analyze the energy interchanges between them.

Fausto O, et. al. [5] have established the apportionment of kinetic energy like translated which means to evaluate the moving wheel chair agitation. To obtain the results of combined physical specifications &geometry of the wheel chair an innovated mathematical model is designed.

III. METHDOLOGY

This project aimed to design a bed that can be converted into a wheelchair that can be relied on by running voice commands. The voice-controlled wheelchair convertible bed is made up of the following components:

A. Wheels:

Dragging a load using a wheeled cart is far easier than dragging it on the ground for two reasons: Wheels reduce friction. Instead of simply sliding over the ground, the wheels dig in and rotate, turning around sturdy rods called axles.

Fig 1: Wheels

B. DC Motor:

Two DC motors are used for the movement of the wheel chair in Forward, Reverse, Left, and Right Direction. These motors are controlled from the Microcontroller. L298 is a dual bridge driver IC is used for driving the DC motors.

Fig 2: DC Motors

C. Bluetooth Module HC05

The HCO5 Bluetooth module can be used in a master or slave configuration, make it a greate solution for wireless communication. you can used it simply for a seriel port replacement to established connection between mcu and gps, pc to your embedded project .

The HCO5 BLUETOOTH MODULE AS 6 pins vcc, gnd , tx,rx,key and led. It comes pre-programmed as a slave, so there is no need to connect the key pin, unless you need it change it to master mode.

Fig 3: Bluetooth Module HC-05

D. Arduino UNO Board:

Arduino uno is a microcontroller, helps to make the application of interactive objects accessible. The code is preprogrammed into the on-board microcontroller chip is a boot-loader that allows uploading programs into the microcontroller memory without needing a chip /device programmer. Once the code uploaded can be replaced again by loading another code through USB cable.

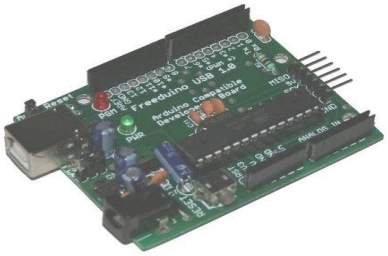

Fig 4: Arduino UNO Board

E. Rechargeable Battery:

A rechargeable battery, also called a storage battery or a secondary cell, is a type of battery that can be recharged over and over again with electrical energy. It helps in avoiding to buy batteries all over again. Rechargeable battery stores electrical energy in form of chemical energy while charging.

Fig 5: Rechargeable Battery

F. L-298 Motor Driver Module:

The L298 N is a dual H-Bridge motor driver which allows speed and direction control of two DC motors at the same time. The module can drive DC motors that have voltages between 5 and 35V, with a peak current up to 2A.

Fig 6: L-298 Motor Driver Module

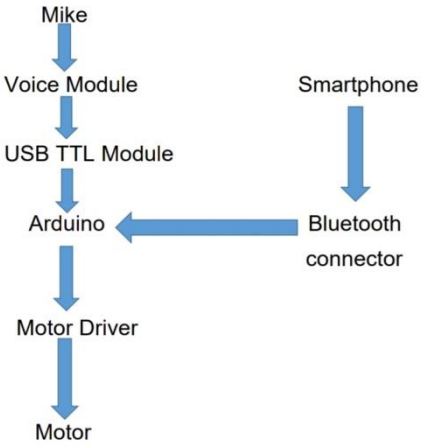

Figure 7: Movement control flow chart

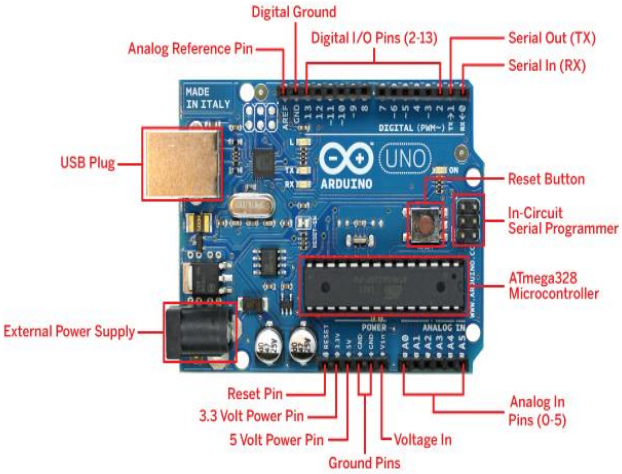

Figure 8: Arduino board representing all components

IV. RESULTS

The prototype of a voice-operated wheelchair cum bed is developed as shown in figure 9.

Figure 9: Prototype of wheelchair cum bed

In future work, we are going to serve our community like stroke patients using wheel chair and their attender. Our proposed system is focused to switch the wheel chair to stretcher .It will be done automatically by analyzing patient heart rate to determine the abnormality of the patient. It will be convenient for stroke patient and provides optimal efficiency. The bed conversion mechanism reduces the strain developed at the back of patient. The height adjustment mechanism helps the person to adjust the height of the wheelchair according to the patients need. The massaging mechanism helps to prevent the bed sores formation and reduces the chances for back sprain. The voice control mechanism allows the chair to move in accordance with the commands given

by the patient. The output was obtained in successful manner. The present product can be further enhanced with certain additional features.

V. CONCLUSION

In this survey paper we have analyzed many journal papers about existing methodologies related to our proposed system. Mostly, they are using mechanical technique which is done manually by a person which faces lots of challenges in current health care industry. Hence we come up with a solution from this survey paper, we suggest combining both mechanical and electrical system to make it automated method for moving wheelchair cum stretcher. It overcomes all of the demerits and provides a unique solution. This automated method is based on the principle of heart rate of the patients and works according to each and every heart rate. When abnormal heart beat prolongs over a certain period of time, the health care professionals can able to sense the condition of the patient using this automated method. The complexities in treatment procedure can also be reduced and more effective when compared to that of manual method. Therefore, the developed voice-controlled wheelchair cum bed can provide easy access for people with physical disabilities and offer more safety due to automatic protection from obstacle collisions.

VI. FUTURE SCOPE

In future work, we are going to serve our community like stroke patients using wheel chair and their attender. Our proposed system is focused to switch the wheel chair to stretcher .It will be done automatically by analyzing patient heart rate to determine the abnormality of the patient. It will be convenient for stroke patient and provides optimal efficiency. A magneto therapy to the legs of a paraplegic wheelchair user can also be incorporated for improving the blood circulation in the legs. Further, the current system consisting mainly of motors for screw jack system for height adjustment can be replaced with a hydraulic system which increases the efficiency of the product.

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