Voice Controlled Wheelchair for Physically Disabled People

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ABSTRACT

Most of the disabled people usually depend on others in their daily life especially in moving from one place to another. For the wheelchair users, continuously they need someone to help them in getting the wheelchair moving. By using a wheelchair control system they become more independent. The moto of this research project is to design and fabricate a voice controlled wheelchair for physically disabled people. The wheelchair control system which deploys a voice recognition system for triggering and controlling all its movements. It integrates a microcontroller, voice recognition through Google assistant, motor control interface board to move the wheelchair. By using the system, the users are able to operate the wheelchair by simply speaking and commanding through Google assistant. The basic functioning process includes forward and reverse direction, left and right turns and stop. It uses a PIC controller manufactured by Microchip Technology to control the system operations. It communicates with the voice recognition through Google assistant and works with the commands which is saved as the number system directed from the Ada-fruit cloud. The speech is given and then determines the corresponding output command to drive the left and right motors. To finish this task, an assembly language program is written and stored in the controller's memory.

Keywords: Voice Controlled Wheelchair, Physically Disabled People

1. INTRODUCTION

The rapid growing and advancement of modern technology has yield to the developments and inventions of modem equipment and machineries. These new findings have eased human significantly in all aspects of their daily lives. One of these new finding that give great impacts and implications to the lifestyles of disabled and handicapped people is the implementation of motorized wheelchair. This research concentrates and focuses on the implementation of a voice-controlled motorized wheelchair. With all the available methods in the ongoing researches, definitely, the daily lifestyle of the disabled people will be improved. The introduction of the motorized wheelchair increases their independency and mobility in the performance of their daily social life activities.

The aim of this research project is to equip the present motorized wheelchair control system with a voice command system. With this system most of the disabled people can move independently is the real moto of the project.

2. MATERIALS AND METHODS

To innovate a realistic voice controlled wheelchair, various kinds of equipment are necessary. Mainly wheelchair is made mechanically or by the installation of mechanical equipment/parts. The electrical equipment components are designed for using in the wheelchair and after installing these in the mechanical wheelchair, the mechanical wheelchair now is turned to an electrical wheelchair. Therefore some of the thoughts worked

useful about the equipment/components used to construct the wheelchair and their installation.

Wheel: A wheel is a circle shaped component that is intended to rotate on an axial bearing. The wheel is one of the primary components of the wheel and axle which is one of the six simple machines. Wheels, in joint combines the points with axles, allow heavy objects to be moved easily facilitating movement or transportation while supporting a load, or performing labor in machines. A unproved, single, double, or compound wheel that is designed to be mounted to the bottom of a larger object (the "vehicle") so as to enable that object to be P-ID 44 which can be easily moved. There are apparatus available in various sizes, and are commonly made of rubber, plastic, nylon, aluminum, or stainless steel. Casters are found for many kinds of applications, including shopping carts, office chairs, and material handling equipment. Generally, casters work with wellness on smooth and flat surfaces.

DC Motor: A dc motor is an electric machine that converts electrical energy into mechanical energy. The opposite conversion of mechanical energy into electrical energy is done by an electric generator. In usual working of motor, many of the electric motors operate through the working between an electric Motor's magnetic field and winding currents to generate force within the motor. In particular applications, such as in the transportation industry with traction motors, electric motors can be worked in both motoring and generating or braking modes to also produce electrical energy from mechanical energy.

Relay: A relay is an electrically operated switch. Some of the relays use an electromagnet to mechanically operate a switch, but other operating principles are also used, such as solid-state relays. These things are operated wherever it is required to control a circuit by a low-power signal, or where several circuits must be controlled by one signal. These were worked extensively in telephone exchanges and early computers to perform logical operations.

Microcontroller: A microcontroller is a small working system on a single integrated circuit containing a processor core, memory, and programmable input/output peripherals. By decreasing the size and price between the design that uses a separate microprocessor, memory, and input/output devices, microcontrollers make it economical to digitally control even more devices and processes.

Node MCU: Node MCU is an open source firmware for which open source prototyping board designs are available. The term "Node MCU" strictly speaking refers to the firmware rather than the associated development kits. The prototyping hardware typically used is a circuit board functioning as a dual in-line package (DIP) which integrates a USB controller with a smaller surface-mounted board containing the MCU and antenna. The design was initially was based on the ESP-12 module of the ESP8266, which is a Wi-Fi SoC integrated with a Tensilica Xtensa LX106 core, widely used in IoT applications.

Ada-Fruit IO IFTTT: Google implemented changes to their API ecosystem that will impact the Gmail service on IFTTT. To the distinct, this change means that all Gmail triggers were removed from IFTTT. If this is an internet service which can listen to services on the internet (such as a new tweet) and trigger physical device actions.
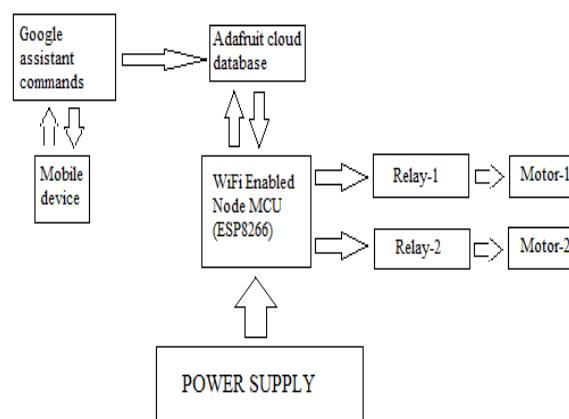
Wheelchair control system block diagram.

Theory of System Operation:

The above figure shows the system block diagram showing the interconnections between each block or module. Every things were mounted onboard as to ease the wheelchair movement. The systems works with a microphone which is located nearest to the user so as to make it handy and easy to use. Usually, the input voice level affects the recognition accuracy result. For the most recognizing result, the microphone should be mounted or attached as closed as possible to the user's mouth. Principally, the system is triggered by the voice command word produced by the user through the use of this microphone. The controller commands for the wheelchair movement by producing words which have been stored previously in the SRAM memory. This SRAM resides in the voice recognition processor. To maintain the system as simple as possible, the words are kept short and the quantity is kept to minimum quantity. The quantity of words can be added and upgraded later on for future development and improvement.

Voice Controlled Wheelchair Fabrication:

The artificial wheelchair is converted into an electrical wheelchair which is operated using voice command. The essential change is to upgrade the manual wheelchair into an electrical wheelchair. So, the things such as motors, pulleys, belts and a battery were required. By the coordination of such mechanical and electrical parts, the manual wheelchair now is turned to be an electrical wheelchair. There were many number of available driving wheel configurations (front wheel drive, rear wheel drive and mid wheel drive) which affect the characteristics of the chair in different situations, with turning while driving being the most complex. Also many features could be added to assist the user such as lights, actuators and wireless links. The main working operation of the powered wheelchair is in the controller as it provides both a conduit for the power to the motors and controls the overall system. The wheels which are interconnected with the motor is obtained as the main wheel. The main wheel is 6" in diameter. This bore is connected to the motor. A caster (or castor) wheel shown which is an undriven, single, double, or compound wheel that is structured to be mounted to the end of a larger object, so this has to enable that object to be easily moved. This part mainly deals with the electrical components used in controlling the wheelchair. This DC motor is an electric motor that runs on direct current (DC) electricity.
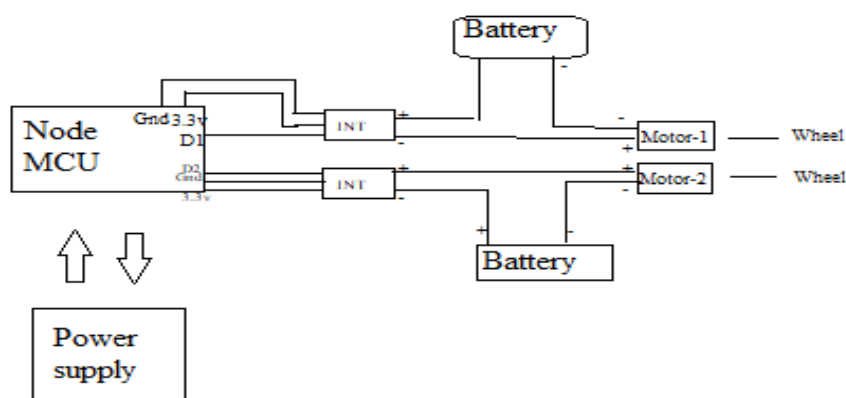
Basic Components of Wheelchair

Operation of the Wheelchair:

A total and latest new designed voice controlled wheel chair for disable person is shown. In this system some advanced voice commands are designed so that the user can choose the speed. The end-user can choose the speed in two levels, either slow or fast speed to move. For an instance if the user need only to move in a short distance or to approach object, he should use the slow speed. The level of speed selection is important for safety and

extra manoeuvrability of the user. The important part of the design is to control the motion of the wheelchair. The above shows the working principle of the wheel chair based on the voice recognition. There were different types of motions considered, moving forward, moving in reverse direction, moving to the left and moving to the right. For leveling the speed, the user may use slow or fast speed. Lowering the speed is important as the user want to move in short distance or approaching an object. These system initiates by applying the supply voltage to the speech recognition circuit. This system will be also in stand by condition in which the LED on circuit recognition board will be turned on.

3. RESULTS

The most essential aspect of the wheelchair system is to find its velocity. At the time the voice controlled wheelchair moving in a straight line, the distance and time is noted for velocity. This wheel chair velocity needs to be experimented under two conditions. First the velocity is observed in unloaded condition. This system of wheelchair was made to move in a straight line and the velocity is found 1.53ft/s. The next thing, with 15kg loads was allowed the wheelchair to carry the load and the velocity was found 1.24ft/s. At the end a person weighing 30kg was seated at the wheelchair. This system of voice controlled wheelchair was worked to move in a straight line. The wheel chair's velocity with this load is 1.21ft/s. From the operated result, the velocity of voice controlled wheelchair is affected by the load. This is obtained that the velocity of the wheelchair system will decrease proportional to the load that is carried by the system.

4. CONCLUSION

This main moto of this research was to design and fabricated a voice controlled wheelchair for disabled people usually depend on others in their daily life especially in getting from one place to another. From the above results and discussions following conclusion can be drawn. This system of voice controlled wheel chair runs successfully with a speed 1.21ft/s for 30kg load. This working system responds to the voice command from its user to perform any movements functions. The simple movement functions include forward direction, left and right turns and stop. To identify the spoken words, the voice recognition processor must be trained with the word spoken out by the user who is going to operate the wheelchair. The motor drive and control system of the intelligent wheelchair has been presented. This way of proposed microcontroller based voice operated intelligent wheelchair would bring more convenience for the disabled people.

5. REFERENCES

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