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E-VEHICLE FOR PHYSICALLY CHALLENGED PEOPLE

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ABSTRACT

Over the last few years the automotive industry has advanced significantly towards a future without human drivers. Researchers are currently trying to overcome the technological, political and social changes involved in making autonomous vehicles mainstream. These vehicles need to be safe, reliable and cost-efficient. This project proposes a vehicle to everything coordination protocol for autonomous vehicles and a testing environment where it will be evaluated. In order to assist physically challenged persons, we developed a voice controlled e-vehicle. The user can control the e-vehicle by voice commands, such as "start, stop, right, left". The voice recognition module V3 is used. Two type commands, the basic reaction command and the verification command, are given. We tested speech recognition by V3 module, and obtained recognition rate 98.3%, 97.0% of the reaction command and the verification command, respectively. The running experiment with a person was carried out in the campus.

1.INTRODUCTION

The old person and the physically challenged person have many constraints in riding a vehicle. The interface of vehicle, voice, direction are proposed for physically challenged person vehicle. Though a person moves his face and the direction of his eyes unconsciously, unnaturalness causes to use these movements as the interface consciously. Operation by signal needs the skill, and a mental burden is forced on the user to use a contact type sensor to measure these signals. On the opposite hand, voice is a natural communication way, and voice is one of the easy interfaces. This research develops a voice controlled vehicle which uses the voice command as the interface. The basic modes of the vehicle is, 1) running until next command is input, 2) turning or rotating, and 3) stopping. Though, our system has these modes, in this paper, to use in the narrow space, we use four commands which move short distance. Moreover, we have a tendency to additionally use 2 sort verification (acceptance and rejection) commands to forestall the incorrect reaction by the misrecognition. The running experiments square measure administered with some persons within the field passageway.

1.1EVOLUTION OF E-VEHICLE

RobChair project aims to apply robotic algorithms on a powered wheelchair in order to improve mobility and safety. Users with severe motor handicaps such as tetraplegia and general muscle degeneration are unable to steer their own wheelchair through a conventional joystick, often depending on other persons. By providing the wheelchair with new Human–Machine Interfaces (HMI) and increasing the wheelchair moving autonomy, it is possible to contribute to the social independence of this group of wheelchair users. In order to extend the RobChair accessibility, a new interface has been incorporated on the wheelchair: a voice HMI. The voice/speech is a natural form of communication and suits perfectly for users with severe motor restrictions. However, this new interface does not solve completely the steering problem. Low-level voice commands square measure distinct and provides rough direction data.

Speech is that the most typical approach to convey for individuals whereas this has been valid since the start of human advancement, the innovation and across the board utilization of the phone, radio, and TV has given considerably any significance to speech correspondence and speech process. The advances in computerised sign reworking innovation have driven the use of speech process in numerous application regions like speech compression, enhancement, synthesis, and recognition. Voice recognition is that the methodology of taking the talked word as a knowledge to a machine program. This procedure is vital to computer game in lightweight of the actual fact that it offers a genuinely regular and self regulated methodology for dominant the recreation whereas allowing the user's hands to stay free. Voice recognition is "the innovation by that sounds, talked by people unit changed over into electrical signs, and these signs unit changed become secret writing examples to which importance has been allocated".

2.COMPONENTS OF E-VEHICLE

The components include a vehicle setup, battery, BLDC motor, BLDC motor controller, DC-DC converter.

2.1.VEHICLE SETUP

The E-Vehicle is a Three wheeled Concept Prototype. The Front Wheel is fitted with the Hub Motor. The rear two wheels are small normal wheels for motion. It has a Seating platform to carry a person. The Steering motor is mounted on the Front column below the handle bar. The battery, Motor Controller and the Autonomous Vehicle Controller Unit (AVCU) are housed below the Seat.

2.2.BATTERY

Amco batteries are widely used in the vehicles of various top manufacturers as the products are known for their durability and long years of service. Be it a self start vehicle, the batteries offered by Amco can deliver impeccable power to keep the vehicle running even during the wintry days. This amco battery is an ideal choice for all types of two wheelers as it can help in instant start and rules out self discharge issue.

2.3.BLDC MOTOR AND CONTROLLER

Plain electric motors use a mechanical device called commutator and two contacts called carbon brushes to reverse the electric current continuously and ensure the axle keeps surrendering constant direction.Hub motors are typically brushless motors (sometimes called brushless direct current motors or BLDCs), which replace the commutator and brushes with half-a-dozen or more separate coils and an electronic circuit. The circuit switches the power on and off within the coils successively making forces in each that build the motor spin. Since the brushes press against the axle of a normal motor, they start friction, slow it down, make a certain amount of noise, and waste energy. That's why brushless motors are often more efficient, especially at low speeds.In a normal motor, you'd expect the inner coil to rotate (it's called the rotor) and the outer magnet to stay static (that's called the stator). But during this motor, the roles are reversed: the inner part with the coils is static and the gray magnet spins around it. The electronic circuit sends power round the 9 copper coils successively, making the gray outer case (which is a magnet split into a number of sections, bent round into a circle) spin around the copper coils and circuit board (which remain static).There are several tiny magnetic field sensors (known as Hall-effect sensors) positioned between some of the coils. The trouble with this is that it means the motor does need an electronic circuit to operate it, which is something you don't need for an ordinary DC motor.

2.4.DC-DC CONVERTER

As its name implies, a DC-DC converter converts one DC voltage to another. The operating voltage of different electronic devices such as ICs can vary over a wide range, making it necessary to provide a voltage for each device. A Buck Converter outputs a lower voltage than the first voltage. Here it converts 48V to 12V.

3 .HARDWARE COMPONENTS

3.1 ATMEGA328P MICROCONTROLLER

The superior semiconductor unit picoPower 8-bit AVR RISC-based microcontroller combines 32KB ISP non volatile storage with read-while-write capabilities, 1024B EEPROM, 2KB SRAM, 23 general purpose input lines, 32 general purpose operating registers, three flexible timer/counters with compare modes, internal and external interrupts, serial programmable USART, a byte-oriented 2-wire serial interface, SPI serial port, a 6-channel 10-bit A/D converter, programmable timer with internal oscillator, and 5 software selectable power saving modes. The device operates between 1.8-5.5V. By effecting heavy instructions in a exceedingly single clock cycle, the device achieves throughputs approaching 1 MIPS per MHz, maintaining power consumption and processing speed.

3.2.VOICE RECOGNITION MODULE V3

Voice recognition module V3 is one of the most compact and easy-to-control voice recognition module.There are two ways for using this module, using the serial port or through the built-in GPIO pins. The V3 board has the capability to store up to 80 voice commands each with a length of 1500 milliseconds. This one wont convert your commands to text however compare it with associate already recorded set of voices. S o technically there aren't any language barriers to use this product. You can record your command in any language or virtually any sound are often recorded and used as a command. So you wish to coach it initial before you let it acknoeledge any voice commands.While using the module with it's GPIO pins, the module will deliver outputs for only 7 commands out of the 80

.

3.2 Voice Recognition Module V3

For this method you need to select and load 7 commands in to the recognizer and the recognizer will send outputs to the respective GPIO pins if any of these voice commands gets recognized.The device works at an input voltage range of 4.5 - 5 volts and will draw a current less than 40 mA. This module will work with ninety nice recognition accuracy if its used below ideal conditions. The choice of electro-acoustic transducer and therefore noise within the surroundings plays an important role in moving the performance of the module. It's higher to decide on a electro-acoustic transducer with sensible sensitivity and take a look at to cut back the noise in your background whereas giving commands to induce the most performance out of the module.The size of the module is 31mm x 50mm.

3.3.ULTRASONIC SENSOR

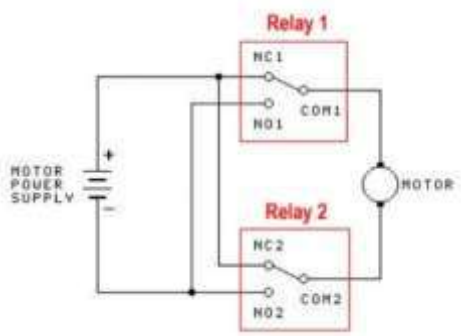
HC-SR04 Ultrasonic (US) sensor is a 4 pin module, whose pin names are Vcc, Trigger, Echo and Ground respectively. This sensing element may be a very hip sensing element employed in several applications whenever mensuration distance or sensing objects square measured needed. The module has 2 eyes like comes within the front that forms the inaudible transmitter and Receiver. The sensor works with the simple high school formula that Distance = Speed * Time. The Ultrasonic transmitter transmits an ultrasonic wave, this wave travels in air and when it gets objected by any material it gets mirrored back toward the sensing element this mirrored wave is determined by the inaudible receiver module.

3.4 DC MOTOR

12V 55Rpm DC Motor is commonly used as wiper motor for cars, but it can also be used in the field vehicles that require high power. The motor speed is 55rpm and since the bearing used its no downside with longer operation times. The motor has 6mm screw holes for mounting and its intended to air left facet of the motor.

3.5 DRIVER CIRCUIT

The driver circuit consists of two relays.The supply voltage for the driver circuit is 12V.Each of the relay is triggered at a constant voltage pulse, the control is then given to the motor and the direction is controlled. To stop the rotation at certain angle time delay is given. To protect from high voltage, optocoupler is used.



3.5 Driver Circuit

4.SOFTWARE COMPONENTS

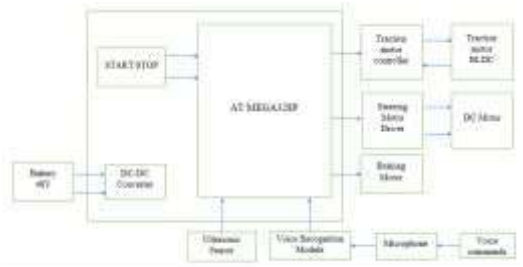
4.1ARDUINO SOFTWARE IDE

The most important one is the way every Arduino board is easily programmed with the ardunio software (IDE).It is enough to connect the board to the computer USB port and press the "Upload" icon to start the process that transfers the sketch into the flash memory of the microcontroller. The little piece of code is called "Bootloader" and to program the bootloader, need to use an In-circuit Serial Programmer(ISP) that is the device that connects to a specific set of pins of the microcontroller to perform the programming of the full non-volatile storage. The process of loading the bootloader code and burning the fuses properly to make an ATmega microcontroller an "Arduino" is managed by the Arduino software(IDE).This process uses VCC,GND and four data pins.Three pins connect MISO,MOSI and SCK between the programming micro and the target micro, the fourth pin from the programming micro goes to the reset pin of the target.

5.METHODOLOGIES

5.1.OVERALL OPERATION

The Arduino and the module are connected. To train the module, program is uploaded in the Arduino. The baud rate is set using the serial monitor. By using the 'train' command, the voice commands are stored in specific address. Eg. train 20, train 2, etc. The commands are given after a message 'speak now' appear in the window. If the command is clear enough, another message show up asking to speak again, and the command is registered. When both the commands are matched, 'trained successful' message is appeared in the window. The commands are loaded to the board by 'load' command.



5.1 Functional Block Diagram

5.2.START-STOP

To start the vehicle, commands are given through the voice recognition module. 'start' command is given through voice recognition module. The Arduino board and the module are interlinked and it is programmed to run at a certain speed (2 kmph). When the given command matches with the trained command the vehicle starts to run. When the command is 'stop' and as the command matches, the speed of the vehicle is made zero and thus the vehicle stops.

5.3.SPEED CONTROL

The voice commands like low, medium and high are given and the respective changes are observed. When the command is given a throttle voltage value is set and the corresponding action is done. When the command is low, the voltage value is set 0.25V and hence the vehicle runs in 2kmph. When the command is medium, the voltage value is set 0.45V and the vehicle runs in 5kmph. When the command is high, the voltage value is set 0.51V and the vehicle runs in 10kmph.

5.4.STEERING CONTROL

The steering control is done with the help of a DC motor through the voice commands. The change in direction of the motor is controlled by the relay driver circuit. To stop at certain angle, the angle of dc motor is adjusted by giving time delay in the programming. When the command is given as left the steering steers to left at an angle of 50 degree and when the command is right, it steers right at an angle of 50 degree. By this stage the steering is in centre position. So by using the commands the steering control is made like left, centre position(right command), right, centre position(left command).

CONCLUSION

The project is tested for the movement of the vehicle using trained voice and after the design and development of the vehicle with various interfacing units.On the basis of two important aspects, firstly, on the accuracy of the voice system and secondly the vehicle velocity by means of control commands is experimented. This would be implemented for physically challenged people. Firstly the voice recognition system is tested in a quiet room with single user. Every word is correctly recognized and the corresponding action is done.After this system is tested in a noisy environment, there is no problem in correctly recognizing the words.

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