

Voice Operated Logical Switching Circuit Applied for Electrical Vehicles

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Abstract: *In natural we use electrical vehicles in loaded and unloaded constraints, so we have power switching problems. We came out with a new proposal model with switching through voice and operated with logical circuit in managing series and parallel connections with manual voice communication. Communication plays a major role in day to day life and can be used as a better tool in control system. Voice recognition systems work sensibly well with some quiet conditions. However, inadequately underload conditions or in twisted channels. Voice recognition application is interfaced with motors using micro controller. This can also be controlled through simple voice commands. Different from the conventional voltage equalizers which are developed by switched mode power converters, bulky magnetic components and complex monitoring and controlled system are avoided in the proposed system. This application mainly useful for speech enabled vehicle design and development. It deals with wireless communication and voice recognition and is used to control the motor speed. The key focus of the project is to control an electric vehicle.*

Keywords: *Electrical Vehicles, Voice Operated Logical Switching Circuit, Microcontroller, Bluetooth, Solid State Relays.*

I. INTRODUCTION

Automobile industry is the fundamental industry of national economy, it is closely related to peoples' life, and it has become an essential factor of modern society. However, although providing us fast and comfortable vehicles, traditional automobile industry consuming petroleum has already caused the economy's deep dependent on fossil energy resource and has made the conflict between energy production and consumption even worse. Moreover, the air pollution and global warming caused by CO₂ has made a great influence on the environment in which we human beings are living. In the circumstance of energy and environment crisis, increasing the efficiency of energy consumption and reducing the discharge of harmful waste are highly required.

Electric vehicles are significantly quieter than conventional internal combustion engine automobiles. They do not emit tailpipe pollutants, giving a large reduction of local air pollution, and, can give a significant reduction in total greenhouse gas and other emissions. Boasting features like immediate torque, silent ride, and premium performance, EVs also have lower fuel and maintenance costs. And consumers ultimately garner social pride and responsibility from creating a better, healthier planet. For all of these reasons and more, EVs have caught the attention of car-lovers and costumers. A battery electric vehicle (BEV) has far fewer moving parts than a conventional gasoline-powered vehicle. There's no need for liquid fuels or oil changes. There's no transmission or timing belt to fail when you least expect it. In fact, most of the maintenance costs associated with an internal combustion engine are eliminated.

These days, automotive has turned into a stand out amongst the most well-known modes of transportation on the grounds. There are numerous decisions of innovations in the market. One of the engineering is voice controlled framework. Voice Recognition is the procedure of consequently perceiving a certain statement talked by a specific speaker focused around individual data included in discourse waves. An electric vehicle is controlled by voice of human. An essential pre-processing venture in Voice Recognition systems is to recognize the vicinity of noise. Sensitivity to speech variability, lacking recognition precision, and helplessness to mimic are among the principle specialized obstacles that keep the far-reaching selection of speech-based recognition systems. Voice recognition systems worksensibly well with a quiet condition however inadequately under loud conditions or in twisted channels. Speech is the most common approach to convey for people. While this has been valid since the beginning of human advancement, the innovation and across the board utilization of the phone, radio, and TV has given significantly further significance to speech correspondence and speech processing. The advances in computerized sign transforming innovation have driven the utilization of speech processing in various application regions like speech compression, enhancement, synthesis, and recognition.

Voice recognition is the methodology of taking the talked word as a data to a machine program. This procedure is critical to virtual reality in light of the fact that it gives a genuinely regular and instinctive method for controlling the recreation while permitting the user's hands to stay free. Voice recognition is the innovation by which sounds, words or expressions talked by people are changed

over into electrical signs, and these signs are changed into coding examples to which importance has been allocated. While the idea could all the more by and large is called sound recognition. This extend concentrates on the human voice in light of the fact that regularly and most characteristically utilize our voices to impart our thoughts to others in our prompt surroundings. Voice control is coming to control car starter system. The procedure is perceives a certain expression talked by the user. The user will charge through receiver introduced in the car. The signal in analogue form will converted into digital form.

II. VOICE OPERATED LOGICAL SWITCHING CIRCUIT APPLIED FOR ELECTRICAL VEHICLES

The gist of the paper is to reduce the complexity and to control the speed by implementing the voice operated control of the electrical vehicles using logical switching. We came out with new proposal model with switching through voice and operated with android mobile to transmit signals through google play talk and send that information for microcontroller and activate logical circuit in managing series and parallel connection depending upon loaded and unloaded constraints.

The voice commands act as the controlling commands. The voice commands which are series and parallel are given through the android mobile. These are received by Bluetooth through a wireless Ad-huc network. This Bluetooth acts as a transmitter and transmits these voice commands as the signals to the microcontroller. This microcontroller acts as a receiver and receives these commands. Relay and diode form a logical circuit and acts as logical switches. According to the commands the relays switch logically. The series command resulting in the switching of the relay in the series connection whereas the parallel command resulting in the switching of the relay in the parallel connection. This logical switching is applied for the electrical vehicles to control the speed of the motor of the electrical vehicle and thereby giving a safe and efficient ride for the users.

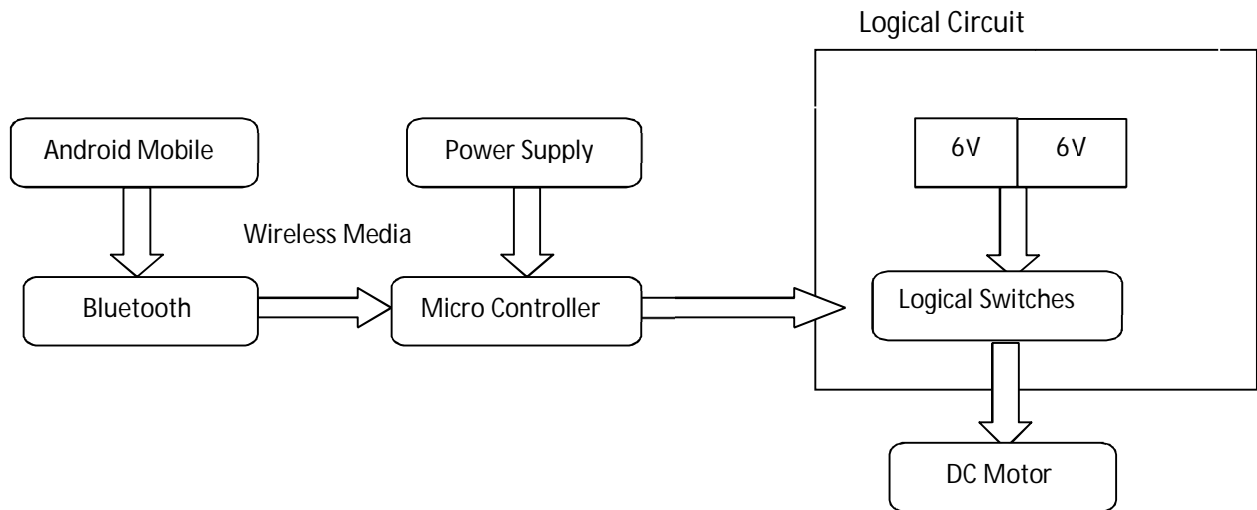


Fig. 1 Block diagram

III. SCHEMATIC DIAGRAM AND OPERATION

The micro controller is the main component is responsible for all the operations performed in the paper. In this paper we are using a Bluetooth module, two relays, two rechargeable batteries, and two dc motors. Here we give a voice commands which are series and parallel commands through android mobile using google play talk services. The Android mobile acts as a transmitter. These commands are received by a Bluetooth module HC05. The Bluetooth thus acts as a receiver. The commands series and parallel are received as a code by Bluetooth via an Ad-huc network, a wireless ad hoc network (WANET) is a decentralized type of wireless network.

Thus the commands received by Bluetooth acts as input to the microcontroller. The Atmega 328 microcontroller is used as the main controller is supplied with a 9V battery. The Tx and Rx of the Bluetooth are connected to the Rx and Tx of the microcontroller respectively and serial communication is done. The microcontroller output is connected to the solid state relays. The relays are connected with batteries and a diode is connected at the output of the relay circuit which is a logical circuit.

The dc motors are controlled through the switching of the relays. These form a logical circuit for switching in series and parallel. If we follow the power and ground leads from the battery, we see that each normally closed position is connected to positive (+) and

each normally open position is connected to ground (-). In this way, the motor normally sees +12V at both leads. Since there is no net difference in potential, the motor operates in series mode. Similarly, if the motor sees +6V at both leads then the motor operates in parallel mode. A diode is connected to the relay circuit to give a uni directional flow by blocking the reverse flow of charge. When the series command is given since the batteries are connected in series connection the voltage will be 12V. The relay will drive the motor in series mode. Similarly if the command is parallel, since the batteries are connected in parallel connection the voltage will be 6V. The relay will drive the motor in parallel mode. since two dc motors are used according to the command resulting in the given mode series or parallel the concerned motor is said to be operated. Thus the serial parallel switching is done with the logical circuit based on the voice commands given and hence used to control the electrical vehicle.

IV. HARDWARE IMPLEMENTATION

In the quest of a new design which comparatively ensures more safety than conventional methods we planned to design a new model which executes a drastic change in electrical vehicles if the design is implemented in a perfect way obviously it might be a new era in electrical vehicles to concentrate more on quality rather than quantity. Our design is voice operated logical switching with speed alerting system applied for electrical vehicles. In this design, we are going to control electrical vehicle using micro-controller, motors, voice commands and sensors

A. Android Mobile

We use android mobile as a transmitter i.e., we give voice commands through the android mobile. For this we use google play talk services. Android's default user interface is mainly based on direct manipulation, using touch inputs that loosely correspond to real-world actions, like swiping, tapping, pinching, and reverse pinching to manipulate on-screen objects, along with a virtual keyboard.

B. Bluetooth

Bluetooth is a wireless technology standard for exchanging data over short distances (using short-wavelength UHF radio waves in the ISM band from 2.4 to 2.485 GHz) from fixed and mobile devices, and building personal area networks (PANs). Bluetooth is managed by the Bluetooth Special Interest Group (SIG), which has more than 30,000 member companies in the areas of telecommunication, computing, networking, and consumer electronics.

C. Microcontroller

This project employs the 16-bit microcontroller from Arduino UNO ATmega328. The micro controller is the main component of the whole project. It is responsible for all the operations performed in the project. The microcontroller in our voice control system is used for sending signals which takes input from the Bluetooth and output is given to relays. A coding is already stored in the Arduino ATmega328 microcontroller. When a logical switching takes place with a voice response though Bluetooth this signals received by Bluetooth are given as input to the microcontroller in order to run the motor according to the given voice command.

D. Solid State Relay

Solid State Relays are normally open semiconductor equivalents of the electromechanical relay that can be used to control electrical loads without the use of moving parts Unlike electro-mechanical relays (EMR) which use coils, magnetic fields, springs and mechanical contacts to operate, the solid-state relay, or SSR, has no moving parts but instead uses the electrical and optical properties of solid state semiconductors to perform its input to output isolation and switching functions.

E. Diode

A diode is a device which only allows unidirectional flow of current if operated within a rated specified voltage level. A diode only blocks current in the reverse direction while the reverse voltage is within a limited range otherwise reverse barrier breaks and the voltage at which this breakdown occurs is called reverse breakdown voltage. The diode acts as a valve in the electronic and electrical circuit. A diode allows electrical current to flow in one direction -- from the anode to the cathode.

F. Battery

An electrical battery is one or more electrochemical cells that convert stored chemical energy into electrical energy. The invention of the first battery (or voltaic pile) was in 1800 by Alessandro Volta.

G. DC Motor

DC motors consist of one set of coils, called armature winding, inside another set of coils or a set of permanent magnets, called the stator. Applying a voltage to the coils produces a torque in the armature, resulting in motion. The stator is the stationary outside part of a motor. The stator of a permanent magnet dc motor is composed of two or more permanent magnet pole pieces. The magnetic field can alternatively be created by an electromagnet. In this case, a DC coil (field winding) is wound around a magnetic material that forms part of the stator. The rotor is the inner part which rotates. The rotor is composed of windings (called armature windings) which are connected to the external circuit through a mechanical commutator. Both stator and rotor are made of ferromagnetic materials. The two are separated by air-gap. A winding is made up of series or parallel connection of coils. Armature winding-the winding through which the voltage is applied or induced. Field winding the winding through which a current is passed to produce flux Windings are usually made of copper. If electrical energy is supplied to a conductor lying perpendicular to a magnetic field, the interaction of current flowing in the conductor and the magnetic field will produce mechanical and the direction of force. This voltage is in opposition to the voltage that causes current flow through the conductor and is referred to as a counter-voltage or back EMF. The value of current flowing through the armature is dependent upon the difference between the applied voltage and this counter-voltage. The current due to this counter-voltage tends to oppose the very cause for its production according to Lenz's law. Eventually, the rotor slows just Induced EMF. Flux enough so that the force created by the magnetic field equals the load force applied on the shaft. Then the system moves at constant velocity.

Table 1 Technical Specifications

| S. No | Name | Specification |
|-------|-------------------|---------------|
| 1 | Bluetooth | Hc05 |
| 2 | Microcontroller | Atmega328 |
| 3 | Solid State Relay | 12V, 10A |
| 4 | Batteries | 6v, 9V |
| 5 | Diode | In4007 |
| 6 | DC Motor | 12v, 100RPM |

V. RESULTS

The dc motors are controlled through the switching of the relays. These form a logical circuit for switching in series and parallel. If we follow the power and ground leads from the battery, we see that each normally closed position is connected to positive (+) and each normally open position is connected to ground (-). In this way, the motor normally sees +12V at both leads. Since there is no net difference in potential, the motor operates in series mode. Similarly, if the motor sees +6V at both leads then the motor operates in parallel mode. A diode is connected to the relay circuit to give a uni directional flow by blocking the reverse flow of charge.

When the series command is given since the batteries are connected in series connection the voltage will be 12V. The relay will drive the motor in series mode. Similarly if the command is parallel, since the batteries are connected in parallel connection the voltage will be 6V. The relay will drive the motor in parallel mode.

When the voice commands are given through the mobile the series and parallel switching is done according to type of voice command i.e., series or parallel. We can observe the change in speed when there is a load applied on the vehicle. We also observe the variation in speed according to the type of switching based on the type of voice command given by the user. The voltages and the speed for the type of connection are shown in the tabular form.

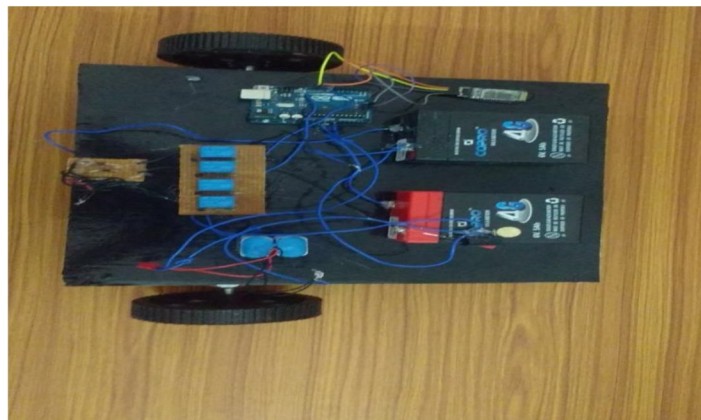


Fig. 2 Hardware Implementation Kit

Table 2 Results

| Type of switching | Voltage | speed |
|-------------------|---------|-------|
| Series | 12v | 92rpm |
| Parallel | 6v | 46rpm |

VI. CONCLUSION

Voice operated logical switching circuit applied for electrical vehicles improves the quality of ride and speed control of electrical vehicles by logical switching with economical, reliable and accurate design. We are implementing the switching of series parallel connection by using logical switching circuit with a voice command. The system can be implemented for electrical vehicles. By this method some of the disadvantages faced due to conventional controlling techniques and the complexity can be overcome.

The main advantage of this project is it can merge with existing system. The initial cost as well as maintenance cost of the system is very less. So, developing countries like INDIA can bear these costs in order to implement this design in the real time. In future, our design will be a more useful to encourage the usage of electric vehicles. We hope this controlling method gives safe and secure journey for the users.

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