

MOTOR SPEED CONTROLLING IN RF USING ARDUINO

Submitted in partial fulfillment of the requirements for
the award of
Bachelor of Engineering degree in Computer Science and Engineering

by

J.D.Vin Ronald (Reg No. 37110839)



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
SCHOOL OF COMPUTING**

SATHYABAMA

**INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)**

**Accredited with Grade "A" by NAAC
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CHENNAI – 600 119**

MARCH - 2021



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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

BONAFIDE CERTIFICATE

This is to certify that this project report is the bonafide work of **J.D.VIN RONALD** (Reg. No. 37110839) who carried out the project entitled "**MOTOR SPEED CONTROLLING IN RF USING ARDUINO**" under my supervision from **August 2020** to **March 2021**.

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DECLARATION

I **J.D.VIN RONALD** hereby declare that the Project Report entitled “**MOTOR SPEED CONTROLLING IN RF USING ARDUINO**” is done by me under the guidance of **Ms.T. Anandhi, M.E., CSE** Department of Computer Science and Engineering at Sathyabama Institute of Science and Technology is submitted in partial fulfillment of the requirements for the award of Bachelor of Engineering degree in Computer Science and Engineering.

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ABSTRACT

The aim of this project is to limit the speed of vehicles automatically in speed-restricted areas such as the school and hospital zone, U-turn, etc., and to avoid accidents using an ultrasonic sensor. Special type of transmitters which are tuned at a frequency of 433MHZ are placed in a particular region. These transmitters radiate RF signals continuously. The receiver in the vehicle is enabled when the vehicle comes within this radiation. Whenever the vehicle is within the zone, the speed of the vehicle is controlled by the received signals. That is, each time the speed of the vehicle is decreased to some cut-off and kept constant until the vehicle moves out of the zone and the vehicle can accelerate itself. The ultrasonic sensor device continuously sends signals to any vehicle or other obstacles in front of the car and detects them. The distance which can be reached by the ultrasonic sensor is not more than 4 meters. After receiving this signal, when any obstacle or vehicle detected by the ultrasonic sensor device sends a signal to the arduino, the arduino sends a signal to the motor and the vehicle stops immediately.

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CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

In our project, the control of the device was completely controlled by RF technology. The circuit used to control this operation is very simple. Before that, we will discuss various components used in project hardware and their operation in the next job so that block diagram can be understood and work well in the next job. In many applications, the DC motor is sometimes used as a special technique in many industries for special control of speed and direction control. The adverse effect on the output of the process is the use of a speed control method. In some cases, automatic speed control is required. It is necessary to control the motor speed using wireless in industries. The power supply is fed from the source to the DC motor. The goal behind the selection of this project is to provide users with a full automated control system that provides easy access beyond distance and time, and also provides accuracy and reliability. The main objective of the project is to create a flexible device that can control the DC motor by using communication. The data obtained by the controller can be encoded through an RF encoder. The encoded data will then be transmitted by the transmitter over the wireless medium and will be received by the receiver of the RF. The following project will deal with the speed control of the vehicle using the RF transmitter and the integration of the obstacle detector with the receiver. The transmitter must be mounted at required locations where the vehicle's speed limit needs to be tested, such as hospital, school, highways, official government buildings, U-Turns, etc. The transmitter transmits a signal and, for speed control purposes, the receiver has to be mounted inside the car. The vehicle's speed is limited to a certain cutoff while the vehicle is inside the transmitter zone and kept constant until the vehicle moves out of the transmitter zone. The vehicle will accelerate by itself after that. By stopping the vehicle immediately, the ultrasonic sensor allows the vehicle to locate any obstacle in front and avoid accidents. The concern of car accidents is part of an endless list of disasters that can happen anywhere at any moment. According to the Association for Safe International Road Travel[1], nearly 1.24

million people die each year and 50 million are injured on the world's roads. For example, carelessness when turning a radio on/off, searching for temperature control, searching for light control, etc. There are several reasons why vehicle accidents can occur.

A Jordan Vehicle Accident Accordance Report. Traffic incidents are a big social problem in many parts of the world (i.e., in Jordan). They are considered the second leading cause of death statistically. Many car manufacturers and automotive machinery suppliers have attempted to build speed control systems to maintain a reasonable distance from the vehicle in order to solve these problems. Causes of car accidents in Jordan Two approaches have commonly been used; one is the laser-based approach, the other is the radar-based approach. The systems do not track vehicles in adverse weather conditions in the Laser-based form, nor do they track extremely dirty vehicles reliably. Another implication implied is that it is necessary to expose the sensors. The system can be hidden behind plastic fascias in the Radar-based kind. In 1995, Mitsubishi Inc.[3] was the first automaker to offer a laser-based ASC system marketed as "Preview Distance Control" on the Japanese Mitsubishi Diamante. Such features as BMW, Mercedes-Benz, Audi, Honda, and Hyundai were then used by more manufacturers. The implementation of additional goals in automated vehicle control, such as fuel economy and speed control required by the driver, has recently begun to be explored by researchers. Shengbo et al.[4,5] proposed the use of automatic speed control to minimize vehicle fuel consumption and considered the difficulties of the driver's desired answer, suggesting the need to adjust to the specific driving requirements of drivers. The key difference between the transistor and the receiver is the sensing range, i.e. the transistor range is narrower, which in the ASC systems is a big problem.

1.2 AUTOMATED SPEED CONTROL (ASC)

The general architecture is implemented for every ASC framework . The Arduino Mega is used in this paper to provide all the necessary functions for the vehicle safety control proposed. The Arduino Mega device is a board based on the ATmega2560 microcontroller. It has 54 digital input/output pins, 16 analogue inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator along with

other required connections (of which 14 can be used as PWM outputs). It contains all the parts required to support the microcontroller and is operated by a USB-cable computer[9]. Although the Arduino device is an educational tool for testing new concepts, it can be easily converted using an ATmega2560 microcontroller (used on the Arduino mega board) with the necessary connections for real implementation.

The ASC is carried out in the proposed work using the Arduino map function that, in a way, is similar to a fuzzy controller. "The structure of the map function is: "map (value, from Low, from High, to Low, to High)". From one set to another, the function remaps a given number. For example, a given value of "from Low" would be mapped to "to Low"; a value of "from High" would be mapped to "to High"; an in-between value would be mapped to a different value [9]. "However, the value "from High" from above would be mapped to "to High" from above and thus another "constrain" function is used to hold the value in the correct range[9]. The map function's value reflects the distance measured by the ultra sonic sensor as it falls within a certain range. If the value drop into a lower range, it is appropriate to stop the car. As normal, a command is sent to activate the ultra sonic signal, measuring the time needed for the return of the echo signal. Using the following sound equation, the distance is calculated: $(\frac{1}{2}) \text{ Scale } T V h = (1)$ where the high level time is $V = 340 \text{ m/s}$ and T_h . In the next step, the speed of the vehicle is measured using a suitable sensor, such as an accelerometer. The distance and speed values are inserted into the controller algorithm, where a test algorithm is used to test whether the distance needed is greater than the current distance. If the distance needed is less than the current distance, the speed of the vehicle should be maintained; otherwise, the speed should be decreased to less than the maximum speed required.

CHAPTER 2

BACKGROUND OF PROJECT

2.1 BACKGROUND OF PROJECT

A large amount of road accidents take place every year only because of reckless driving of the drivers and because of this, people get injured and killed. For those who get seriously injured and become physically impaired people, the tale is more hideous. It must come to an end here. Restless driving needs to be monitored. So we were thinking about implementing unique safe zones across the country in which vehicles are automatically forced to hold their speed at some safe level and are unable to speed up their vehicle while they are in that area. These zones are created by concentrating on public areas such as schools, hospitals, busy roads, U-Turns, etc.

2.2 PROBLEM STATEMENT

In any state or country that deals with high traffic during the year, there are certain highways. In order to operate comfortable cars, there must be a certain speed limit on those highways. Roads in front of schools, colleges, universities, official government offices, Uturns, etc. are also at high risk of road accidents in busy areas. So our community wanted to make these vital areas a special safe zone for both adults and children. This safe zone would ensure that the vehicles have a certain speed limit so that, if they are within that range.

2.3 OBJECTIVE

The main objectives of the following projects are:

- Making the roads safer for every person in the world. For regulating vehicle drivers' careless and reckless driving.
- Vehicle speed control in particular selected areas where the speed limit of the vehicle is to be decided by the governing authority.
- To create a vehicle that can defend itself with acceleration or high speed from collisions as it closes to another object or automobile.

CHAPTER 3

3.1 HARDWARE DETAILS

- 3.2 Arduino UNO
- 3.3 RELAY AND 4 CHANNEL RELAY MODULE
- 3.4 POWER SUPPLY
- 3.5 HW WATT BATTERY
- 3.6 DC MOTOR
- 3.7 RF module
- 3.8 Jumper Wire

3.2 ARDUINO UNO

The Uno is based on the ATmega328P and is a microcontroller board. It has 14 digital input/output pins, 6 analogue inputs, a 16 MHz quartz crystal, a USB link, a power jack, an ICSP header and a reset button (of which 6 can be used as PWM outputs). It contains all the microcontroller needs to support; just connect it to a computer with a USB cable or power it to get started with an AC-to-DC adapter or battery. Without thinking too much about doing something wrong, you can tinker with your UNO, you can swap the chip for a few bucks and start again, worst case scenario. 'Uno' means one in Italian and has been chosen to mark the launch of Arduino Program (IDE) 1.0. The reference versions of Arduino were the Uno board and version 1.0 of Arduino Software (IDE), which have now developed into newer updates. The Uno board is the first in a series of Arduino USB boards and the reference model for the Arduino platform. If you have a piece of software in your microcontroller that enables you to instal new firmware using an external programmer, microcontrollers are normally programmed through a programmer. This is referred to as a bootloader. The ATmega328 on the Uno comes with a bootloader preprogrammed to allow you to upload new code to it without using an external hardware programmer. It communicates using the original protocol of the STK500. We can also bypass the bootloader and programme the microcontroller by using the Arduino ISP via the ICSP (In-Circuit Serial

Programming) header.

3.2.1 Overview of Arduino UNO

The Arduino Uno is an ATmega3288 microcontroller board based on (datasheet). It has 14 digital input/output pins, 6 analogue inputs, a 16 MHz ceramic resonator, a USB link, a power jack, an ICSP header, and a reset button (of which 6 can be used as PWM outputs). It contains all the microcontroller needs to support; just connect it to a computer with a USB cable or power it to get started with an AC-to-DC adapter or battery. The Uno differs from all previous boards in that the FTDI USB-to-serial driver chip is not included. Instead, it contains the Atmega16U2 configured as a USB-to-serial converter (Atmega8U2 up to version R2).

The Uno board's Revision 2 has a resistor that pulls the 8U2 HWB line to the ground, making it easier to bring into DFU mode.

The board's revision 3 has the following new features: 1.0 pinout: added pins for SDA and SCL that are similar to the AREF pin and two more additional pins:

- The IOREF, located near the RESET pin, helps the shields to adjust to the voltage supplied by the board. In the future, shields will be compatible with both the 5V-operating board that uses the AVR and the 3.3V-operated Arduino Due. A non-connected pin is the second, which is reserved for future purposes. Stronger circuit RESET.
- The 8U2 will replace the Atmega 16U2.

"Uno" means one in Italian and is called to mark the upcoming Arduino 1.0.0 update. Uno and version 1.0 will be Arduino's reference models, going forward. The Uno is the newest in a series of Arduino USB boards and the reference model for the Arduino platform; see the index of Arduino boards for comparison with previous models.

3.2.2 Programming

With Arduino tools, the Arduino Uno can be programmed (download). From the Tools > Board menu, pick 'Arduino Uno (according to the microcontroller on your board). See the sources and tutorials for information.

The ATmega328 comes pre-burned with a bootloader on the Arduino Uno that

allows you to upload new code to it without using an external hardware programmer. It communicates using the original protocol of STK500 (reference, C header files).

You can also bypass the bootloader via the ICSP (In-Circuit Serial Programming) header and programme the microcontroller; see these instructions for details.

The source code of the ATmega16U2 (or 8U2 on the rev1 and rev2 boards) firmware is available. The DFU boot loader is loaded with the ATmega16U2/8U2, which can be triggered by:

- On Rev1 boards: attach the solder jumper (near the map of Italy) to the back of the board and then reset the 8U2.
- There is a resistor on Rev2 or later boards that pulls the 8U2/16U2 HWB line to the ground, making it easier to bring into DFU mode.

You can then load a new firmware using Atmel's FLIP software (Windows) or a DFU programmer (Mac OS X and Linux). Or, with an external programmer, you can use the ISP header (overwriting the ==++DFU boot loader). For more information, see this user-contributed tutorial.

3.2.3 Communication

There are a range of facilities available for the Arduino Uno to connect with a computer, another Arduino, or other microcontrollers. UART TTL (5V) serial communication is provided by the ATmega328 and is accessible on digital pins 0 (RX) and 1 (TX). This serial contact over USB is channelled by an ATmega16U2 on the board and appears on the device as a virtual com port to applications. The standard USB COM drivers are used by the '16U2 firmware, and no external driver is required. An .inf file is needed on Windows, however. A serial monitor is included in the Arduino programme, which enables simple textual data to be sent to and from the Arduino board. As data is transmitted via the USB-to-serial chip and the USB link to the device, the RX and TX LEDs on the board will flash.

A serial library of applications enables serial communication on any of the digital pins of the Uno. The ATmega328 facilitates communication between I2C (TWI) and SPI as well. To simplify the use of the I2C bus, the Arduino programme provides a Wire library; see the documentation for details. Using the SPI library for

SPI communication.

3.2.4 Power Supply

The TX is a transmitter module with an ASK. The TX is designed specifically for the 315/433.92 MHz operating remote control, wireless mouse and car alarm system. The RX is a miniature receiver module for the next decoder stage that receives an On-offkeyed (OOK) modulation signal and demodulates it to a digital signal. The RX is designed specifically for 315/434Mhz remote-control and wireless surveillance receivers. UART TTL o/p - Rate of Baud - 9600. RF Module Features Input Input Electricity supply - 5 Volts At a frequency of 433Mhz, the transmitter/receiver (Tx/Rx) pair operates. An RF transmitter receives serial data and transmits it via its antenna connected to pin 4 wirelessly via RF. The switch takes place at a rate of 1Kbps -10Kbps. An RF receiver that operates at the same frequency as that of the transmitter receives the transmitted data. The RF module, along with an encoder/decoder pair, is also used. The encoder is used to encrypt parallel transmission feed data while a decoder decodes reception.

It is possible to power the Arduino Uno through a USB link or an external power supply. The source of power is automatically chosen. External (non-USB) power can come from either an AC-to-DC (wall-wart) adapter or from a battery. By plugging a 2.1mm center-positive connector into the power jack of the board, the adapter can be attached. In the Gnd and Vin pin headers of the POWER connector, you can insert leads from a battery. On an external supply of 6 to 20 volts, the board can work. However, if supplied with less than 7V, less than five volts will be supplied by the 5V pin and the board may be unstable. The voltage regulator can overheat and harm the board if more than 12V is used. 7 to 12 volts is the recommended range. As follows, the power pins are:

- VIN. By using an external power source, the input voltage to the Arduino board (as opposed to 5 volts from the USB connection or other regulated power source). Via this pin, you can supply voltage, or access it via this pin while supplying voltage through the power jack.
- 5V. From the regulator on the board, this pin outputs a controlled 5V. The board can be operated either from the DC power jack (7 - 12V), from the USB connector (5V) or from the board's VIN pin (7-12V). The supply of

voltage through the 5V or 3.3V pins bypasses the regulator, and your board can be impaired. We're not suggesting it.

- 3V3. A supply of 3.3 volts provided by the on-board regulator. The maximum draw current is 50mA.
- GND. Ground pins.



3.2 ARDUINO UNO



3.2.4 ARDUINO POWER SUPPLY

3.3 HW WATT BATTERY

It is a low-power, inexpensive, efficient, dedicated solution to supply your application with sufficient energy. Ideally used in low power consumption circuits so that it can run for longer durations.

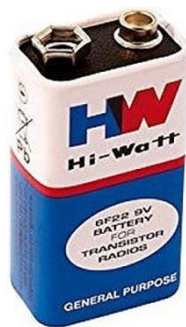
Features:

- Model Number: 9V 6F 22
- Battery Type: Zinc Carbon

- Size: 6F22 006P
- Jacket: Metal
- Single Battery Dimensions (mm): L- 26. 5, H - 48. 5, W - 17. 5 (Max)
- Nominal Voltage(V) :9V
- Discharge Resistance(Ω): 620
- Cut-off Voltage(V): 5.4

3.3.1 Nine-volt battery or 9-volt battery

This is a common battery size introduced for early transistor radios. With rounded edges and a polarised snap connector at the tip, it has a rectangular prism form. In walkie-talkies, clocks and smoke alarms, this type is widely used. In primary carbon-zinc and alkaline chemistry, in primary lithium iron disulfide, and in rechargeable form in nickel-cadmium, nickel-metal hydride and lithium-ion, the nine volt battery format is widely available. Due to their mercury content, mercury-oxide batteries of this format, once popular, have not been produced in many years. NEDA 1604 and IEC 6F22 (for zinc-carbon) or MN1604 6LR611 are included in the designations for this format (for alkaline). The size is commonly referred to as PP3, regardless of chemistry, a designation originally reserved for carbon-zinc alone, or in some countries, Most nine-volt alkaline batteries are constructed from a wrapper of six individual 1.5 V LR61 cells. [2] These cells are slightly smaller than the LR8D425 AAAA cells and, although they are 3.5 mm shorter, may be used for some devices in their place. In order to prevent drying, carbon-zinc types are produced with six flat cells in a stack, enclosed in a moisture-resistant wrapper.



3.3.1 9-VOLT BATTERY

3.3.2 Connectors

On one end, the battery has both terminals in a snap connector. The smaller circular (male) terminal is positive, with the negative touch being the larger hexagonal or octagonal (female) terminal. The battery connections are the same as those on the charging device; the smaller one attaches to the larger one, and vice versa. On other battery types in the Power Pack (PP) series, the same snap-style connector is used. Polarization of the battery is generally apparent, as mechanical connection is usually only possible in one configuration.

3.3.3 Lithium

Consumer-replaceable, disposable high-energy-density batteries are lithium 9-volt batteries. They are usually rated at 0.8-1.2Ah in the PP3 size (e.g., >1.2Ah @ 900 ohms to 5.4V @ 23 °C for one type),[14] about twice the alkaline battery ability. "High energy density, up to 5x more than alkaline" is claimed by manufacturers. [14] [14] Smoke and carbon monoxide (CO) alerts and electronic parking metres are popular applications for lithium nine-volt batteries.

3.4 RELAYS

A relay is a switch that is electrically operated. Relays allow one circuit to modify a 2nd circuit that can also fully tear the first one apart. By attracting the relays, the current in the relay coil changes the contact.

Relays have two changing locations and are double throw (changeover) switches, so the coil current can either be on or off. Inside the relay between the 2 circuits, there is no electrical connection; the hyperlink is magnetic and mechanical.

Relays are instruments that are very basic. In any relay, there are four major components.

- Electromagnet
- Armature that can be attracted to the electromagnet
- Spring
- Set of electrical contact

3.4.1 Working

The resulting magnetic self-discipline attracts an armature that is robotically connected to a relocating touch as a current flows through the coil. The action both makes and breaks a continuous touch reference. When the present coil is turned off, the armature is cut back by means of a force about half as robust as the magnetic drive to its relaxed location. This may normally be a spring, but in industrial engine starts, gravity may typically be used. The majority of relays are manufactured to work rapidly. That's to curb noise in a low-voltage programme. That is to decrease arcing in immoderate voltage or unnecessary gift utility.

3.4.2 Drive Circuit and Protection Diodes for Relays

A relay's coil passes a fairly big reward, more commonly 30mA for a 12V relay, but it may be as much as 100mA for relays Built to operate from slash voltages. As a result, the incentive rating of the relay is obtained using a CB amplifier.

Transistors and ICs have to be blanketed when a relay coil is switched off from the transiently immoderate voltage emitted. The use of a relay coil produces a magnetic field that immediately collapses when the current is turned off. The unexpected way of supplying the magnetic subject causes a short immoderate voltage through the relay coil that is almost clearly intended to disrupt transistors and ICs.

3.4.3 CHANNEL RELAY MODULE

8 channel relay module illustration Look at the photo of the relay on the right below. Note the 3 terminals that are screw-type. "NO", "COM", "NC" are numbered. Such labels mean: NO: Normally open NO: Normally open COM: Common Link: Common Connection NC: Normally Locked On the right, look at the diagram. This indicates the turn in the relay that is inside. By the electromagnet inside, this switch is "thrown". The diagram indicates that the usually closed contact is connected to the COM. When the relay is off, that is the case. The switch flips up when the relay is triggered on the electromagnet and COM is then connected to Normally Open. So, if we want to put a lamp on while the relay is on,

we're going to link our circuit from COM to NO. Let's give that a shot. We use 8 channel relay boards operated by the ULN 2803A IC in this suggested framework. 10A/250V DC, 10A/30V DC, 15A/120VAC or 7A/250VAC are the highest power ratings that the board can accommodate. Status of Relay Showing LEDs. Next to each relay, the relay board features an onboard relay status indicator LED.



3.4.3 CHANNEL RELAY MODULE

3.5 DC MOTOR

A is one of the classes of rotary electric motors that transform electric energy from direct current into mechanical energy. The forces generated by magnetic fields depend on the most common forms. Almost all types of DC motors have some internal function, either electromechanical or electronic, in order to change the current path of part of the motor periodically. As they could be powered from existing direct-current lighting power distribution systems, DC motors were the first type of motor commonly used. The speed of a DC motor can be regulated over a wide range, either using a variable supply voltage or by adjusting the current intensity of its field windings. In instruments, toys, and appliances, small DC motors are used. The universal motor is a lightweight brushed motor used for portable power tools and appliances, but can work on direct current. Currently, larger DC motors are used in electric vehicle propulsion, elevator and hoist propulsion, and in steel rolling mill drives. In many applications, the advent of power electronics has made replacement of DC motors with AC motors possible.

3.5.1 Operating Precautions

DC motors display high performance and are lightweight, and their speed is simple

to monitor. They can be powered by a battery or any other power source and are easy to use as well. Improper power supply, however, can lead to burnout or irregular brush wear. Problems with the supply of fuel, installation, general precautions and problems with an in-circuit mounted engine will be identified.

3.5.2 Overload and lock-up

During overloaded driving or when locked up, an excessive amount of load torque is applied, causing the motor to incur an excessive current flow with heat damage. Overloaded or locked-up use is, therefore, to be avoided. (Locking up for 5 or more seconds results in a motor being impaired. Do not lock the motor for 5 seconds or more.)

3.5.3 Applied voltage

At its rated voltage (+10V), make sure to use a motor, and stop any surge voltage. We can produce motors specifically built with an electrical path that protects the motor from surges and reversed polarity.

3.5.4 Applying non-rated supply voltages

Applying a voltage higher than the engine rating results in a rise in temperature, resulting in damage to heat or shortened service life. There may also be scoring of the commutator surface by sparks and mechanical wear of the brush resulting from vibration. Ultimately, the application of a voltage lower than the engine rating can result in the engine failing to start. This is due to the carbon powder piling up on the commutator. Motors are manufactured to use their rated requirements within $\pm 10\%$. If you need to use engines outside of their scores, please contact us.

3.5.5 Brush wear promoted by power supply ripples

Brush wear can be mechanical wear due to abrasion of the brush and commutator or electrical wear due to sparking between the brush and commutator, the most common of which is the latter. Therefore, brush wear is greatly affected by ripples

in the voltage of the power supply, and the use of general regulated DC is recommended. However, be sure to use full-wave rectification with a capacitor or similar element in a smoothing circuit when rectifying AC for use by a motor.

3.5.6 Ambient conditions

A DC motor's service life is contingent on its rectifying operation. Care must be taken to ensure proper switching, as dust, oil, gas, water, etc. on the surface of the switch results in poor rectification and brush wear increases.

3.5.7 Changing the brush position

In general, the brushes are set in place in such a way that both clockwise and counter-clockwise directions retain rotational speed and current characteristics equal. Based on the position of the magnetic poles, these are basically determined. The misalignment of the brushes and magnets results from rotating the engine after not properly relocating parts such as the brush holder (for repairing the brushes) or the rear cover. This will cause changes in the above features in the rotational direction or cause poor rectification, resulting in irregular wear of the brush. Changes in the placement of the brush must also be avoided.

3.6 RF MODULE

An (short for radio-frequency module) is a (usually) small electronic unit used by two devices to transmit and/or receive radio signals. It is also beneficial for an embedded system to communicate wirelessly with another device. This wireless communication can be achieved by means of optical communication or communication through radio frequency (RF). For many applications, because line of sight is not necessary, the medium of choice is RF. A transmitter and a receiver are built into RF communications. They are of different kinds and ranges. Some can stretch to as much as 500 feet. Usually, RF modules are fabricated using RF CMOS technology. Owing to the complexity of designing radio circuitry, RF modules are commonly used in electronic design. Because of the sensitivity of radio circuits and the precision of components and layouts needed to achieve operation on a particular frequency, good electronic radio design is notoriously

complex. Moreover, a stable RF communication circuit requires close monitoring of the production process in order to ensure that the output of the RF is not adversely affected. Finally, radio circuits are normally subject to radiated emission standards and require a standardisation body such as ETSI or the U.S. Federal Communications Commission to test and certify compliance (FCC). Tech engineers will also design a circuit for an application that involves radio communication for these purposes, and then 'drop in' a pre-made radio module rather than attempt a discrete design, saving development time and resources. For consumer applications such as garage door openers, wireless alarm or monitoring systems, industrial remote controls, smart sensor applications, and wireless home automation systems, RF modules are used most commonly in medium and low volume goods. As they have the benefit of not needing line-of-sight service, they are often used to replace older infrared communication designs. Several carrier frequencies, including those in the industrial, science and medical (ISM) radio bands, such as 433.92 MHz, 915 MHz and 2400 MHz, are widely used in commercially available RF modules. Due to national and international laws restricting the use of radio for communication, these frequencies are used. Unlicensed frequencies, such as 315 MHz and 868 MHz, can also be used by Short Range Devices.

Types of RF modules

- 3.6.1 Transmitter module
- 3.6.2 Receiver module

3.6.1 Transmitter modules

A small PCB sub-assembly, capable of transmitting a radio wave and modulating the wave to carry data, is an RF transmitter module. Usually, transmitter modules are implemented alongside a microcontroller that provides the module with data that can be transmitted. RF transmitters are normally subject to regulatory specifications that determine the requirements for maximum permissible transmitter power output, harmonics, and band edge.

3.6.2 Receiver modules

An RF receiver module receives, and demodulates, the modulated RF signal. There are two kinds of modules for RF receivers: superheterodyne and super regenerative receivers. Using a series of amplifiers to collect modulated data from a carrier wave, super regenerative modules are typically low cost and low power designs. As their operating frequency varies significantly with temperature and power supply voltage, super regenerative modules are usually imprecise. [required quotation] Superheterodyne receivers have a performance advantage over super regenerative ones; over a wide voltage and temperature spectrum, they provide improved precision and stability. This stability stems from a fixed crystal nature that has appeared to mean a comparatively more costly product in the past. Advances in the design of the receiver chip now mean, however, that there is currently little price difference between super heterodyne and super regenerative receiver modules.

3.7 JUMP WIRE

A jump wire is a short electrical wire with a solid tip at each end (or only "tinned" often without it), typically used to interconnect the components in a breadboard. A jump wire (also referred to as a jumper wire or jumper) is an electrical wire, or group of wire, with a connector or pin at each end (or often without, simply "tinned") that is usually used without soldering to interconnect the components of a breadboard or other prototype or test circuit, internally or with other devices or components. In the slots given in a breadboard, the header connector of a circuit board, or a piece of test equipment, individual jump wires are fitted by inserting their "end connectors." Disclosed is an enhanced arrangement of jump wire for a printed circuit board. The arrangement requires at least one jump wire with its opposite ends bent in the same direction to face each other, and at least one slot given on the printed circuit board's upper surface. The slot has holes created at its opposite ends to permit the opposite ends of the jump wire to be inserted. By inserting the opposite ends into the reverse through holes, bending the opposite ends, and then welding these bent ends to a printed circuit pattern shaped on the lower or rear surface of the printed circuit board, the jump wire can be mounted

and installed in the slot. This arrangement allows the mounting density of components and devices to be increased without fear of short-circuiting on the printed circuit board.

3.7.1 ZIPWIRE (JUMP WIRE)

Multi-color ribbons of 40 wires, available in 10 cm lengths of male-male, female-female or male-female connectors.

Ideal for use with solderless BreadBoards or for attaching to 0.1" pitch sockets or square post headers.

The 10 basic electrical colours are provided by Rainbow coloured ribbon cables to color-code your connections.

For arranging signals or as individual wires, 28AWG PVC insulated ribbon cable can be unzipped in groups.

In black plastic casings, contacts use tinned beryllium-copper.

3.7.2 Zip Wire Details

In your ventures, ZipWire offers a simple way to connect the signals. For individual wires, the wires can be unzipped as needed. To keep the circuit structured, the color-coding can be used to arrange power, ground and other types of signal. The 10 regular electrical colours are provided by the rainbow coloured ribbon cable. 40 wires, four of each colour, are formed by each ZipWire ribbon. A group of connected ZipWires may be used when connecting to a group of signals (such as UART or SPI signals) to hold the signals together to help control your wiring. For shorter links, the male-male wires are available in 10cm lengths. Inside a solderless breadboard, they work well for signalling (such as the BB400 and BB830). The male-female ZipWires may be used to make longer links as extension wires.

ZipWires have a pitch of 0.1 Female links (0.025" square posts on 0.1" centres) work well on regular square post headers. With solderless breadboards or 0.1" pitch sockets, male pins can be used.

CHAPTER 4

SOFTWARE DETAILS

Wireless Communication

The flow of information between two or more points that are not linked by an electrical conductor is wireless communication. Radio is being used in the majority of wireless technologies. Distances can be short for radio waves, such as a few metres for Television, or as big as thousands or even millions of kilometres for deep-space radio.

4.1 RADIO FREQUENCY TECHNOLOGY

Radio frequency (RF) is among the frequencies of electromagnetic waves in the range to around 3 kHz to 300 GHz, which involves some frequencies used for radar or communication signals.

4.1.1 Description:

High frequency alternating current (AC) signals formed of electromagnetic energy are RF signals. RF movement travels at the speed of light and does not need the use of such a medium such as air. Sun flares, lightning, and stars in space that generate RF waves as they age are all examples of RF waves. People communicate using radio waves which have already been artificially produced and oscillate at various frequencies. In many fields, RF communication is used, including Television, radar systems, networks for computers and mobile platforms, remote control, remote metering/monitoring, and many more.

4.1.2 Properties of RF

The following properties apply to all radio frequency signals:

- **Amplitude:** The “Amplitude” of a signal is the shift in RF energy. The most basic quality of an RF signal is amplitude. The higher the strength of an RF signal, the further it can travel to the point of becoming unreceivable before being weakened.
- **Frequency:** Since the most fundamental quality of an RF signal is amplitude, information is conveyed by altering the amplitude of the RF signal over time. When the signal oscillates with a more or less normal pattern, transmission and reception become simpler. The time between one

amplitude peak and the next is constant from one peak to the next. The frequency of the signal is the number of times a second that the signal's amplitude peaks.

- **Wavelength:** An RF signal's wavelength is a function of the frequency of the signal and its speed across space. If a wave front signal progresses at a certain speed through space, and we know the amount of time between each peak, then we can approximate how far the signal moves from one peak to the next. The wavelength of a signal is the ratio of two.
- **Phase:** Phase is a way to describe the relationship between two RF signal amplitudes that have the same frequency. The phase is expressed in degrees (like the degrees of a compass). Phase is important to the Wireless Lan Engineer because two signals in phase blend their energy, resulting in a stronger signal. Two signals that are 180 degrees out of phase cancel each other out totally.
- **Polarity:** A radio wave is actually made of up of two fields:- One electric, One magnetic, The sum of these two field is called the “electromagnetic field”, when energy is transferred back and forth from one field to the other it is called “Oscillation”.
- **Reflection:** Reflection happens when an object that has a very huge size similar to the wavelength of the propagating wave is hit by a propagating electromagnetic wave.
- **Refraction:** Refraction describes a radio wave's bending as it passes through a medium of varying density.
- **Diffraction:** Diffraction arises when a surface containing sharp defects or another rough surface interrupts the radio path between the transmitter and receiver.
- **Absorption:** When an RF signal hits an object, it is absorbed into the material, blocking it from pushing through, bouncing off, or bending around the object.

4.1.3 Advantages and Disadvantages of RF:

Advantages: Used for the construction of high directive antennas, broad bandwidth, small dimensions.

Disadvantages: From 3 KHz to 300 GHz RF or Microwave works

4.2 OVER-SPEED CONTROL SYSTEM

By modifying the speed of the DC motor, we can adjust the speed of the vehicle. There are effectively three ways of varying the speed of DC motors. The following are some examples of these techniques:

- **Mechanical Gears:** To achieve the desired speed, mechanical gears are being used.
- **Series Resistor:** Use the series resistor to decrease the motor voltage. This is inefficient, however, as energy in the resistors is lost and torque is decreased. As the load on the motor increases, the current drawn by the motor increases. More current implies a greater voltage drop around the series resistor, leading to lower voltage to the motor. The motor now tries to draw even more current, that causes it to "stall."
- **Pulse Width Modulation (PWM):** By applying full voltage to the motor in bursts or pulses, the series drop effect is eliminated. Pulse width modulation is the technical term for this (PWM). The shorter pulses indicate that the motor runs slowly, the better the motor runs with longer pulses.

For a very long time, DC motors have been used in variable speed devices. The flexibility of dc motors encourages them to provide high starting torques, which are essential for traction drives. Control can be very easily achieved over a large velocity range, both below and above the rated speed. The dc motor speed control methods are easier and less expensive than those for alternating current motors. Speed demand is fulfilled using PWM technique in this project and PWM generation is carried out using microcontrollers.

4.2.1 Pulse Width Modulation:

A modulation technique used to encode a message into a pulsing signal is pulse-width modulation (PWM) or pulse-duration modulation (PDM). Although this modulation technique can be used to encode data for transmission, this is most widely used to control the power supplied to electrical devices, especially inertial

loads including motors. Furthermore, one of the two key algorithms used in photovoltaic solar battery chargers is PWM. As a result, we use radio frequency technology (RF) to send the signal in pulses, as stated in the previous chapter. All we need to do to monitor the speed of the engine is replace the digitalWrite feature on L293D to permit analogWrite pins. The engine speed is proportional to the value passed to the analogWrite function. We can pass between 0 and 255 only. The motor will stop if we pass 0, and it will run at full speed if we pass 255. If we pass a value between 1 and 254, the motor's speed will adjust accordingly.

4.2.2 Working Principle of PWM:

Pulse width modulation (PWM) is a binary signal generation method that has high and low signal periods of 2. Each pulse's width (W) varies between 0 and time (T). The core principle is to vary the service cycle to regulate capacity. The time of conduction to the load is regulated here. Allow the input voltage to appear across the load for time t_1 . i.e., the voltage across the load is zero for t_2 time.

- The average voltage at output is given by

$$V_a = V_{\max} \times I_a$$

Here,

TON = Time period for Pulse ON,

TOFF = Time period for Pulse OFF

- The average load current $I_a = V_a/R = kV_s/R$

Total time period, $T = t_1 + t_2$,

Duty cycle, $k = t_1/T$

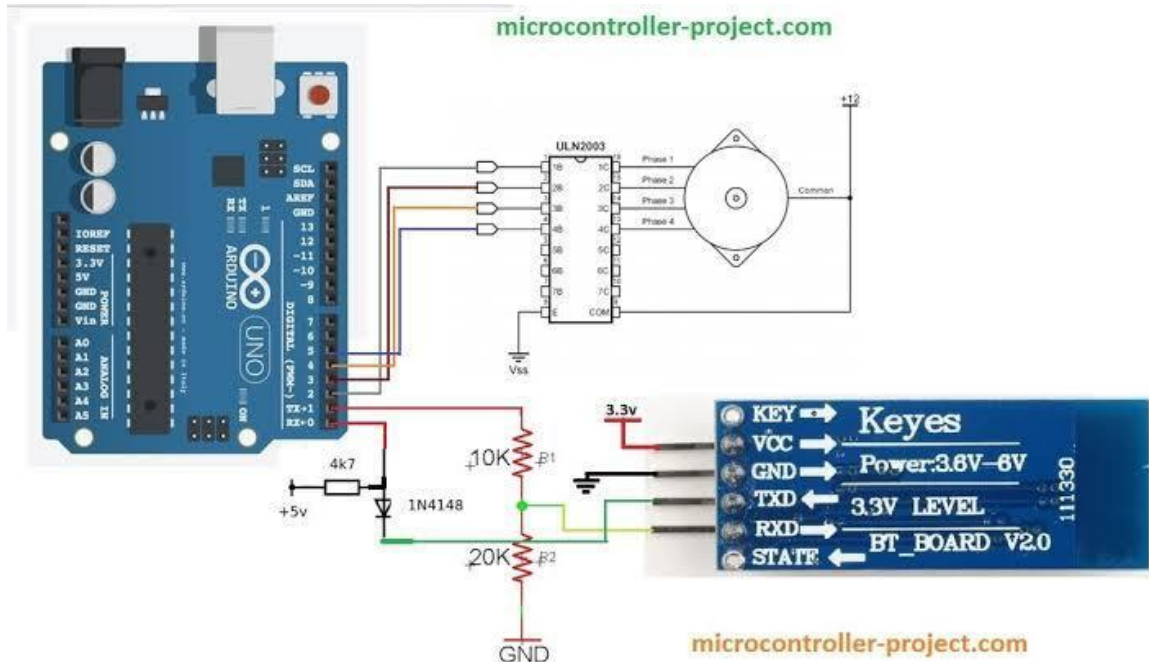
You might switch the duty cycle from 0 to 1 by varying t_1 , T or f . Therefore, by adjusting k , the V_0 output voltage can be varied from 0 to V_s , and the power flow can be controlled.

The width of the pulse differs as time t_1 changes, and this method of control is defined as pulse width modulation (PWM).

These diagrammatic representations can be used to better understand PWM. The waveforms obtained as output at various voltage requirements are defined by these figures.

CHAPTER 5

5.1 SYSTEM ARCHITECTURE



5.1 SYSTEM ARCHITECTURE

5.2 WORKING MODEL

Arduino.cc created the Arduino UNO, an open-source microcontroller board based on the Microchip ATmega328P microcontroller. The board has a variety of digital and analogue input/output (I/O) pins that can be used to connect to different expansion boards (shields) and other circuits. The board has 14 digital pins and 6 analogue pins, and it can be programmed using the Arduino IDE (Integrated Development Environment) and a USB type B cable. It accepts voltages between 7 and 20 volts and can be powered by a USB cable or an external 9 volt battery. It's almost equivalent to the Arduino Nano and Leonardo microcontrollers. The hardware reference design is available on the Arduino website under a Creative Commons Attribution Share-Alike 2.5 licence. There are also layout and production files available for certain versions of the hardware. In Italian, the word "uno" means "one," and it was chosen to celebrate the release of Arduino

Software (IDE) 1.0. The reference versions of Arduino were the Uno board and version 1.0 of Arduino Software (IDE), which have now developed into newer updates. The Arduino Uno board is the first in a series of USB Arduino boards and acts as the platform's reference model. The ATmega328 on the Arduino Uno is pre-programmed with a bootloader that allows you to upload new code without using an external hardware programmer. [3] It communicates using the original protocol of the STK500. Also, the Uno differs from all previous boards in that the FTDI USB-to-serial driver chip is not included. Instead, it uses the Atmega16U2 configured as a USB-to-serial converter (Atmega8U2 up to version R2). Microcontrollers are usually designed using a dialect of C and C++ programming features. The Arduino project offers an integrated development environment (IDE) based on the Processing language project, in addition to using conventional compiler tool chains.

By linking it to the battery pack, you can check the motor polarity. The relation is right if it rotates in the forward direction (red wire with positive and black wire with negative terminal of the battery). As a consequence, each side has two terminals. MOTORA is in charge of two right-side motors, while MOTORB is in charge of two left-side motors. To link all, follow the steps below.

Motors Connection:

Out1 -> Left Side Motor Red Wire (+)

Out2 -> Left Side Motor Black Wire (-)

Out3 -> Right Side Motor Red Wire (+)

Out4 -> Right Side Motor Black Wire (-)

Arduino

IN1 -> D5

IN2-> D6

IN2 ->D9

IN2-> D10

Power :

12V - > Connect Battery Red Wire

GND -> Connect Battery Black wire and Arduino GND pin

5V -> Connect to Arduino 5V pin

CHAPTER 6

CONCLUSION

The speed control operations were conducted effectively through experimentation. We will increase the number of engines and different engine models in this console in the future. We obtained 10 velocity levels for two directions in this experiment by increasing 10 percent and decreasing 10 percent at its rpm. During the project, we experienced a variety of difficulties. All of our efforts, however, will be realised if we were one step closer to creating a smoother route to a better future. An automated vehicle safety control is introduced in this paper because it can improve vehicle safety problems and provide the driver with more vehicle operation comfort, which leads to a reduction in the number of vehicle accidents. An Arduino microcontroller is used to implement the design. For voice recognition operation and training, an EasyVR is used. The required action for vehicle speed control is issued based on the vehicle-to-vehicle distance calculation. The design has been equipped with numerous other automatic control functions to maintain a proper road and situation focus; radio control, flasher control, light control. The proposed model has been developed, built, and tested, and it has yielded satisfactory results.

Future Recommendations:

We are doing this project with the opening of doors for more modifications and more advanced study of vehicle speed regulation. As a consequence, the following are some possible future scopes for this project:

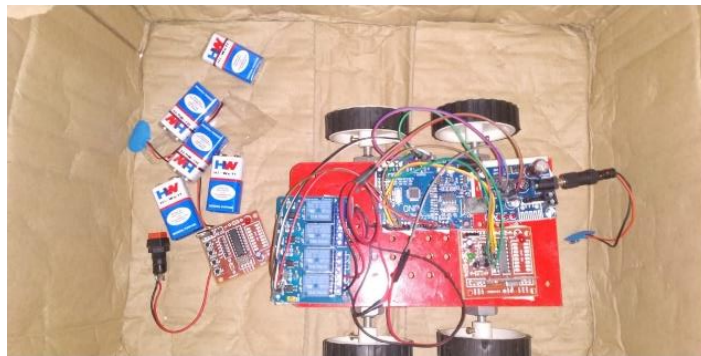
- We want to create a vehicle that can locate its location from the city map available and decide for itself on the highest speed limit for any specific road or highway. An autonomous vehicle is the ultimate goal of this project that can run without the help of a driver and retain the choice of the vehicle operator whether he or she wants to run the vehicle.
- We would like to suggest the installation of a monitoring device with GPS data and the speed of that vehicle from remote locations inside the car and vehicle tracker in the future.
- We'd like to work on a vehicle that can sense speed limits on roads and highways from signboards along the way in the future.

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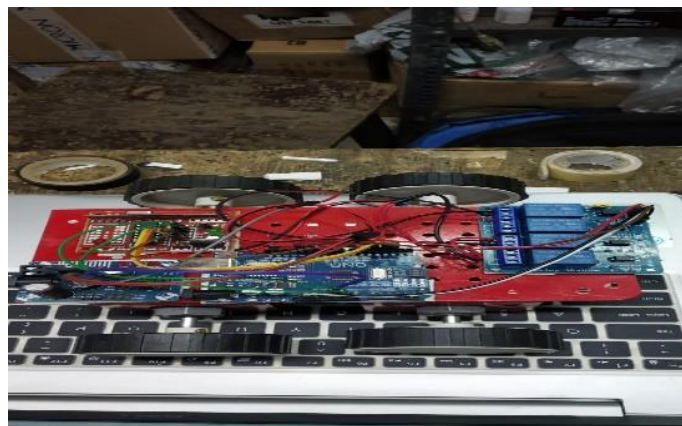
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APPENDIX

A. Screenshots



This is the device. It is used in vehicles to reduce the speed of it. It automatically controls the speed of the vehicles using ultrasonic sensor. These transmitters continuously radiate RF signal. When the vehicle comes within this radiation the receiver in the vehicle gets activated.



The ultrasonic sensor system continuously sends signals and monitors any car or other obstacles which are in front of car. When any obstacle or vehicle detected by ultrasonic sensor system it will send signal to the Arduino. After receiving this signal Arduino sends a signal to the vehicle to stop or reduce the speed of the car immediately.

B. Source Code

```
_____  
_____  
const int potPin = A0;  
_____  
const int buttonPin = 7;  
_____  
const int forward1 = 5;  
_____  
const int forward2 = 4;  
_____  
const int backward1 = 3;  
_____  
const int backward2 = 2;  
_____  
int potValue = 0;  
_____  
int motorValue = 0;  
_____  
int buttonState = 0;  
_____  
boolean a;  
_____  
void setup()  
_____  
{  
_____  
_____  
pinMode(buttonPin, INPUT_PULLUP);  
_____  
pinMode (forward1, OUTPUT);  
_____  
pinMode (forward2, OUTPUT);  
_____  
pinMode (backward1, OUTPUT);  
_____  
pinMode (backward2, OUTPUT);  
_____  
}  
_____  
void loop()  
_____  
{  
_____  
_____  
potValue = analogRead(potPin);  
_____  
motorValue = map(potValue, 0, 1023, 0, 255);  
_____  
buttonState = digitalRead(buttonPin);  
_____  
_____  
if (buttonState == LOW)  
_____  
{  
_____  
a=!a;  
_____  
}
```

```
_____  
_____ if(a)  
_____ {  
_____   analogWrite(backward1, motorValue);  
_____   digitalWrite (backward2, HIGH);  
_____   digitalWrite (forward1, LOW);  
_____   digitalWrite (forward2, LOW);  
_____  
_____ }  
_____  
_____ else  
_____ {  
_____  
_____   analogWrite(forward1, motorValue);  
_____   digitalWrite (forward2, HIGH);  
_____   digitalWrite (backward1, LOW);  
_____   digitalWrite (backward2, LOW);  
_____  
_____ }
```