Bluetooth Enabled RC Circumvent Bot

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***Abstract*—Bluetooth Enabled RC Circumvent Bot project is proposed on the interest of engineers towards experiments and exploration. The circumvent bot is made out of a wide lasting technological subject called Arduino's . It is a robot which simulates an autopilot car that can be controlled remotely and avoids obstacles in its path and changes its direction to where no obstacle is found. It is done with the help of a control board called the HC-05 Bluetooth module which controls the motor driver shield, and the Arduino MEGA 2560 which takes the calibration from the Ultrasonic sensors and the Bluetooth module controller. The controller is operated by mobile phones and is supported by a 12.6V Li-Po battery along with LM2596 DC to DC Buck Converter(3.0-40V to 1.5-35V)power supply step down module. The input is taken from the user's mobile phone and the command is sent to the HC-05 Bluetooth module and instructs the bot accordingly which calculates the distance and based on those calculation the Arduino MEGA produces the output. Using this principle we can apply this application in major projects like autopilot in Tesla cars etc.**

Keyword Terms-- *a)The working principle of Arduino MEGA 2560 is posted at*
https://store.arduino.cc/usa/mega-2560-r3
b)The Ultrasonic sensor is posted at:
https://www.tutorialspoint.com/arduino/arduino_ultrasonic_sensor.htm#:~:text=Arduino%20%2D%20Ultrasonic%20Sensor,or%201%E2%80%9D%20to%2013%20feet.
c)The HC-05 Bluetooth is posted at:
https://www.electronicshub.org/hc-05-bluetooth-module/
d)The Driver Shield is posted at:
https://lastminuteengineers.com/1293d-motor-driver-shield-arduino-tutorial/

INTRODUCTION

Robotics is employed in our day to day applications,which are embedded with coding, AI(Artificial Intelligence) that is monitored by itself without any third party. The Bluetooth enabled obstacle circumvent bot is one of the applications of Arduino's exploration[a] towards AI. This bots main application and simulation can also be found in Tesla,MG HECTER and other autopilot engaged cars. Its main purpose is to avoid or pass over an obstacles to which its approaching and change its direction to some other place where it finds no obstacles. The BERC Bot (*Bluetooth Enabled RC Bot in Heading 1)* requires external control using HC-05 Bluetooth module to perform its operation. The code is loaded using a USB port and selecting the desired port named COM6. While loading the code we need to make sure that all the hardware's are not in contact with the IC ,so as to not cause damage. By first when the IC is turned on, the first operation is carried by the DC-motors and the Ultrasonic sensor[b] simultaneously. When the body starts moving the Ultrasonic sensor starts sensing the surroundings. This Ultrasonic sensors are fixed on front(2) and rear(1) of the bot. The Ultrasonic sensor[b] works when the bot is in rest and motion. When the sensors sense the object ,it sends the distance in(cm) to the IC. The IC then request the motor shield Arduino controller to take the bot approx 5cm backward,forward,left,right as per the sensors request .In this step, buzzer is alerted . And the signal is passed to the driver controller ,to change the bot's direction left or right as per the commanding signal received from the Ultrasonic sensors. The BERC Bot is operated by an HC-05 Bluetooth module connected to Bluetooth Rc controller mobile application.

ARDUINO MEGA 2560

The **Arduino Mega 2560** is a microcontroller board based on the ATmega2560. It has 54 digital input/output pins (of which 15 can be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Mega 2560

board is compatible with most shields designed for the Uno and the former boards Duemilanove or Diecimila.The Mega 2560 is an update to the Arduino Mega, which it replaces.

figure 1:Arduino MEGA circuit board

From figure[1] was chosen to mark the release of Arduino Software (IDE) 1.0. The MEGA board and version 1.0 of Arduino Software (IDE) were the reference versions of Arduino, now evolved to newer releases. The MEGA board is the first in a series of USB Arduino boards, and the reference model for the Arduino platform; for an extensive list of current, past or outdated boards see the Arduino index of boards.

DC MOTOR

A **DC motor** is any of a class of rotary electrical motors that converts direct current electrical energy into mechanical energy. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic, to periodically change the direction of current in part of the motor.

DC motors were the first form of motor widely used, as they could be powered from existing direct-current lighting power distribution systems. A DC motor's speed can be controlled over a wide range, using either a variable supply voltage or by changing the strength of current in its field windings. Small DC motors are used in tools, toys, and appliances. The universal motor can operate on direct current but is a lightweight brushed motor used for portable power tools and appliances. Larger DC motors are currently used in propulsion of electric vehicles, elevator and hoists, and in drives for steel rolling mills. The advent of power electronics has made replacement of DC motors with AC motors possible in many applications.

figure 2:DC motor

Electromagnetic motors

A coil of wire with a current running through it generates an electromagnetic field aligned with the center of the coil. The direction and magnitude of the magnetic field produced by the coil can be changed with the direction and magnitude of the current flowing through it.

A simple DC motor has a stationary set of magnets in the stator and an armature with one or more windings of insulated wire wrapped around a soft iron core that concentrates the magnetic field. The windings usually have multiple turns around the core, and in large motors there can be several parallel current paths. The ends of the wire winding are connected to a commutator. The commutator allows each armature coil to be energized in turn and connects the rotating coils with the external power supply through brushes. (Brushless DC motors have electronics that switch the DC current to each coil on and off and have no brushes.)

ULTRASONIC SENSORS

This article is a guide about the popular Ultrasonic Sensor HC – SR04. We'll explain how it works, show you some of its features and share an Arduino project example you can follow to integrate in your projects. We provide a schematic diagram on how to wire the ultrasonic sensor, and an example sketch to use with the Arduino

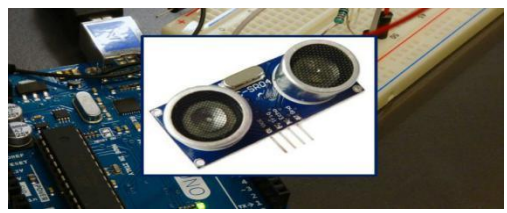

figure 3:ultrasonic sensor

DescriptionAs shown in figure[3] The HC-SR04 ultrasonic sensor uses sonar to determine distance to an object like bats do. It offers excellent non-contact range detection with high accuracy and stable readings in an easy-to-use package. It comes complete with ultrasonic transmitter and receiver modules.

Features

Here's a list of some of the HC-SR04 ultrasonic sensor features and specs:

- Power Supply :+5V DC
- Quiescent Current : <2mA
- Working Current: 15mA
- Effectual Angle: <15°
- Ranging Distance : 2cm – 400 cm/1″ – 13ft
- Resolution : 0.3 cm
- Measuring Angle: 30 degree
- Trigger Input Pulse width: 10uS
- Dimension: 45mm x 20mm x 15mm

The ultrasonic sensor uses sonar to determine the distance to an object. Here's what happens:

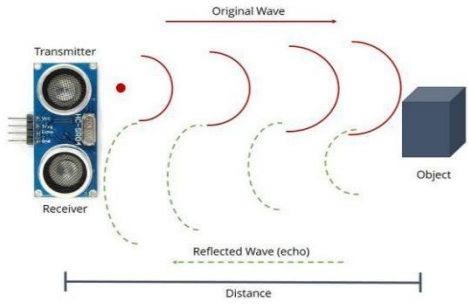

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figure 4:reflected wave

1. The transmitter (trig pin) sends a signal: a high-frequency sound.
2. When the signal finds an object, it is reflected and…
3. … the transmitter (echo pin) receives it.

MOTOR DRIVER SHIELD

It's a full-featured motor shield – perfect for many robot and CNC projects.It can drive :1)4 bi-directional DC motors with 8-bit speed selection(0-255)2)2 stepper motors (unipolar or bipolar) with single coil, double coil, interleaved or micro-stepping.3)2 servo motors

L293D Motor Driver & 74HC595 Shift Register

Figure 5:L193D Motor Driver &74HC595 Register

The L293D is a dual-channel H-Bridge motor driver capable of driving a pair of DC motors or single stepper motor.As the shield comes with two L293D motor driver chipsets, that means it can individually drive up to four DC motors making it ideal for building four-wheel robot platforms.The L293D is a dual-channel H-Bridge motor driver capable of driving a pair of DC motors or single stepper motor.As the shield comes with two L293D motor driver chipsets, that means it can individually drive up to four DC motors making it ideal for building four-wheel robot platforms.

Power Supply

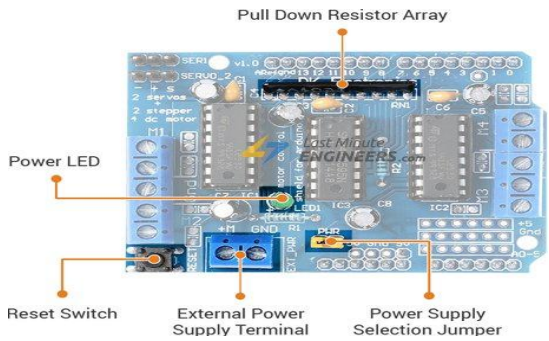

figure 6:L293D Motor Driver power supply

There exists three scenarios when it comes to supplying power for the motors through shield.

Single DC power supply for both Arduino and motors: If you would like to have a single DC power supply for both Arduino and motors, simply plug it into the DC jack on the Arduino or the 2-pin EXT_PWR block on the shield. Place the power jumper on the motor shield.You can employ this method only when motor supply voltage is less than 12V.(Recommended) Arduino powered through USB and motors through a DC power supply:If you would like to have the Arduino powered off of USB and the motors powered off of a DC power supply, plug in the USB cable. Then connect the motor supply to the EXT_PWR block on the shield. Do not place the jumper on the shield.Two separate DC power supplies for the Arduino and motors:If you would like to have 2 separate DC power supplies for the Arduino and motors. Plug in the supply for the Arduino into the DC jack, and connect the motor supply to the

EXT_PWR block. Make sure the jumper is removed from the motor shield.

3S Li-Po battery

A **lithium polymer battery**, or more correctly abbreviated as **LiPo**, **LIP**, **Li-poly**, **lithium-poly** and others), is a rechargeable battery of lithium-ion technology using a polymer electrolyte instead of a liquid electrolyte. High conductivity semisolid (gel) polymers form this electrolyte. These batteries provide higher specific energy than other lithium battery types and are used in applications where weight is a critical feature, such as mobile devices, radio-controlled aircraft and electric vehicles.[1]

figure 7:3S Li-Po battery

Just as with other lithium-ion cells, LiPos work on the principle of intercalation and de-intercalation of lithium ions from a positive electrode material and a negative electrode material, with the liquid electrolyte providing a conductive medium. To prevent the electrodes from touching each other directly, a microporous separator is in between which allows only the ions and not the electrode particles to migrate from one side to the other.The voltage of a single LiPo cell depends on its chemistry and varies from about 4.2 V (fully charged) to about 2.7–3.0 V (fully discharged), where the nominal voltage is 3.6 or 3.7 volts (about the middle value of highest and lowest value). For cells based on lithium-metal-oxides (such as $LiCoO_2$); this compares to 1.8–2.0 V (discharged) to 3.6–3.8 V (charged) for those based on lithium-iron-phosphate ($LiFePO_4$).The exact voltage ratings should be specified in product data sheets, with the understanding that the cells should be protected by an electronic circuit that won't allow them to overcharge nor over-discharge under use.LiPo battery packs, with cells connected in series and parallel, have separate pin-outs for every cell. A specialized charger may monitor the charge on a per-cell basis so that all cells are brought to the same state of charge (SOC).

CODING

Arduino programs are written in the Arduino Integrated Development Environment (IDE). Arduino IDE is a special software running on your system that allows you to write sketches (synonym for program in Arduino language) for different Arduino boards. The Arduino programming language is based on a very simple hardware programming language called processing, which is similar to the C language. After the sketch is written in the Arduino IDE, it

ıould be uploaded on the Arduino board for ɛecution.The first step in programming the Arduino board downloading and installing the Arduino IDE. The open ɔurce Arduino IDE runs on Windows, Mac OS X, and inux. Download the Arduino software (depending on ɔur OS) from the official website and follow the ɹstructions to install.

figure 8:coding an Arduino MEGA

9v LED

The **nine-volt battery**, or **9-volt battery**, is a common size of battery that was introduced for the early transistor radios. It has a rectangular prism shape with rounded edges and a polarized snap connector at the top. This type is commonly used in smoke detectors, gas detectors, clocks, walkie-talkies, electric guitars and effects units.The nine-volt battery format is commonly available 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. Mercury-oxide batteries of this format, once common, have not been manufactured in many years due to their mercury content. Designations for this format include *NEDA 1604* and *IEC 6F22* (for zinc-carbon) or *MN1604 6LR61* (for alkaline). The size, regardless of chemistry, is commonly designated **PP3**—a designation originally reserved solely for carbon-zinc, or in some countries, *E* or *E-block*.[2]Most nine-volt alkaline batteries are constructed of six individual 1.5 V LR61 cells enclosed in a wrapper.[3] These cells are slightly smaller than LR8D425 AAAA cells and can be used in their place for some devices, even though they are 3.5 mm shorter. Carbon-zinc types are made with six flat cells in a stack, enclosed in a moisture-resistant wrapper to prevent drying. Primary lithium types are made with three cells in series.[4]9-volt batteries accounted for 4% of alkaline primary battery sales in the United States in 2007, and 2% of primary battery sales and 2% of secondary battery (rechargeable) sales in Switzerland in 2008.[5][6]

HC-05 BLUETOOTH MODULE

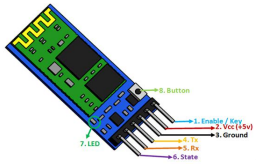

figure 9:HC-05 Bluetooth module

T**HC-05** is a very cool module which can add two-way (full-duplex) wireless functionality to your projects. You can use this module to communicate between two microcontrollers like Arduino or communicate with any device with Bluetooth functionality like a Phone or Laptop. There are many android applications that are already available which makes this process a lot easier. The module communicates with the help of USART at 9600 baud rate hence it is easy to interface with any microcontroller that supports USART. We can also configure the default values of the module by using the command mode. So if you looking for a Wireless module that could transfer data from your computer or mobile phone to microcontroller or vice versa then this module might be the right choice for you. However do not expect this module to transfer multimedia like photos or songs; you might have to look into the CSR8645 module for that.

DC-DC BUCK CONVERTER

A **buck converter** (**step-down converter**) is a DC-to-DC power converter which steps down voltage (while drawing less average current) from its input (supply) to its output (load). It is a class of switched-mode power supply (SMPS) typically containing at least two semiconductors (a diode and a transistor, although modern buck converters frequently replace the diode with a second transistor used for synchronous rectification) and at least one energy storage element, a capacitor, inductor, or the two in combination. To reduce voltage ripple, filters made of capacitors (sometimes in combination with inductors) are normally added to such a converter's output (load-side filter) and input (supply-side filter).[7]Switching converters (such as buck converters) provide much greater power efficiency as DC-to-DC converters than linear regulators, which are simpler circuits that lower voltages by dissipating power as heat, but do not step up output current.[8]Buck converters can be highly efficient (often higher than 90%), making them useful for tasks such as converting a computer's main (bulk) supply voltage (often 12 V) down to lower voltages needed by USB, DRAM and the CPU (5V, 3.3V or 1.8V, see PSU).

Figure 10:DC-DC Buck converter

JUMPER WIRE

A **jump wire** (also known as jumper, jumper wire, jumper cable, DuPont wire or cable) is an electrical wire, or group of them in a cable, with a connector or pin at each end (or sometimes without them – simply "tinned"), which is normally used to interconnect the components of a breadboard or other prototype or test circuit, internally or with other equipment or components, without soldering.[9]

Individual jump wires are fitted by inserting their "end connectors" into the slots provided in a breadboard, the header connector of a circuit board, or a piece of test equipment.

There are different types of jumper wires. Some have the same type of electrical connector at both ends, while others have different connectors. Some common connectors are:

- Solid tips – are used to connect on/with a breadboard or female header connector. The arrangement of the elements and ease of insertion on a breadboard allows increasing the mounting density of both components and jump wires without fear of short-circuits. The jump wires vary in size and colour to distinguish the different working signals.
- Crocodile clips – are used, among other applications, to temporarily bridge sensors, buttons and other elements of prototypes with components or equipment that have arbitrary connectors, wires, screw terminals, etc.
- Banana connectors – are commonly used on test equipment for DC and low-frequency AC signals.
- Registered jack (RJnn) – are commonly used in telephone (RJ11) and computer networking (RJ45).
- RCA connectors – are often used for audio, low-resolution composite video signals, or other low-frequency applications requiring a shielded cable.
- RF connectors – are used to carry radio frequency signals between circuits, test equipment, and antennas.
- RF jumper cables - Jumper cables is a smaller and more bendable corrugated cable which is used to connect antennas and other components to network cabling. Jumpers are also used in base stations to connect antennas to radio

units. Usually the most bendable jumper cable diameter is 1/2".

Figure 11:Jumper wires

BUZZER

A **buzzer** or **beeper** is an audio signalling device,whichmaybe mechanical, electromechanical, or piezoelectric (*piezo* for short). Typical uses of buzzers and beepers include alarm devices, timers, and confirmation of user input such as a mouse click or keystroke.

figure 12:Buzzer

TYPES:

Electromechanical

Early devices were based on an electromechanical system identical to an electric bell without the metal gong. Similarly, a relay may be connected to interrupt its own actuating current, causing the contacts to buzz (the contacts buzz at line frequency if powered by alternating current) Often these units were anchored to a wall or ceiling to use it as a sounding board. The word "buzzer" comes from the rasping noise that electromechanical buzzers made.

Mechanical

A joy buzzer is an example of a purely mechanical buzzer and they require drivers. Other examples of them are doorbells.

Piezoelectric

A piezoelectric element may be driven by an oscillating electronic circuit or other audio signal source, driven with a piezoelectric audio amplifier. Sounds commonly used to indicate that a button has been pressed are a click, a ring or a beep.piezoelectric buzzer/beeper also depends on acoustic cavity resonance or Helmholtz resonance to produce an audible beep.

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9. Jump wire patents

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