ALL IN ONE ROBOT

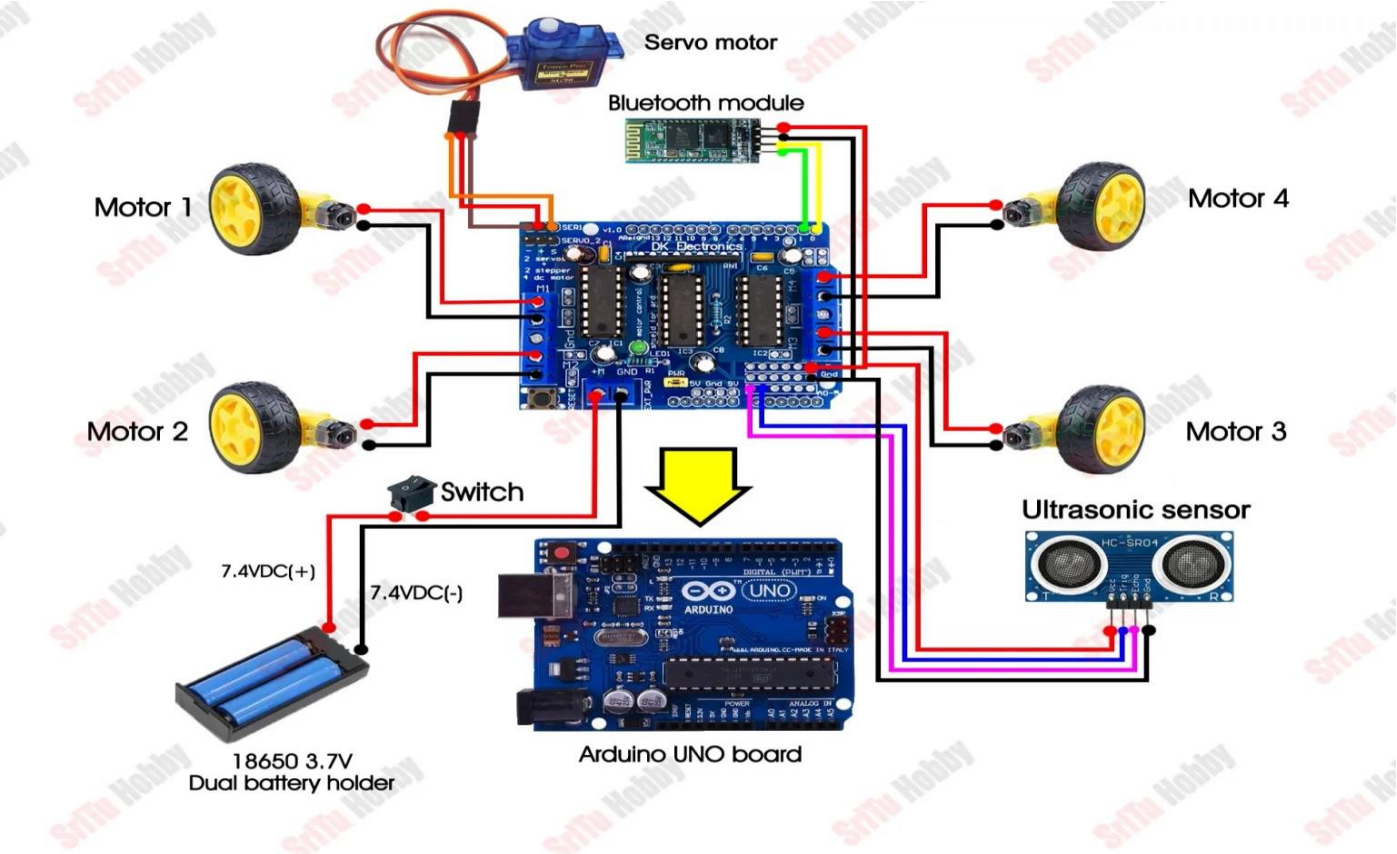
SUB-PROJECTS INVOLVED

- OBSTACLE AVOIDING
- VOICE CONTROL
- BLUETOOTH CONTROL ROBOT
- HUMAN FOLLOWER

TEAM ELITES

- R.G.V.AYYAPPA (22ECB0C04)
- D.LOKESHWAR (22ECB0C01)
- T.PRANATHI (22ECB0C21)
- V.B.S.VEDHA (22ECB0C31)

CIRCUIT DIAGRAM



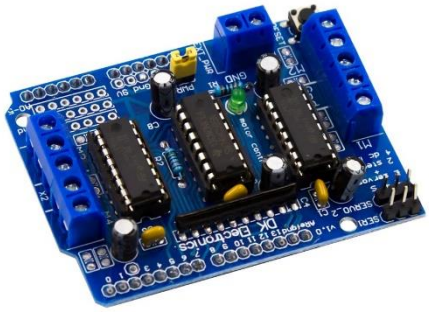
LIST OF COMPONENTS

COMPONENTS	NO.OF ITEMS	COST
1.AURDINO UNO	1	350
2.GEAR MOTOR	4	300
3.ROBOT WHEELS	4	200
4.MOTOR DRIVER	1	450
5.ULTRASONIC SENSOR	1	100
6.BLUETOOTH MODULE	1	300
7.LITHIUM ION BATTERY	2	160
8.LITHIUM ION BATTERY HOLDER	1	50
9.JUMPER WIRES	20	40
10.SWITCH	1	10
11.INFRARED SENSOR	2	100
		TOTAL COST : 2060

HARDWARE REQUIREMENTS

ARDUINO UNO BOARD- in this project Arduino uno acts as a brain that controls every part of the project. This is an open-source microcontroller board based on microchip ATmega328. It has digital and analog input/output pins that can be interfaced with various boards and shields. Arduino board can be powered by using the USB cable from your computer. All you need to do is connect the USB cable to the USB connection. The microcontroller is an embedded chip that controls most of the devices it is a 40-pin chip that comes with built in microprocessor. uno is a8 bit ATmega32p that contains other components such as crystal oscillator, serial communication, voltage regulator etc. To support the microcontroller .it has 6 analog pin input,18Mhz microcrystal, USB connection. the operating voltage is 5 v.it contains 32kb of which 0.5KB is used by bootloader and a clock speed of 16Mhz.the important pins such as RXD and TXD pins are used for transmission and receiving the serial data inputs.

ULTRA SONIC – the ultra-sonic sensor HC-SR04 uses SONAR (sound navigation and ranging) technology. To determine distance of the object. The device measures the distance of an object by emitting ultra-sonic waves and converts the reflected wave into electrical signal. the ultra-sonic sensor travels more than the speed of sound human can hear. The ultra-sonic sensors have two main components first one is a transmitter that emits sound using piezoelectric crystals and second one is receiver which encounters sound waves after the reflection from the object.



MOTOR DRIVE- the l293d motor drive is designed in such way that it fits into Arduino uno r3. This particularly used to drive the DC motors, Leds etc. This is a shield usually used to drive 2 to 6 dc motors, a wire stepper motor, and a set of two pins to drive the servo.it is integrated to adopt high voltage and high current at four channel motor drive to accept load such as relay solenoid, DC motors and four wire stepper motor and switching power transistor. this is suitable for switching application's up to 50hz.the motor driver shield is placed on uno board through which all the sensors and motors are connected. The supply for the motor drive is usually given in between 5v to 36v.

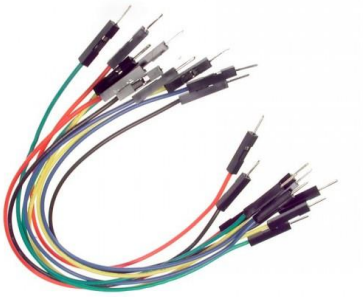
BLUETOOTH MODULE –Bluetooth module is used for wireless communication. This was designed to replace wire cables. This uses serial communication with electronics. This module is usually used to connect small devices. to be operated within 4-6v of power supply. It supports 9600, 19200, 34800, 57600 baud rates. This can be operated in master-slave mode which means it will neither send nor receive external data.

An infrared (IR) sensor is an electronic device that measures and detects infrared radiation in its surrounding environment. Infrared radiation was accidentally discovered by an astronomer named William Herchel in 1800. While measuring the temperature of each color of light (separated by a prism), he noticed that the temperature just beyond the red light was highest. IR is invisible to the human eye, as its wavelength is longer than that of visible light (though it is still on the same electromagnetic spectrum). Anything that emits heat (everything that has a temperature above around five degrees Kelvin) gives off infrared radiation.

SERVO MOTOR- this servo motor is tiny and lightweight with high output power. It rotates 180 degrees, 90 degrees to the right and 90 degrees to the left. This servo is designed to work with control systems. It provides good torque, holding power and faster updates with response to external force. However, these are dead cheap and serve the purpose.

GEAR MOTOR -gear motor is a component that adjusts to the speed mechanism of the motor, thus leading them to operate at a certain speed. These motors deliver high torque at low speeds, as gear head functions as a torque multiplier and can allow small motors to generate higher speeds. This has a combination of gear box and electric motor.

ROBO WHEELS-these are used to navigate in unknown environmental conditions that are
paired with gear motor.



JUMPER WIRES- jumper is an electric cable with connector end. This is normally used to connect the components on bread board, test circuits, and connecting the components on embedded chip. Each end is fitted according to the requirements. By using them we can avoid soldering as these come with several types of endings and colors.

DESIGN AND IMPLEMENTATION

Step1-allign the motor wheels and dc motors to the car chassis.

Step2-place motor drive l293d over Arduino uno and glue it on the chassis. Attach the dc motors to m1, m2, m3, m4 of the motor drive.

Step3- place the ultra-sonic sensor above servo motor with the help of ultrasonic holder. Place the ultrasonic sensor vcc to vcc of motor drive, trig to A1, echo to A0, and gnd(ground) to gnd of motor drive by using jumper wires. Now connect the servo motor to ser1 of the drive by using jumper wires.

Step4- solder RXD, TXD pin of Bluetooth module to pin number 1,0 (Aref pin) of drive. Gnd, vcc of Bluetooth to gnd, vcc of driver shield.

Step5-now attach battery with switch to Ext power of the motor, a supply of 3.7 volts to 9 volts. Step6-connect board and your computer by a cable, select board and board and then remove rx,tx pins of the Bluetooth, compile the given code to Arduino uno board.

Step6-for obstacle avoidance remove the function comment (// before obstacle ())

Step7-for Bluetooth control remove the function comment (// before Bluetooth ()). again, remove rx,tx pins of Bluetooth now compile the code once again from your laptop to Arduino board. Connect Bluetooth of your android to car and control by using Bluetooth Rc control app. If not, you can pair another Arduino uno to avoid reuploading the program.

WORKING OF THE CIRCUIT

The robot in this project detects obstacles with the help of ultra-sonic sensors. This measures the distance of the surrounding object with the help of ultra-sonic sensors to achieve desired movements. The motors are connected through motor driver IC to Arduino. This robot is designed to detect objects within a specified distance. The object that is found in front of car is termed as an obstacle, after detecting any of those obstacles the robot changes its direction. The sensor is placed above the servo motor facing in front. thus, if any object detected the signal is sent to the uno board. Further Arduino instructs servo motor for the change of direction. Servo changes the direction as per the instruction given by Arduino. The distance between object and sensor is calculated. To calculate the distance between object and sensor, the sensor measures the time it takes between emission of waves by the transmitter to its contact with receiver. Similarly, every time whenever the object is found to be in the path it will detect and move in the direction toward the left or right side.

After the code for Bluetooth is compiled. Connect the Bluetooth of your android to HC-05 and open the app. The android phone gets paired with the app. Once Bluetooth gets connected, the app screen opens on your phone. The button which you press, the car follows the same direction. The program is designed in such a manner that when you press the button front and right it moves diagonally towards the right side, similarly when you press the button back and front it moves diagonally opposite direction to the right side. We have paired with another Arduino uno board to avoid re-uploading the program. The RXD pin of Bluetooth receives commands from android and sends to Arduino and sends signal through the TXD pin for transmitting the information.

CODE OF THE CIRCUIT

OBSTACLE AVOIDING, BLUETOOTH CONTROL , VOICE CONTROL

```
#include <Servo.h>
#include <AFMotor.h>
#define Echo A0
#define Trig A1
#define motor 10
#define Speed 170
#define spoint 103
char value;
int distance;
int Left;
int Right;
int L = 0;
int R = 0;
int L1 = 0;
int R1 = 0;
Servo servo;
AF_DCMotor M1(1);
AF_DCMotor M2(2);
AF_DCMotor M3(3);
AF_DCMotor M4(4);
void setup() {
 Serial.begin(9600);
 pinMode(Trig, OUTPUT);
 pinMode(Echo, INPUT);
 servo.attach(motor);
 M1.setSpeed(Speed);
 M2.setSpeed(Speed);
 M3.setSpeed(Speed);
 M4.setSpeed(Speed);
}
void loop() {
 Obstacle();
 //Bluetoothcontrol();
 // voicecontrol();
}
void Bluetoothcontrol() {
 if (Serial.available() > 0) {
  value = Serial.read();
  Serial.println(value);
 }
 if (value == 'F') {
  forward();
 } else if (value == 'B') {
  backward();
 } else if (value == 'L') {
  left();
 } else if (value == 'R') {
  right();
 } else if (value == 'S') {
  Stop();
 }
}
void Obstacle() {
 distance = ultrasonic();
❖ if (distance <= 45) {
```

```
    Stop();
    backward();
    delay(25);
    Stop();
    L = leftsee();
    servo.write(spoint);
    delay(700);
    R = rightsee();
    servo.write(spoint);
    if (L < R) {
      right();
      delay(400);
      Stop();
      delay(100);
    } else if (L > R) {
      left();
      delay(400);
      Stop();
      delay(100);
    }
  } else {
    forward();
  }
}
void voicecontrol() {
  if (Serial.available() > 0) {
    value = Serial.read();
    Serial.println(value);
    if (value == '^') {
      forward();
    } else if (value == '-') {
      backward();
    } else if (value == '<') {
      L = leftsee();
      servo.write(spoint);
      if (L >= 10 ) {
        left();
        delay(500);
        Stop();
      } else if (L < 30) {
        Stop();
      }
    } else if (value == '>') {
      R = rightsee();
      servo.write(spoint);
      if (R >= 10 ) {
        right();
        delay(500);
        Stop();
      } else if (R < 30) {
        Stop();
      }
    } else if (value == '*') {
      Stop();
    }
  }
}
// Ultrasonic sensor distance reading function
int ultrasonic() {
  digitalWrite(Trig, LOW);
  delayMicroseconds(4);
  digitalWrite(Trig, HIGH);
  delayMicroseconds(10);
  digitalWrite(Trig, LOW);
```

```
  long t = pulseIn(Echo, HIGH);
  long cm = t / 29 / 2; //time convert distance
  return cm;
}
void forward() {
  M1.run(FORWARD);
  M2.run(FORWARD);
  M3.run(FORWARD);
  M4.run(FORWARD);
}
void backward() {
  M1.run(BACKWARD);
  M2.run(BACKWARD);
  M3.run(BACKWARD);
  M4.run(BACKWARD);
}

void right() {
  M1.run(BACKWARD);
  M2.run(BACKWARD);
  M3.run(FORWARD);
  M4.run(FORWARD);
}
void left() {
  M1.run(FORWARD);
  M2.run(FORWARD);
  M3.run(BACKWARD);
  M4.run(BACKWARD);
}
void Stop() {
  M1.run(RELEASE);
  M2.run(RELEASE);
  M3.run(RELEASE);
  M4.run(RELEASE);
}
int rightsee() {
  servo.write(20);
  delay(800);
  Left = ultrasonic();
  return Left;
}
int leftsee() {
  servo.write(180);
  delay(800);
  Right = ultrasonic();
  return Right;
}
```

HUMAN FOLLOWER

```
#include <LiquidCrystal_I2C.h>
#include <SPI.h>
#include <MFRC522.h>

#define RST_PIN 9
#define SS_PIN  10
byte readCard[4];
byte a = 0;

LiquidCrystal_I2C lcd(0x27, 16, 2);
MFRC522 mfrc522(SS_PIN, RST_PIN);

void setup() {
  Serial.begin(9600);
  lcd.init();
  lcd.backlight();
  while (!Serial);
  SPI.begin();
  mfrc522.PCD_Init();
  delay(4);
  mfrc522.PCD_DumpVersionToSerial();
  lcd.setCursor(2, 0);
  lcd.print("Put your card");
}

void loop() {
  if ( ! mfrc522.PICC_IsNewCardPresent()) {
    return 0;
  }
  if ( ! mfrc522.PICC_ReadCardSerial()) {
    return 0;
  }

  lcd.clear();
  lcd.setCursor(0, 0);
  lcd.print("Scanned UID");
  a = 0;
  Serial.println(F("Scanned PICC's UID:"));
  for ( uint8_t i = 0; i < 4; i++) {  //
    readCard[i] = mfrc522.uid.uidByte[i];
    Serial.print(readCard[i], HEX);
    Serial.print(" ");
    lcd.setCursor(a, 1);
    lcd.print(readCard[i], HEX);
    lcd.print(" ");
    delay(500);
    a += 3;
  }
  Serial.println("");
  mfrc522.PICC_HaltA();
  return 1;
 }
```

APPLICATIONS OF CIRCUIT

- Obstacle avoiding robots can be used in almost all mobile robot navigation systems.
- They can be used for household work like automatic vaccum cleaning .
- They can be also be used in dangerous environments , where human penetration could be fatal.
- Voice control robots can be used to support people with disability , executing preset commands .

CONCLUSION

With the combination of ultra-sonic sensor and Bluetooth module the car is designed to have two features. This technology can be used for many other applications. By using the Arduino, we convert digital signals into physical work. No worries of code getting erased once the code compiled into boards. This project is built on Arduino platform for data processing to communicate with the robot and guiding the robot. When a robot is placed in an unknown environmental condition the robot moves freely creating its own path. And the robot is controlled using Bluetooth within a 50 ft radius.

PHOTO OF CIRCUIT SETUP