

## THINGS DETECTOR USING EMBEDDED SYSTEMS

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### Abstract:

This paper presents a hardware design and implementation of a robot vehicle namely **Things detector using Embedded systems** which is used to identify the objects automatically which are at random places in a room. The robot vehicle consists of Arduino uno board, Ultrasonic sensor, RFID tags, Wheels for robot movement, DC motors, Motordriver, Bluetooth module and Power supply for the circuit. An android app is developed on the smart phone to operate the robot vehicle. The commands to the robot vehicle will be transmitted through Bluetooth module. After receiving the information the robot will start identifying the required things. The obstacles in the robot path will be detected by the ultrasonic sensor. A buzzer sound will be given to the user after identifying the things. By using this robot vehicle we can save our valuable time.

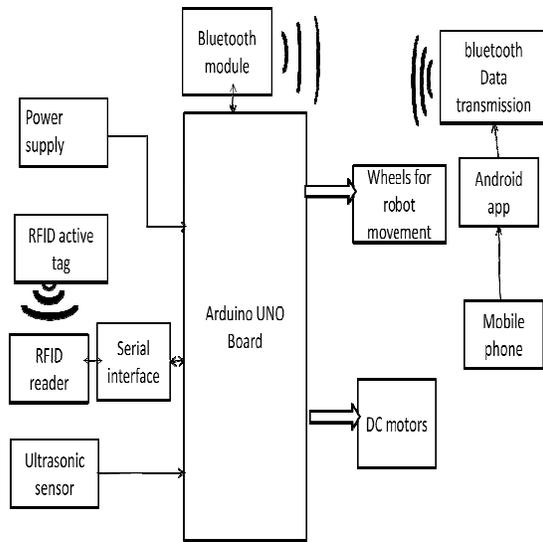
### INTRODUCTION:

Now a days in homes and offices there are so many things at random places. To identify that thing or object manually it requires a lot of time. So to reduce it, **Things detector** is implementing in this paper. Each object in the room will consists of an RFID tag. The object to identify will be select through the app. The information from app to robot vehicle will be transmitted through Bluetooth module. After receiving the information the robot will start moving. During the path if there is any obstacle, ultrasonic sensor will detect the obstacle and that information will be given to the

microcontroller. Based on this the robot vehicle will move either left or right as per the commands written to it. Whenever the code matches with the object the robot movement will stop and a buzzer sound will give to the user such that an indication is being made to the user i.e., required object is being detected.

### 1. BLOCK DIAGRAM:

The block diagram consists of components like microcontroller arduino board, ultrasonic sensor and RFID tags etc. as shown in below figure 2.1.



2. Fig 2.1: Block diagram

### 3. BLOCK DIAGRAM DESCRIPTION:

The proposed system consists of arduino uno board, Ultrasonic sensor, RFID tags, dc motors, Bluetooth module and power supply.

**3.1.Arduino uno:** Arduino uno belongs to atmel family of Atmega328. Using only arduino because it consists of lots of integrated peripherals runs with minimal support circuitary.



Fig 3.1.1: arduino uno microcontroller board

Arduino uno belongs to atmel family of Atmega328. Using only arduino because it consists of lots of integrated peripherals runs with least support circuitary. Arduino is nothing but open source computer hardware. It manufactures and designs microcontroller based kits for construction of devices which are digital and interactive objects those can control and sense objects in physical world. Arduino hardware contains modules like zigbee modules, motordrivers etc are considered to be able to easily connected with arduino board. Arduino system consists sets of digital and analog i/o pins in which 14 are digital pins and 6 are analog pins, USB port for loading programs from PC, serial communication interfaces. For programming of microcontrollers , it provides an IDE i.e., Integrated Development Environment based on which supports programming languages like C,C++, java. It maily contains ICSP header, 1KB of EEPROM, Power slot, atmega328, Operating voltage is 5v, 32 Kb of flash memory of which 0.5 KB is used by boot loader, 2KB of SRAM, 16MHz clock speed, 6 pulse width modulation output pins and it's input voltage is 7-12v.

### 3.2.Ultrasonic sensor:



Fig3.2.1: ultrasonic sensor

It is essential to give robot eyes for preventing obstacles. For this ultrasonic sensors are used. These are also known as transducers. This is used to detect the obstacles in our desired path. Ultrasonic sensor transmits ultrasonic waves continuously. If any obstacle comes, the sound waves will reflect back in the form of echo and gives an exciting pulse. It calculates the time between the signal which sent and the signal which was received.. The received outline will be compared with the model of sound waves to determine the condition of detected signal. This information is passed to microcontroller then based on the commands written it will move to left, right, front or back.

#### Features:

- Voltage supply: 5v(dc)
- Current supply:15mA
- Modulated frequency: 50Hz
- Distance measured:2cm-400cm
- Accurateness:0.3cm

### 3.2 Bluetooth module:

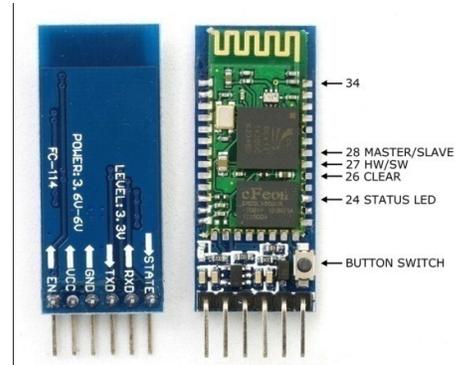


Fig 3.2.2:HC-05 Bluetooth module

HC-05 Bluetooth module is a serial port protocol used for apparent serial communication. This can be used in master or slave mode configuration. By default it is in slave mode. The bluetooth module can mechanism only by AT commands. The slave mode cannot initiate connections but it can allow another connections. Master module can initiate connections to other devices. This module contains 6 pins: **Enable,Vcc, Gnd, Txd&Rxd, State,Button switch.**

This module has a modulation of 3Mbps with 2,4GHz and it can operate between 3.3v to 5v and uses CMOS technology. It consists of an integrated antenna with UART interface.

#### Software features:

- Baud rate:9600
- Data bits:8
- Stop bit:1
- Parity: No parity
- Auto combination pincode:”1234” as default.
- Connects automatically on last device power as default.

### 3.3.RFID tags:



Fig3.3.1: Rfid tag

RFID stands for Radio Frequency Identification. These are mainly used to track the objects. Generally used RFID is Em-18. There are two types of RFID's:1. Active RFID 2. Passive RFID. Active RFID hold their own power source i.e., an internal battery that enables them to have a long period of life as well as large memory capacity. Active RFID tags that are powered by a battery can lasts between 3-5 years. Passive RFID tags have no internal power resource the power is supplied by the reader. These have a life time period of 20 years or more. These are less cost. Generally in small applications passive RFID tags are preferable.

RFID tags consists of mainly three parts: tag, reader ,antenna. Component on the tag have two parts: (a) a microchip that stores and runs the information

(b) an antenna to transmit and receive signals.

The tag contains particular serial number for particular tag. To read the information reader emits the signal to the tag using antenna. RFID reader reads the tag using radio waves.

### 3.4.DC MOTORS:

DC motors are also known as battery operated motors which converts electrical energy into mechanical energy. DC motors used where gears decrease the speed of vehicle but increases its torque is known as gear reduction.

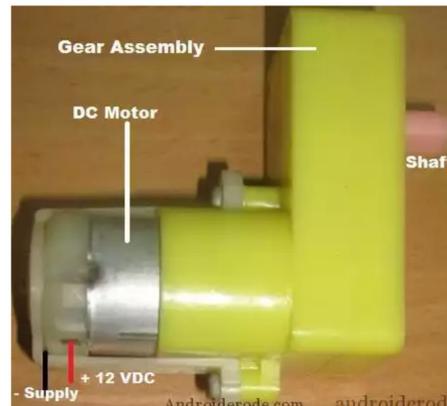


Fig3.4.1: DC motor

Speed of motor can be calculated in terms of per minute called as RPM i.e., Revolution Per Minute which helps to increase the torque and decreases motor speed. It operates between 2v to 12v. To drive the DC motors we need motordriver.

### 3.5Motordriver:

The L293D is a dual H-bridge motordriver IC. These are performed as current amplifiers since they consume a low current control signal

and provide a large control signal. The L293D is a 16 pin motordriver IC in which operation of the two dc motor can be operated at same time in both forward as well as reverse direction. The L293D is designed to provide bidirectional which can drive up to 600mA of current.

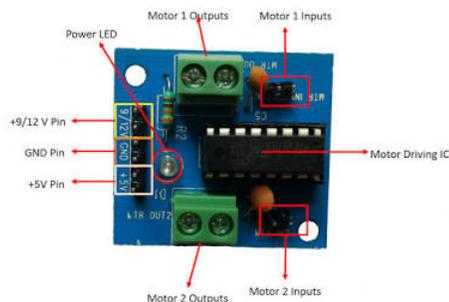


Fig3.5.1: L293D motordriver

L293D consists of two H-bridge. H-bridge is the simplest circuit for to operate and control a motor which has low current ratings. The purpose of the motordriver is to supply enough amount of current to the motors . L293D receives signals from arduino board and transmits the corresponding signals to the motors.

It consists of totally 16 pins and they are comprised as follows:

- Ground pins:4
- Input pins:4
- Output pins:4
- Enable pins:2
- Voltage pins:2

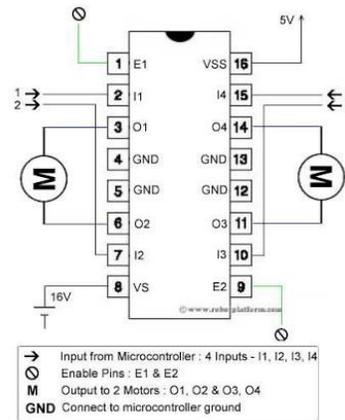


Fig3.5.2: pin description of L293D

To start operating motors, both enable pins must be high for running.

Wheels are placed for the robot to move. At the back side of robot two wheels are placed. Wheels can be of different types as orientable wheels, fixed wheels etc. we can use any types of wheels as per our requirement.

#### 4.CIRCUIT DESCRIPTION:

Firstly an app is installed on the smartphone. The object which we want to find is selected on that app. The data is transmitted to robot vehicle through bluetooth data transmission. The data is received by bluetooth module in the robot vehicle. The data transmission can be made possible by connecting transmission pin to Rx pin and reception pin to Tx pin of arduino i.e., 1 and 0 pins in arduino respectively. Dc motors driven through motordriver. E1 drives motor 1 with inputs i1, i2 and E2 drives motor 2 with inputs i3, i4 respectively. 12v in L293D is connected to battery 5v and gnd are connected to arduino power supply and

common ground. Trigger and Echo pins of ultrasonic sensor are connected to digital pins of arduino. Sensor runs with 5v power supply and Gnd is connected to common ground. Rfid tags and arduino can be connected through serial interface RS232. Tx, Rx and gnd pins of UART in rfid tags are connected with Tx, Rx and Gnd pins of UART in arduino. Hence data transmission is possible. After selecting particular object to detect, the robot moves in the room. Whenever there is an obstacle it detects by ultrasonic sensor, by taking appropriate commands the robot will move. The robot will search for the serial code of RFID tag, whenever it detects that thing it will stop at that particular place and a buzzer sound will be given to user such that it indicated object had been identified.

## 5. EXPERIMENTAL RESULTS:

The figure 5.1 shows the robot vehicle which will detect the things using RFID tags consisting of arduino board. This robot vehicle is having four wheels for its movement and all the components which required for robot to detect the required object.

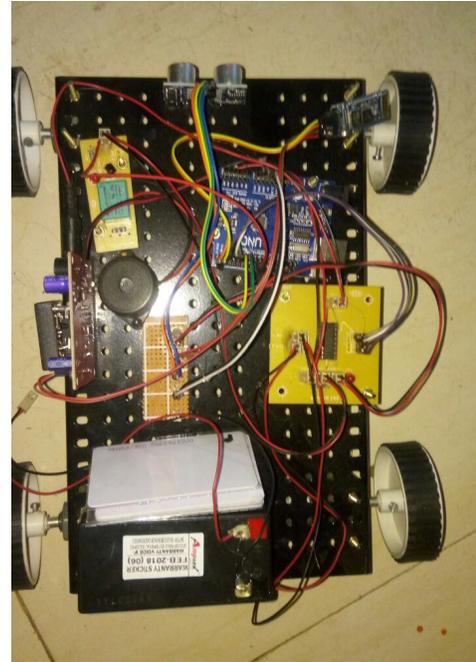


Fig 5.1: Robot vehicle

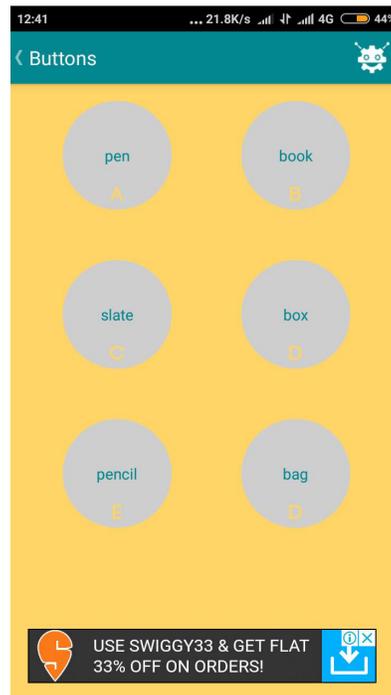


Fig:5.2 Android app

## 6. CONCLUSION:

Time is the crucial factor in these technological and busy scheduled days.

We have to save the time up to our extent and needs to cope up with the trending technologies in the world. Robotics is one of the booming technologies. Using that technology for human applications will be very beneficial for us. Detection of a thing by robot rather than manually can save our valuable time.

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