

# Fully controlled robot car

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**Abstract—** In the modern world, where security and safety are given the utmost importance we require modern robots. A Fully Controlled Robot Car is programmed to fulfil such needs. The microcontroller plays a vital role in this project, which controls obstacle detection providing safety and surveillance with the help of a camera. The present invention provides a simple and relatively low cost way of performing a fire and bomb detection test on the test system to determine whether or not the system is subject to fire or bomb explosion. Apart from detection, this robot also takes necessary action when it encounters fire or bomb explosion.

**Keywords—**robot car, high speed technology

## I. INTRODUCTION

The advent of new high-speed technology and the growing computer capacity provided realistic opportunity for new robot controls and realization of new methods of control theory. This technical improvement together with the need for high performance robots created faster, more accurate and more intelligent robots using new robots control devices, new drives and advanced control algorithms.

Robot is a system that contains sensors, control systems, manipulators, power supplies and software all working together to perform a task. Designing, building, programming and testing a robot is a combination of physics, mechanical engineering, electrical engineering, structural engineering, mathematics and computing. In some cases biology, medicine, chemistry might also be involved. A study of robotics means that students are actively engaged with all of these disciplines in a deeply problem-posing problem-solving environment.

## II. PROPOSAL

The aim of this project is to design a multifunctional robotic model. In this project, 8051 family microcontroller AT89S52 is used.

All the functions are controlled by the microcontroller and all the components are connected to it.

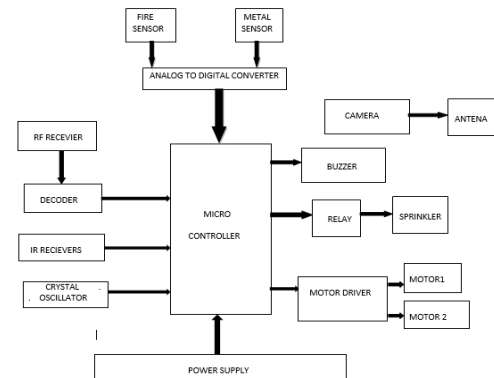


Fig 3.1 (Receiver section)

### A. OBSTACLE DETECTION:

The Motor drivers are connected to the microcontroller for the robotic car to move in all directions based on the input given from the remote. Infrared Sensors are connected on all the sides of the car to detect any obstacle in the way. These IR sensors, sense the obstacle and the microcontroller is intimated. Thus, the microcontroller controls the motor driver, turning in the appropriate direction and avoiding a collision.

### B. SURVEILLANCE:

A camera is mounted on robot and this helps the user to view the video transmitted from camera automatically. This project describes a new economical solution of robot control systems. The presented robot control system can be used for different sophisticated robot applications. The system can be viewed as two different modules- transmitter and receiver sections. The Transmitter section mounted on the car that provides a video and the receiver section receives it with the help of an antenna and the output can be seen on a monitor or a TV.

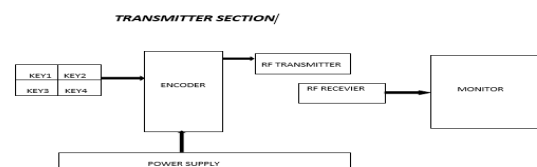


Fig 3.2 (Transmitter section)

### C. FIRE DETECTION:

This action is meant to simulate the real world operation of a Robot performing a fire extinguishing function. The microcontroller is connected with a fire sensor that senses fire and extinguishes fire by a sprinkler action.

### D. BOMB DETECTION:

The metal detector will be fixed in the predetermined area to check the possibility of a metal or a bomb. If there is an existence of metal in that area, the metal detector identifies the metal and intimates this to the controlling unit. This is in-turn intimated to the human by a buzzer connected to the microcontroller.

Both the fire and metal sensors are analog in nature and thus cannot be connected to the microcontroller directly. Thus, an Analog to Digital converter is used to convert the analog information to digital and give it as an input to the controlling system. The microcontroller requires a power supply. But since the car has to move around batteries are used for supplying power. The inputs from the remote are received by a RF receiver which is given to a decoder to decode the information and convert it into a input to the controller for the car to move. All these sensors work independently and can sense the obstacle that comes at the front of the vehicle through different position independently. Thus with these three sensors, we are able to cover the entire frontal view of the vehicle at a distance of 3 inches.

## III. HARDWARE ARCHITECTURE

The Hardware Architecture of the present model consists of

1. Micro controller (8051)
2. RF receiver(433 Mhz)
3. Decoder (HT12D)
4. ADC(0808)
5. IC TIMER (555)
6. Relay
7. Motor Driver (L293D)
8. DC motors (6v/250mA)
9. IR transmitters(Photo Diodes)
10. IR receivers
11. Buzzer
12. Sprinkler

The functions of the proposed components are as follows

### A. MICRO CONTROLLER:

Single integrated circuit containing a processor core, memory and programmable input/output peripherals. Micro controllers are used in automatically controlled products and

devices. Make it economical to digitally control even more devices and processes. It has four ports each facilitating 8 I/O pins to configure and connect various components

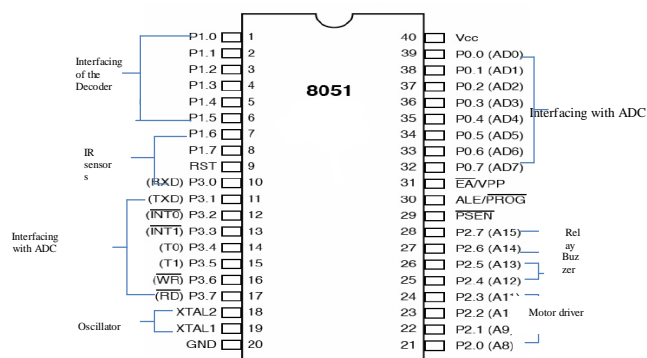


Fig 4.1(Micro controller)

### B. IR SENSORS:

IR sensors based on reflected amplitude of the surrounding objects. Non-linear characteristics depend on the reflectance characteristics of the object surface. IR sensors accurately measures the distance with reduced response time. It detects the obstacle and avoids the collision of the car with the hindrance. We are fitting FOUR IR sensors along with the transmitter at the front of the vehicle in such an angle that the sensor will detect the signal only if certain obstacle is placed at the front of the vehicle at a distance of around 3 inches. This range of detection can be further adjusted by adjusting the amplitude of transmitter or by adjusting the angle of alignment between the transmitter and the sensor. All these sensors work independently and can sense the obstacle that comes at the front of the vehicle through different position independently. Thus with these three sensors, we are able to cover the entire frontal view of the vehicle at a distance of 3 inches.

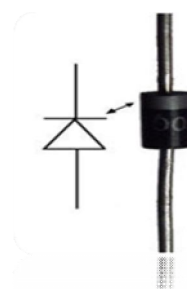


Fig 4.2 (IR sensors)

### C. RF RECEIVER:

RF module (radio frequency module) is a (usually) small electronic device used to transmit and/or receive radio signals between two devices. In an embedded system it is often desirable to communicate with another device wirelessly. This wireless communication may be accomplished through optical

communication or through Radio Frequency (RF) communication. For many applications the medium of choice is RF since it does not require line of sight. RF communications incorporate a transmitter and/or receiver. RF modules are widely used in electronic design owing to the difficulty of designing radio circuitry. In addition, reliable RF communication circuit requires careful monitoring of the manufacturing process to ensure that the RF performance is not adversely affected.

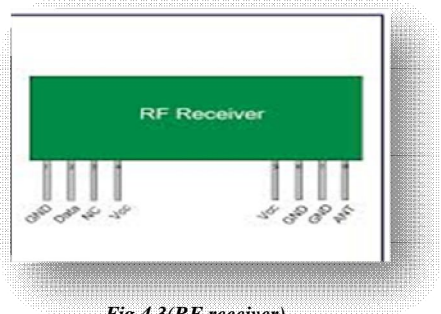


Fig 4.3(RF receiver)

#### D. DECODER:

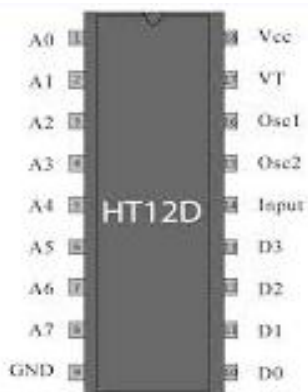


Fig 4.4(HT12D Decoder)

A decoder is a device which does the reverse operation of an encoder, undoing the encoding so that the original information can be retrieved. The same method used to encode is usually just reversed in order to decode. It is a combinational circuit that converts binary information from  $n$  input lines to a maximum of  $2^n$  unique output lines. In digital electronics, a decoder can take the form of a multiple-input, multiple-output logic circuit that converts coded inputs into coded outputs, where the input and output codes are different. E.g.  $n$ -to- $2^n$ , binary-coded decimal decoders. The HT 12D ICs are series of CMOS LSIs for remote control system applications. These ICs are paired with each other. For proper operation a pair of encoder/decoder with the same number of address and data format should be selected. The Decoder receive the serial address and data from its corresponding

decoder, transmitted by a carrier using an RF transmission medium and gives output to the output pins after processing the data.

#### E. ADC 0808:

The conversion involves quantization of the input, so it necessarily introduces a small amount of error. Instead of doing a single conversion, an ADC often performs the conversions ("samples" the input) periodically. The result is a sequence of digital values that have been converted from a continuous-time and continuous-amplitude analog signal to a discrete-time and discrete-amplitude digital signal.

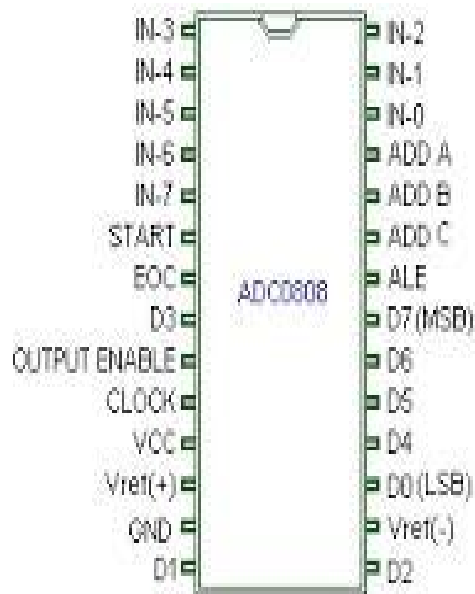


Fig 4.5(ADC)

#### F. IC555 TIMER:

The 555 timer IC is an integrated circuit (chip) used in a variety of timer, pulse generation, and oscillator applications. The 555 can be used to provide time delays, as an oscillator, and as a flip-flop element. Derivatives provide up to four timing circuits in one package. The 555 can operate as a flip-flop, if the DIS pin is not connected and no capacitor is used. Uses include bounce-free latched switches. In astable mode, the 555 timer puts out a continuous stream of rectangular pulses having a specified frequency. Resistor  $R_1$  is connected between  $V_{CC}$  and the discharge pin (pin 7) and another resistor ( $R_2$ ) is connected between the discharge pin (pin 7), and the trigger (pin 2) and threshold (pin 6) pins that share a common node. Hence the capacitor is charged through  $R_1$  and  $R_2$ , and discharged only through  $R_2$ , since pin 7 has low impedance to ground during output low intervals of the cycle, therefore discharging the capacitor.

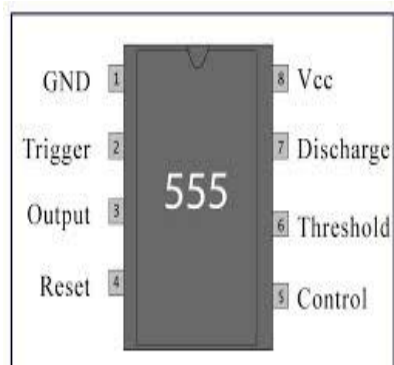


Fig 4.6(IC 555)

load implies increased torque and power consumption. Power supply by a motor is the product of output shafts rotational velocity & torque. Can run in both directions.



Fig 4.8(DC motors)

#### G. MOTOR DRIVER:

The L293D is a quadruple half H-bridge bidirectional motor driver IC. Can drive current upto 600 mA with voltage range of 4.5 to 36 volts .Drive small DC-Geared motors, bipolar stepper motor. An H bridge is an electronic circuit that enables a voltage to be applied across a load in either direction. These circuits are often used in robotics and other applications to allow DC motors to run forwards and backwards. Most DC-to-AC converters (power inverters), most AC/AC converters, the DC-to-DC push-pull converter, most motor controllers, and many other kinds of power electronics use H bridges.

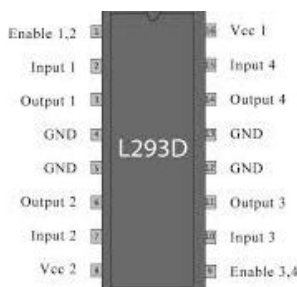


Fig 4.7(Motor driver)

#### H. DC MOTORS:

A **DC motor** relies on the fact that like magnet poles repels and unlike magnetic poles attracts each other. A coil of wire with a current running through it generates an electromagnetic field aligned with the center of the coil. By switching the current on or off in a coil its magnetic field can be switched on or off or by switching the direction of the current in the coil the direction of the generated magnetic field can be switched 180°. A simple *DC motor* typically has a stationary set of magnets in the stator and an armature with a series of two or more windings of wire wrapped in insulated stack slots around iron pole pieces (called stack teeth) with the ends of the wires terminating on a commutator. Dc motors are used for free running torque & current ideally zero. Increased

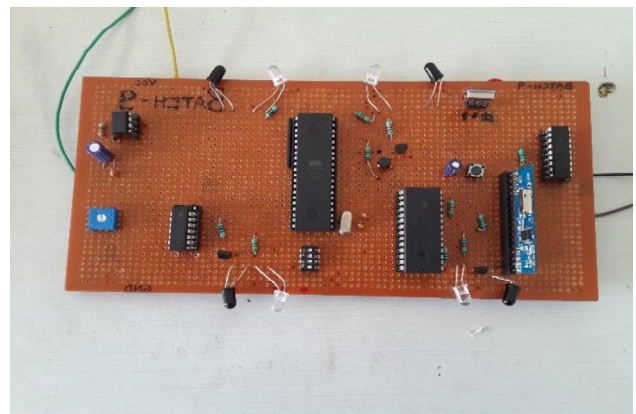
#### IV. POWER SUPPLY SYSTEM

Suitable power source is needed to run the robots. Mobile robots are most suitably powered by batteries. The weight and energy capacity of the batteries may become the determinative factor of its performance

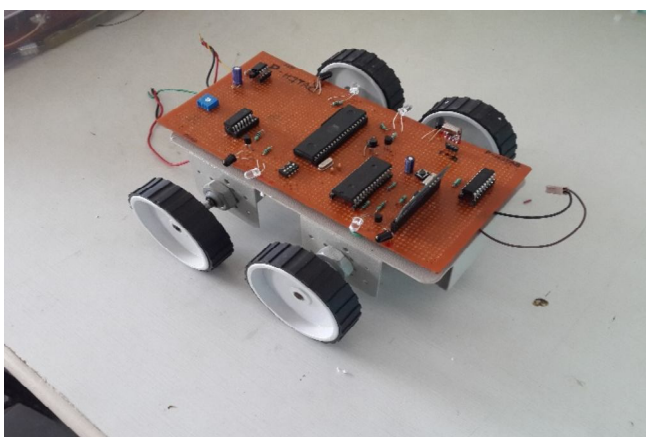
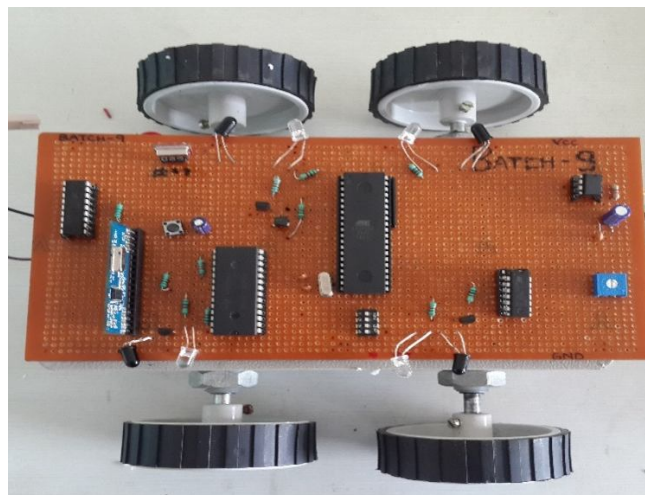
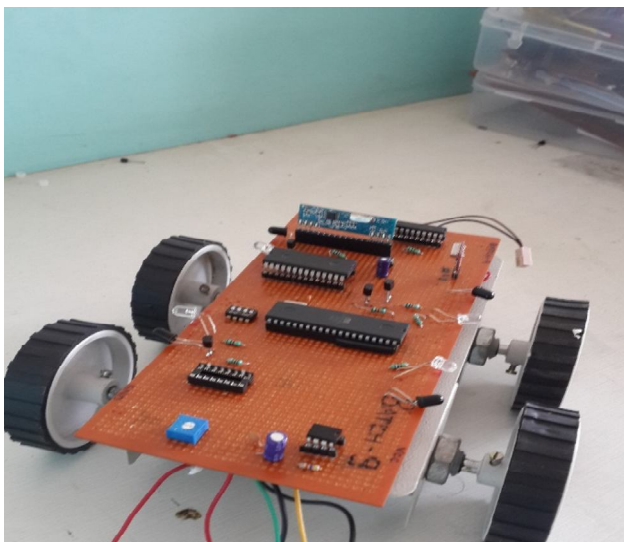
#### V. APPLICATIONS

- i. With proper programming we can use it as a weight lifter, auto parking assistance
- ii. As a bomb detector, fire extinguisher
- iii. Theft controller
- iv. The modification of this logic can be used to design a vacuum cleaner , can be used for avoiding concealed paths.

#### VI. WORKING MODEL







## VII. CONCLUSION

With the advancements in robotics we could design a multifunctional robotic car which can function without any human interference or support. The primary feature of the car being obstacle detection with surveillance, which is extensively designed for user safety. Apart from these the car is designed to sense bomb explosions and fire hazards. All the above features are achieved helping various industrial and military needs. Thus, making it a **“FULLY CONTROLLED ROBOTIC CAR”**.

## REFERENCES

- [1]. The 8051 Micro controller and Embedded systems
  - Muhammad Ali Mazidi
  - Janice GillispieMazidi
- [2]. Programming & Applications
  - Kenneth J.Ayala
- [3]. Electronic Components
  - D.V.Prasad
- [4]. R.Chatila,R.Alami,B.Degallaix, "Integrated Planning and Execution Control of Autonomous Robot"IEEEInt.Conf 1992.
- [5]. O.Khatib, "Real Time obstacle avoidance for manipulators and mobile robots"IEEEInt.Conf 1992
- [6]. Wireless.Communication Technologies
  - i. -Norihiro Moriga
- [7]. Encyclopaedia of firefighting surveillance robot