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REMOTE OPERATED SPY ROBOT

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ABSTRACT

A Spy robot is a machine which can be controlled by the remote. The maximum controllable range is 125meters. The remote has four switches to control the robot in four directions. The robot senses the surroundings through the CCD camera and sends to the receiver through the Radio Frequency wireless communication. Remote operated spy robot has mainly two sections, one is remote control section used to control the robot and other one is video transmission section used to transmit audio and video information. Spy robots are made so small and compact enough to easily transport. Here AT89S52 microcontroller is used which is a low-power high-performance CMOS 8-bit microcontroller with 4K bytes of in-system programmable Flash memory. The radio Frequency modules signals are used in wireless remote control system for transmitting and receiving wireless logic signals to control the motors of the Spy robot control system.

INDEX TERMS: *Microcontroller, Encoder and Decoder, CCD Camera, H-Bridge*

I. INTRODUCTION

A Robot is usually an electro-mechanical machine which is guided by wireless remote or laptop. Spy robot can capture audio and video information from the surroundings and send to a remote station through RF signal. By the use of remote controller, the spy robot will move to desired destination and spy images around the robot in this project.

This robot consists of mainly two sections:

Remote control section and Video transmission section. The block diagram of remote operated spy robot is shown in fig 1.

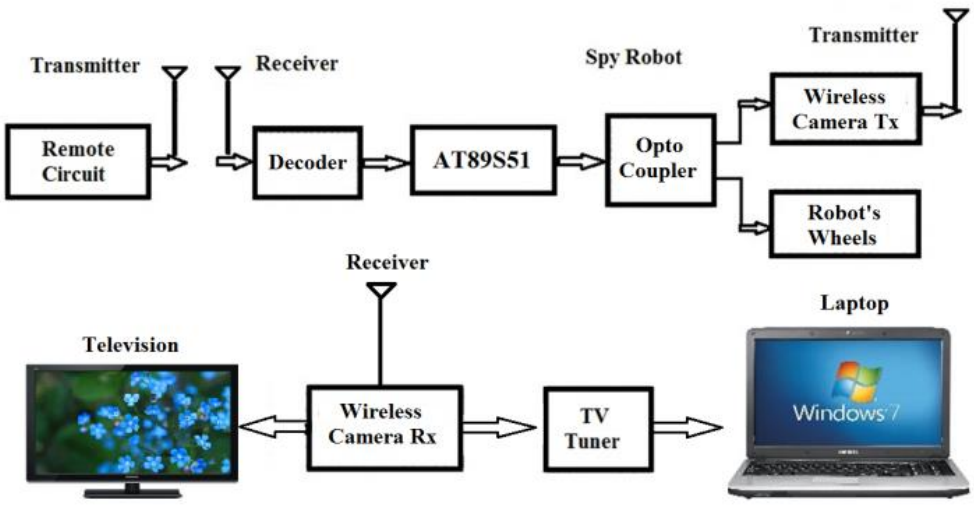


Fig 1: Block Diagram of Spy Robot

II. SYSTEM COMPONENTS

A.Microcontroller

In Remote operated Spy Robot AT89S52 is used as a main processor to control all the movements of robot and transmission & reception of data.

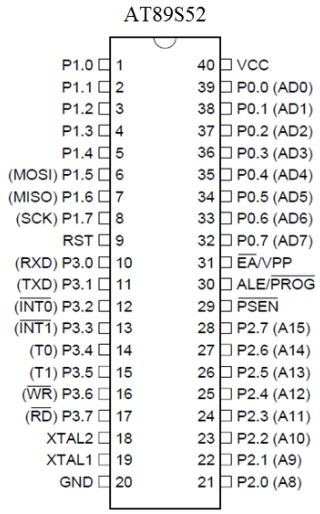


Fig 2: AT89S52 Microcontroller pins diagram

In Fig 2 pins 1,2,3,4,5,6 of AT89S52 are connected to six differnt PC 817(Opto-coupler devices).
The PC817 series of devices each consist of an infrared Emitting diodes, optically coupled to a phototransistor detector.

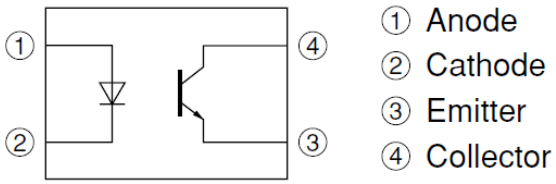


Fig.3 Opto-Coupler Device

They are packaged in a 4-pin DIP package and available in Wide-lead spacing and SMD option.

B. Encoder and Decoder

HT12E is an encoder integrated circuit of 212 series of encoders. They are paired with 212 series of decoders for use in remote control system applications. It is mainly used in interfacing RF and infrared circuits. The chosen pair of encoder/decoder should have same number of addresses and data format. Simply put, HT12E converts the parallel inputs into serial output.

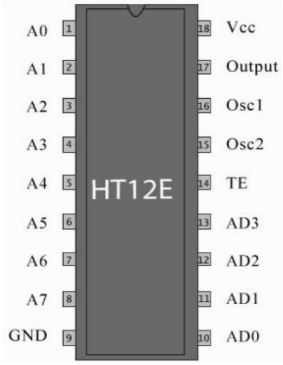


Fig.4: Encoder IC

It encodes the 12 bit parallel data into serial for transmission through an RF transmitter. These 12 bits are divided into 8 address bits and 4 data bits.
HT12D is a decoder integrated circuit that belongs to 212 series of decoders. This series of decoders are mainly used for remote control system applications, like burglar alarm, car door controller, security system etc. It is mainly provided to interface RF and infrared circuits.

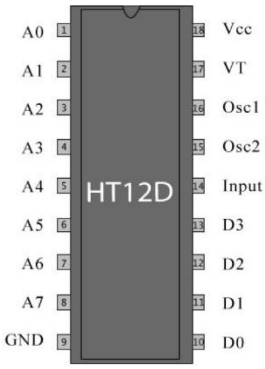


Fig.5: Decoder IC

They are paired with 212 series of encoders. The chosen pair of encoder/decoder should have same number of addresses and data format.

C. CCD Camera

The CCD is a major piece of technology in digital imaging. In a CCD image sensor, pixels are represented by p-doped MOS capacitors.

Fig.6: CCD Camera

These capacitors are biased above the threshold for inversion when image acquisition begins, allowing the conversion of incoming photons into electron charges at the semiconductor-oxide interface the CCD is then used to read out these charges.
The range of transmitted is 100ft visible around the Spy robot and resolution is 1024×800. Power is supplied to CCD camera by +12V from lead acid battery. This camera can move left and right direction to see survey around the robot.

D. H-Bridge

In general an H-bridge is a rather simple circuit, containing four switching element, with the load at the center, in an H-like configuration:

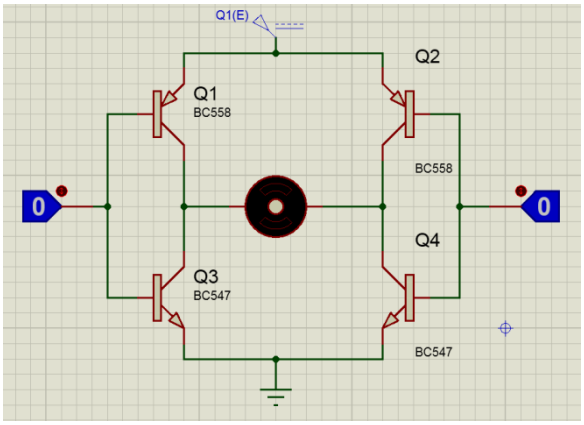
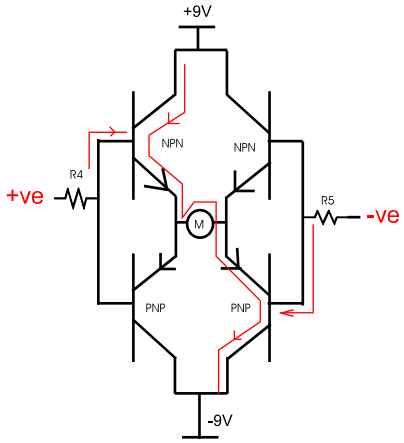
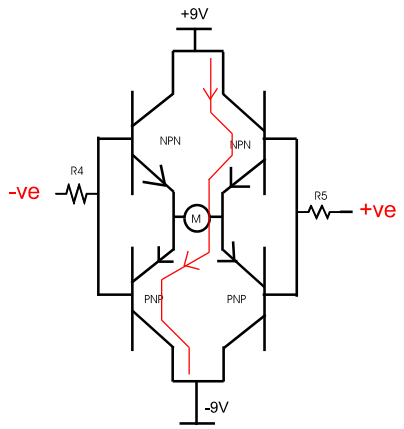


Fig.7: H-Bridge

In this circuit two of four transistors are selectively enabled to control current flow through a motor. These for transistors are used to control the movement of the motors in forward and backward direction. If we give a positive voltage to the base of left junction and negative voltage to the right junction then motor moves to one direction.
Because due to positive on base NPN is on and due to negative on base PNP is on. If left side NPN is on and right side PNP is on then motor moves to the one direction.



If the voltage is reverse on the base point then motor's moves to the reverse direction



When we attach the H-bridge to the logical output of the micro-controller. So to interface the micro-controller with this H-bridge we must connect a Opto-Coupler with the controller.

Opto-Coupler is a special optically isolated device to interface the input with output using light. Opto-Coupler provide an electrical isolation between the input and output circuit.

III. HARDWARE ASSEMBLING

A.Remote Control Circuit

We control all the movement of the robot with the help of the transmitter equipped with encoder circuit and radio frequency transmitter. At the receiver end we receive the data and control the motor's for all direction.

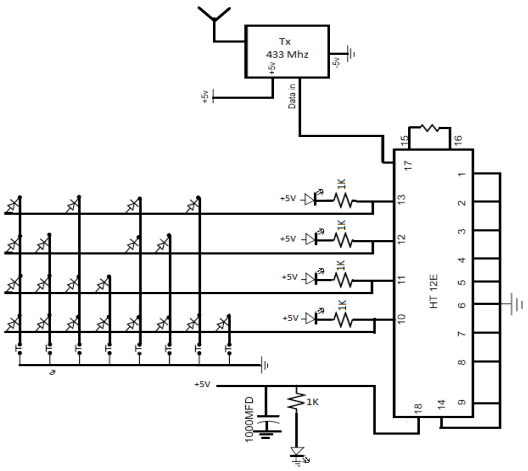


Fig.8: Remote Section

Remote section consist 6 switches 4 switches are used to control the movement of robot in forward, backward, left right and the remaining 2 switches are used to control the rotation of camera clockwise and anticlockwise.

All the switches are connected with the encoder circuit with RF transmitter circuit. RF transmitter circuit transmit the 4 bit code in air. Modulation is done by the RF module itself. This particular type of RF module transmit the data in FSK modulation.

B. Spy Robot Circuit

In the receiver circuit we use RF receiver first. RF receiver receive the data and convert this data into serial data. This data is further connected to the decoder IC. Decoder IC convert the serial data into parallel data. This parallel data is further connected to the micro-controller for compare the signal. Micro-controller compare the data and control the motors for all the direction.

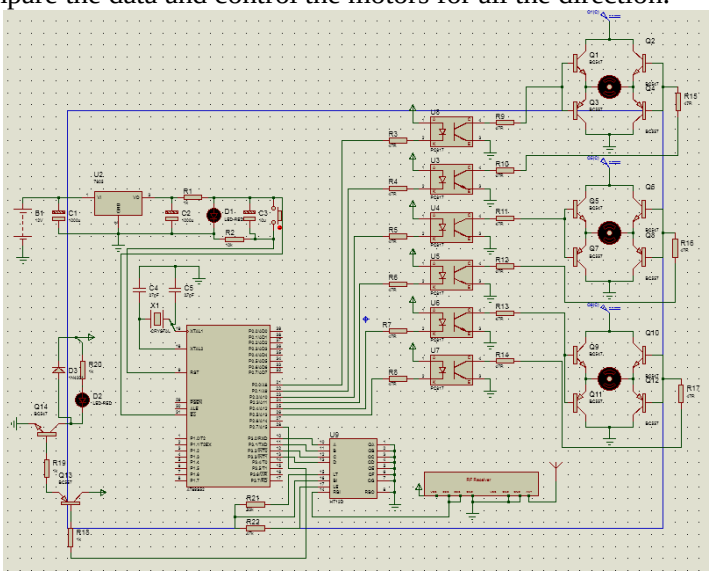


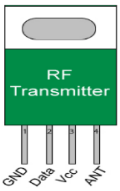
Fig.9: Robot Section

In the receiver circuit we use one decoder IC. This IC is HT 12 D. This IC is a decoder IC. First of all data is to be decoded by the RF module and then connected to the decoder IC. This signal is connected to the pin no 14 of the decoder IC. Output is available on the pin no 10,11,12,13. This data is further connected to the AT89S51 controller. With the help of this controller we control the movement of the motors.

In this project we use one 433 Mhz transmitter and one 433 Mhz receiver in both the circuit. This is RF module and use it for the many RF application circuit, this type of RF module is available in the market for different application. We use one pair of transmitter and receiver in both the circuit.

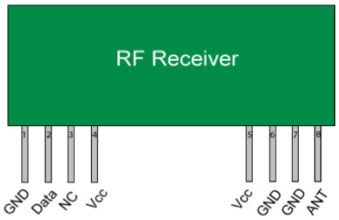
TWS-434: The transmitter output is up to 8mW at 433.92MHz with a range of approximately 400 foot (open area) outdoors. Indoors, the range is approximately 200 foot, and will go through most walls. The TWS-434 transmitter accepts both linear and digital inputs, can operate from 1.5 to 12 Volts-DC, and makes building a miniature hand-held RF transmitter very easy.

The TWS-434 is approximately the size of a standard postage stamp.



TWS-434 Pin Diagram

RWS-434: The receiver also operates at 433.92MHz, and has a sensitivity of 3uV. The RWS-434 receiver operates from 4.5 to 5.5 volts-DC, and has both linear and digital outputs.



RWS-434 Pin Diagram

Transmission through RF is better than IR (infrared) because of many reasons. Firstly, signals through RF can travel through larger distances making it suitable for long range applications. Also, while IR mostly operates in line-of-sight mode, RF signals can travel even when there is an obstruction between transmitter & receiver. Next, RF transmission is more strong and reliable than IR transmission. RF communication uses a specific frequency unlike IR signals which are affected by other IR emitting sources.
This RF module comprises of an RF Transmitter and an RF Receiver. The transmitter/receiver (Tx/Rx) pair operates at a frequency of 434 MHz. An RF transmitter receives serial data and transmits it wirelessly through RF through its antenna connected at pin4. The transmission occurs at the rate of 1Kbps - 10Kbps.The transmitted data is received by an RF receiver operating at the same frequency as that of the transmitter.

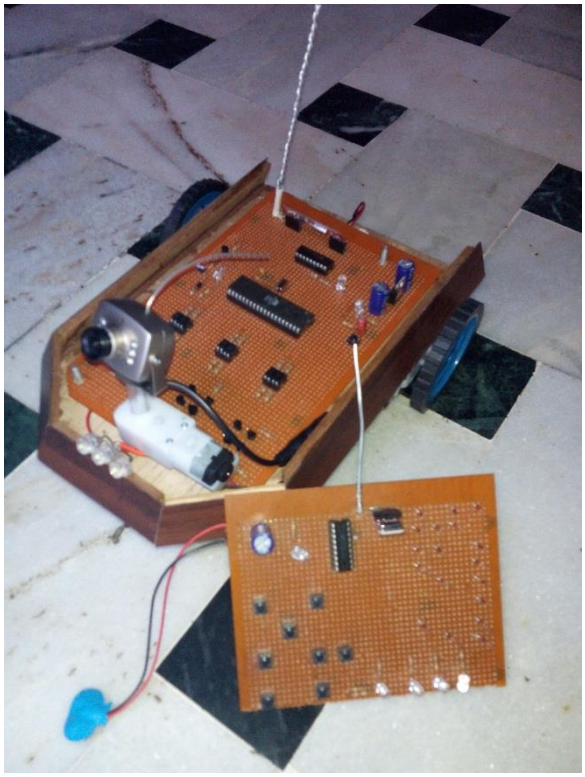


Fig.10: Implemented Spy Robot

IV. CONCLUSION

This Spy robot is used to transmit both audio and video to the receiver station. From the remote the movement of both camera and robot is controlled from the station. Because of the wireless camera is installed in spy robots, it can be used remotely to enter and exit dangerous place that human cannot. When the user controls by remote controller, the spy robot will move to desired destination and spy images around the robot. The user can check and recommend from computer with the wireless remote controller. For the whole system, the required power is supplied by Lead acid batteries which connected the voltage regulator.

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