

Remote Operated Spy Robot Vehicle

Khine Myint Mon¹, Lei Lei Hnin², Aye Sandar Aung², Ye Mann Aung²

¹Professor, ²Assistant Lecturer

^{1,2}Department of Electronic Engineering, Technological University, Meiktila, Myanmar

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ABSTRACT

Remote operated spy robot vehicle can be controlled by using a wireless remote controller. It can capture audio and video information from the surroundings and can be sent to a remote station through RF signals. The maximum range is 125meters. It overcomes the limited range of infrared remote controllers. HT12e encoder, HT12d decoder, RF433MHz transmitter and receiver modules are used for the spy robot and the remote control. H-Bridge circuits are used to drive two 12V motors. By pressing any key in remote controller, the HT12e encoder generates 8 address bit and 4 data bit. The RF module transmitter sent them and RF module receiver receives. And then HT12d decoder decodes the data and generates the output signals to control the L293D motor driver which then rotates the motors and wheels of spy robot vehicle. In this research, DC power supply is taken from the battery placed on the robot. The camera is placed on spy robot. Its audio and video output signals are directly sends from a SIM router. These information are received and caught to a phone, PC or TV in the remote station through internet.

KEYWORDS: Spy robot, HT12e encoder, HT12d decoder, RF433MHz transmitter and receiver modules, remote control, camera, SIM router

I. Introduction to Remote Operated Spy Robot Vehicle

Remote controlled spy robot operates with radio frequency transmitter/receiver (RF Tx/Rx), HT12e, HT12d and L293D motor driver, Charge Couple Device (CCD) camera, SIM router.

A remote controlled spy robot circuit can be controlled by using a wireless remote controller.

It has two transmit source. One is remote controller. It controls by wireless. Another one is wireless CCD camera. It can capture video and audio information from the surroundings and can be sent to a remote station through RF signal. Wireless CCD camera is short range but it is connected with SIM router. It is used internet. So the range of the camera is unlimited. It can use in dangerous conditions where human cannot reach. Example, in army to detect bomb, in industries and, to observe the behavior of wild animals where human cannot reach.

The block diagrams of spy robot and remote controller are shown in Fig.1 and Fig.2. Spy robot is controlled by joystick remote and CCD camera is spied the surrounding. The robot vehicle is controlled through the air by using radio RF signal. The distance between the vehicle and remote can be over 150ft and maximum range is 250ft. RF Tx/Rx is used 433MHz frequency.

Remote control has four switches. Two switches are used to control left motor wheels and other two switches are used to control right motor wheels. Robot vehicle can turn 360 degree by controlling remote. The transmitter section (remote control) mainly consists of HT12e encoder and RF transmitter module.

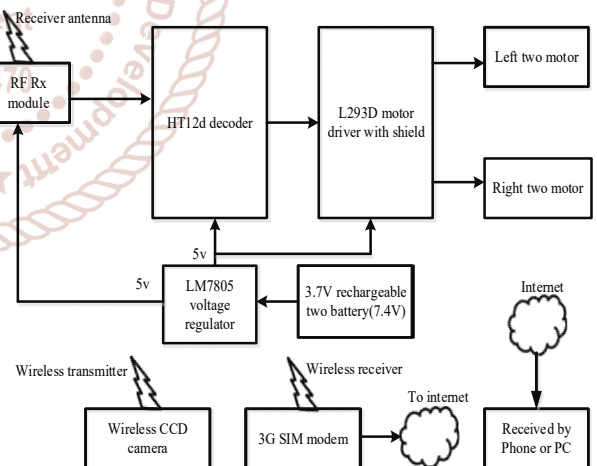


Figure1 Block Diagram of Spy Robot Vehicle

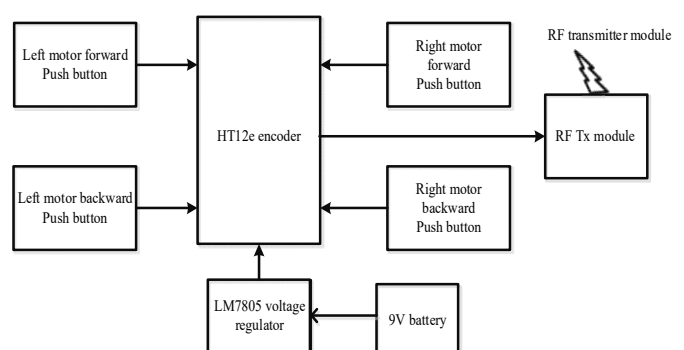


Figure2 Block Diagram of Remote Controller

HT12e is converted the parallel information from switch pad into serial for RF transmitter module, that module is used 433MHz frequency and operated. The transmitted RF signal is reached the receiver section and controlled the robot vehicle. RF receiver module is received the serial data from RF transmitter through the antenna and the signal sent to the HT12d decoder. HT12d decoder converts the serial information from RF receiver into parallel and sends output to L293D motor driver. And motor driver drives the four wheel motors.

The CCD camera on the spy robot sends the audio and video information to the receiver section. So the user can see the environment on the vehicle way and control it to move the desired direction. The received audio and video data can also be stored on receiver device.

II. Main Aim and Components

The main aim of this project is to control the robot vehicle with remote control and to spy the environment and receive information. The remote operated spy robot vehicle consists of the following main components.

- RF Tx/Rx module
- HT12d decoder and HT12e encoder
- L293D motor driver
- Four DC motors and wheels
- Wireless CCD camera
- 3G SIM router

To get the power supply 7.4V for spy robot circuit, two 3.7V rechargeable batteries are connected in serial. It is reduced to require 5V supply by using LM7805 voltage regulator. RF module, HT12d decoder, L293D motor driver is used power supply 5V. CCD camera has own battery. But power bank (2500mAh) is used as a power supply for 3G SIM router. A remote control is required 5V that is regulated by LM7805 voltage regulator from a 9V battery.

III. Operation of Charge Couple Device (CCD) Camera

In this project, CCD camera is used to see the view on vehicle way. It uses Plug and Play (P2P) technology adaption to wireless network. Local mode and remote monitoring mode are available. The built in Wi-Fi distance is 10meter. Using infrared night vision technology supports to work during the night. If it has full charging, it can work 100 minutes at normal mode and 60 minutes at night vision mode and support recording while charging. The camcorder accepts micro SD cards up to 32G, and the camera data can also be saved to the mobile phone. The video will be saved to user mobile phone when user uses the wireless network function.



Figure3. Diagram of CCD Camera

At first, mobile software P2P application is downloaded in mobile phone. According to user phone system, the QR code on the CCD camera is scanned to download the software and install in mobile phone.

A. Local Mode (LAN) Connection of CCD Camera

The steps for LAN connection of CCD camera are as follows.

- Turn the power on CCD camera and wait a minute.
- User mobile phone is used to search the signal of camera and join.
- The software is opened and click on LAN.



Figure4 LAN Mode Connection of CCD Camera on Phone

In Fig.4, the CCD camera connection can be chosen the LAN mode on phone. Camera's Wi-Fi is connected with mobile phone application on phone and opened the plug and play software on phone. Fig.5 and Fig.6 show the CCD camera in day mode and in night mode.

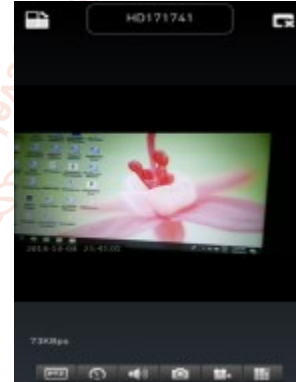


Figure5 LAN Connection of CCD Camera in Day Mode

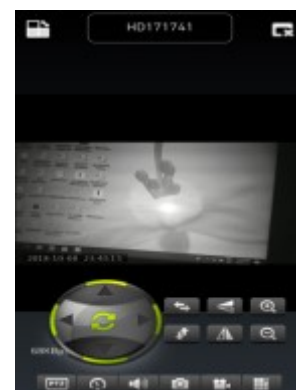


Figure6 LAN Connection of CCD Camera in Night Mode

B. WAN Mode Connection of CCD Camera

The steps for WAN connection of CCD camera are as follows.

- Power on the 3G SIM router.
- Connect the CCD camera with 3G SIM router.



Figure7 CCD Camera Setting Mode

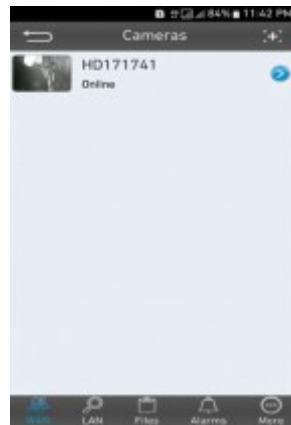


Figure10 CCD Camera Connection in WAN Mode



Figure7 CCD Camera Connection with 3G SIM Router

In Fig.7, the connection of CCD camera and 3G SIM router with password is shown. CCD camera is connected with 3G SIM router. And then the internet is opened on mobile phone. WAN mode in application is chosen as shown in Fig.8. And then the QR code in CCD Camera is scanned as shown in Fig.9. CCD camera in WAN mode connection on mobile phone is shown in Fig.10.



Figure8 WAN modes Connection of CCD Camera



Figure9 Scan QR Code of CCD Camera

IV. Operation of Remote Operated Spy Robot Vehicle

There are two main sections in this remote operated spy robot vehicle: receiver section (spy robot vehicle) and transmitter section (remote control). Fig.11 presents the circuit diagram of spy robot vehicle and Fig.12 shows the circuit diagram of remote controller.

A. Circuit Operation of Spy Robot Vehicle

Robot receiver section has RF433MHz receiver module. RF receiver module receives serial data 8 address bit and 4 data bit. These data sent to HT12d decoder. HT12d decoded serial data into parallel 8 address bit and 4 data bit. The decoded data sent to the L293D motor driver. L293D motor driver drives the motor forward, backward, left and right. Robot has four DC motors. Two DC motors are connected in serial on each side. On spy robot section consists of wireless CCD camera and router. CCD camera captures the video and audio information and sent these data to the internet by 3G SIM router. 3G SIM router received the data from the CCD and sent this video and audio information to the internet. The video and audio information from the CCD camera are received by the mobile phone or computer by using internet.

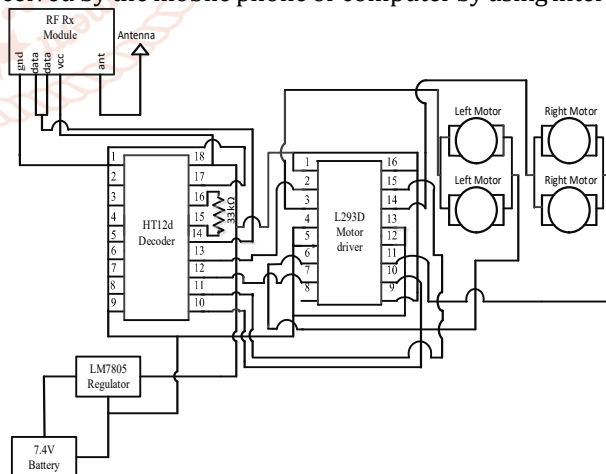


Figure11 Circuit Diagram of Spy Robot Vehicle

B. Circuit Operation of Remote Controller

HT12e encoder is mainly component of remote control section. HT12e encode the parallel data into serial data 8 address bit and 4 data bit. And these serial data is transmitted by RF433 transmitter module. RF433 transmitter module transmit radio signal. RF433MHz transmitter module has two sections. One module is transmitter section. Another one is receiver section. RF433MHz transmitter module is used in remote control. Another one is used in spy robot section.

When switch one is pressed, the left serial DC motors run forward direction. When switch two is pressed, the left serial DC motors run backward direction. When switch three is pressed, the right serial DC motors run forward direction. When switch four is pressed, the right DC motors run backward direction.

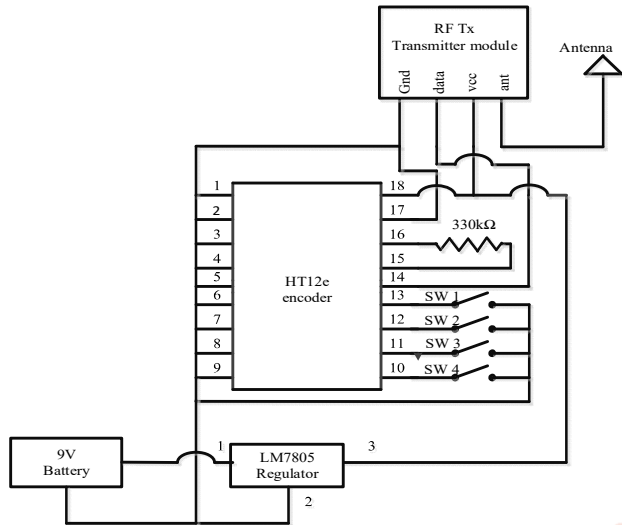


Figure12 Circuit Diagram of Remote Controller

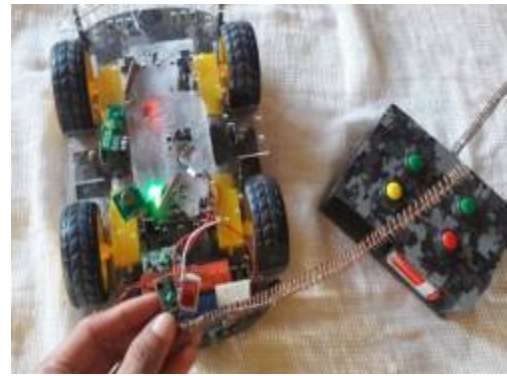


Figure15 RF433MHz Modules Testing with Spy Robot

V. Testing of Remote Operated Spy Robot Vehicle

Spy robot testing with remote control transmitter is shown in Fig.13 and Fig.14. RF433MHz module testing with spy robot is presented in Fig.15. CCD camera LAN mode testing with mobile phone is shown in Fig.16. CCD camera WAN mode testing with router and mobile phone is shown in Fig.17.



Figure16. CCD Camera LAN Mode Testing with Mobile Phone



Figure13 Spy Robot Testing with Remote Controller



Figure17. CCD Camera WAN Mode Testing with Router and Mobile Phone



Figure14 Remote Control Transmitter

VI. Results of Remote Operated Spy Robot Vehicle

Installation of CCD camera and 3G SIM router combined with spy robot as shown in Fig.18. Result of spy robot with remote controller and camera is shown in Fig.19. The complete view of remote operated spy robot vehicle is shown in Fig.20.



Figure18 CCD Camera and 3G SIM Router Combined with Spy Robot



Figure19 Result of Spy Robot with Remote Controller and Camera



Figure20 Remote Operated Spy Robot Vehicle

VII. Conclusion and Discussions

This project has developed a reliable mechanism of communication, control and capture video and audio data for a remote operated spy robot. It used in various applications like military applications, landmine detection, firing situations, wireless security and surveillance in hot spots, search and rescue operation, maneuvering in hazardous environment. In this system, HT12e encoder and HT12d decoder are connected with RF433MHz module.

In this project, wireless CCD camera can be connected via the internet by 3G SIM router. So the camera captures the video and audio information from the surrounding sent by internet. User can receive the information by using internet anywhere.

In this circuit, RF module has disadvantages. RF module signal has many losses because it needed to adjust the variable preset. Sometime signal is lost and the connection of robot is break. If RF crystal module that has strong signals is used, communication is better. In this project, CCD camera is used with internet. It is not good for any situation without internet. Therefore, module camera can be used in future project. Metal detector can be combined with this spy robot for searching metal.

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