



# Radio Frequency based Remote operated SPY Robot

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**ABSTRACT:** It is a remote operated spy robot circuit which can be controlled by using a wireless remote controller. It can capture audio and video information's from the surroundings and can be sent to a remote station through RF signals. The maximum range is 125 meters. It overcomes the limited range of infrared remote controllers. The circuit uses HT 12E, HT 12D encoder and decoder. 433MHz ASK transmitter and receiver are used for the remote control. H-bridge circuits are used for driving motors. Two 12V DC/100RPM gear motors are used as drivers. When we are pressing any key in remote controller the HT 12E generate 8 bit address and 4 bit data .The DIP switches are used for setting the address. Then the ASK transmitter sends the 8 bit address and 4 bit data to the receiver Then the ASK receiver receives the 8 bit address and 4 bit data and HT 12D decoder decodes the data, thus enabling the appropriate output. Thus the output signals that are generated controls the H-bridge which then rotates the motors. In this paper we are using a wireless CCD camera. It works on 12VDC supply. The 12 Volt DC supply is taken from the battery placed on the robot. The camera has a receiver, which is placed in the remote station. Its output signals are in the form of audio and video. These signals are directly connected to a TV receiver or a computer through a tuner card.

**Key words:** Mechatronics, RF, Robot, Sensors, ASK

## 1. INTRODUCTION

1.1. *Introduction to Robot:* A Robot is a mechatronics` device which also in includes resourcefulness or autonomy. A device with autonomy does its thing "on its own" without a human directly guiding it moment-by-moment. Some authors would contend that all mechatronic devices are robots, and that this books restriction on robot entails only specialized software. Robotics can be described as the current pinnacle of technical development. Robotics is a confluence science using the continuing advancements of mechanical engineering, material science, sensor fabrication, manufacturing techniques, and advanced algorithms. The study and practice of robotics will expose a dabbler or professional to hundreds of different avenues of study. For some, the romanticism of robotics brings forth an almost magical curiosity of the world leading to creation of amazing machines. A journey of a lifetime waits in robotics.

Robotics can be defined as the science or study of the technology primarily associated with design, fabrication, theory, and application of robots. While other fields contribute the mathematics, the techniques, and the components, robotics creates the magical end product. The practical applications of robot drive development of robotics and drive advancements

in other sciences in turn. Crafters and researchers in robotics study more than just robotics. Robot control using RF is an exclusive paper where the direction of the movement of robot can be changed using wireless technologies. The robot will be placed different from that of from where it is controlled the robot movement is controlled using wireless concept in this paper; the robot movement is controlled by using remote controller in a wireless fashion. This paper can also be carried out using wiring processes. But the main disadvantage when we go for wiring is that, data transmission and reception may not be perfect and the data may be lost if the wiring is not done properly. Thus, the robot movement is controlled using wireless concept in this paper. In this paper, the robot movement is controlled by using remote controller and the information will be passed to the robot in a wireless fashion.

1.2. *Need for remote operated spy robot:* The idea of the paper evolved with a fantasy to see the places we wish to see at will. In this paper this idea is realized at our fingertips. The paper is done to create a version of spying robot that can enable us to observe the place of our interest. The size of the robot also aids it to be used as a spy robot. Thus to create the robot, we should be able to manipulate its path when necessary. To realize all that, a control unit is required .In this control units RF signal is used. Using these signals encoding is done and signal is sent through the transmitter. In the receiver end these received signals are decoded and given as input to drive the motor. This will help us to manipulate the robot in the manner we want. A video transmitter mounted on top of the robot helps us to see the path of motion.

## 2. GENERAL DESCRIPTION

2.1 *About RF:* Radio frequency (RF) is a frequency of rate of oscillation in the range of about 3 KHZ to 300 GHZ which corresponds to the frequency of radio waves, and the alternating currents which carry radio signals. Since most of this range is beyond the vibration rate that most mechanical system can respond to, RF usually refers to oscillations in electrical circuits or electromagnetic radiation.

Electrical currents that oscillate at radio frequencies have special properties not shared by direct current signals. One such property is the ease with which it can ionize air to create a conductive path through air. This property is exploited by "high frequency" units used in electric arc welding. Another property is the ability to appear to flow through paths that contain insulating material, like the dielectric insulator of

a capacitor. The degree of effect of these properties depends on the frequency of the signals.

**2.2 Brief description of RF:** Radio frequency is a term that refers to alternating current (AC) having characteristics such that, if the current is input to an antenna, an electromagnetic (EM) field is generated suitable for wireless broadcasting and/or communications. These frequencies cover a significant portion of the electromagnetic radiation spectrum, extending from 9KHz, the lowest allocated wireless communications frequency (it's within the range of human hearing), to thousands of gigahertz (GHz) When an RF current is supplied to an antenna, it gives rise to an electromagnetic field that propagates through space. This field is sometimes called an RF field: in less technical jargon it is a "radio wave". Any RF field has a wavelength that is inversely proportional to the frequency. In the atmosphere or in outer spaces, if  $f$  is the frequency in MHz and the wavelength in meters, then  $\lambda = 300/f$

The frequency of an RF signal is inversely proportional to the wavelength of the EM field to which it corresponds. At 9 KHz, the free-space wavelength is approximately 33 kilometers (km) or 21 miles (mi). At the highest radio frequencies, the EM wavelengths measure approximately one millimeter (1mm). As the frequency is increased beyond that of the RF spectrum, EM energy takes the form of infrared (IR), visible, ultraviolet (UV), X rays, and gamma rays. Many types of wireless devices make use of RF fields. Cordless and cellular telephone, radio and television broadcast stations, satellite communications systems, and two-way radio services all operate in the RF spectrum. Some wireless devices operate at IR or visible-light frequencies, whose electromagnetic wavelengths are shorter than those of RF fields. Examples include most television-set remote-control boxes some cordless computer keyboards and mice, and a few wireless hi-fi stereo headsets. The RF spectrum is divided into several ranges, or bands. With the exception of the lowest-frequency segment, each band represents an increase of frequency corresponding to an order of magnitude (power of 10). The table depicts the eight bands in the RF spectrum, showing frequency and bandwidth ranges. The SHF and EHF bands are often referred to as the microwave spectrum.

**RF Advantages:**

- No line of sight is needed.
- Not blocked by common materials. It can penetrate most solids and pass through walls.
- Longer range
- It is not sensitive to the light
- It is not much sensitive to the environmental changes and weather conditions

**2.3. Video Transmission:** A program is created by focusing the camera on a scene. The camera changes light from the scene into an electric signal, called the video signal, which varies depending on the strength, or brightness, of light received from each part of the scene. In color television, the camera

produces an electric signal that varies depending on the strength of each color of light. The video signals from the cameras are processed in a control room and audio signals from microphones placed in or near the scene also flow to the control room, where they are amplified and combined. The camera captures the video and audio signals and is then sent to the transmitter. The transmitter amplifies the video and audio signals, and uses the electronic signals to modulate, or vary, carrier waves.

The carrier waves are combined and then sent to the transmitting antenna. In the antenna, the oscillations of the carrier waves generate electromagnetic waves of energy that radiate horizontally throughout the atmosphere. The waves excite weak electric currents in the receiving antennas within the range. These currents have the characteristics of the original picture and sound currents. The currents flow from the antenna attached to the television or computer into the receiver, where they are electronically separated into audio and video signals. These signals are amplified and sent to the picture tube and the speakers, where they produce the picture and sound portions of the program.

**2.4. Camera Receiver:**



Figure 1. Television with a camera receiver

We are using a wireless CCD camera, this type of cameras are commonly available in the market. This camera works on 12volts DC supply. The camera has a receiver, which is placed in the remote station. Its output signals are in the form of audio and video. These signals are directly connected to a



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television or a computer through a tuner card. This CCD camera is connected to the robot. This camera captures the video and audio signals and sends those signals to the remote station and with the help of the camera receiver which is connected to the television or a computer through we can able to see the captured signals.

### 3. WORKING

When we are pressing any key in remote controller the HT 12E generate 8 bit address and 4 bit data .The DIP switches are used for setting the address. Then the ASK transmitter sends the 8 bit address and 4 bit data to the receiver Then the ASK receiver receives the 8 bit address and 4 bit data and HT 12D decoder decodes the data, thus enabling the appropriate output. Thus the output signals that are generated controls the H-bridge which then rotates the motors. The 433 MHZ ASK transmitter and receivers are extremely small, and are excellent for applications requiring short-range RF remote controls. The transmitter accepts both linear and digital inputs and can operate from 1.5 to 12 Volts-DC. The receiver operates from 4.5 to 5.5 volts-DC. Video Transmission Section: In this paper we are using a wireless CCD camera. Now these types of cameras are commonly available in the market. It works on 12VDC supply. The 12 Volt DC supply is taken from the battery placed in the robot. The camera has a receiver, which is placed in the remote station. Its output signals are in the form of audio and video. These signals are directly connected to a TV receiver or a computer through a tuner card.

### 4. RESULT

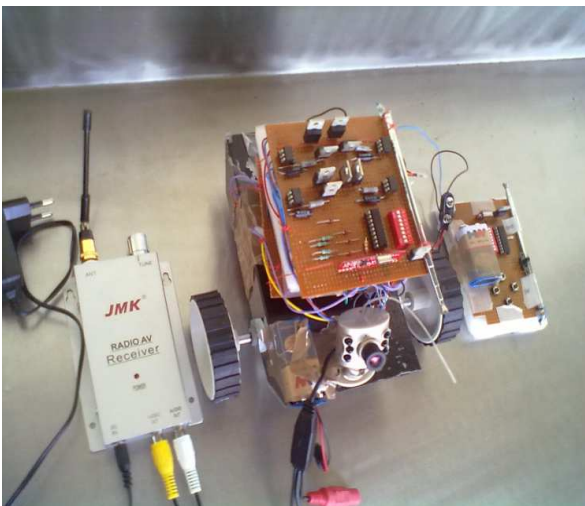


Figure 2. Designed circuit of Remote Operated Spy Robot

During tests, our design works as expected. The primary metric for our paper would be accuracy. This has been tested to the best of our ability. We have been able to view the things accurately that are happening. In our experience, our design has not caused any sort of disturbances. The robot will move based on the motor direction depending upon the input we

give through remote controller. With the help of the camera we are able to view the things that are happening in the area where the robot is hidden. By keeping the circuit simple, most users will be able to use it easily.

### 5. CONCLUSION

The idea of the paper evolved with a fantasy to see the places we wish to see at will. In this paper this idea is realized at our fingertips. The paper is done to create a version of spying robot that can enable us to observe the place of our interest. The size of the robot also aids it to be used as a spy robot. Thus to create the robot, we should be able to manipulate its path when necessary. To realize all that, a control unit is required .In this control units RF signal is used. Using these signals encoding is done and signal is sent through the transmitter. In the receiver end these received signals are decoded and given as input to drive the motor. This will help us to manipulate the robot in the manner we want. A video transmitter mounted on top of the robot helps us to see the path of motion. The reason behind manual control of the robot is that it will not be lost owing to absence of human involvement. If not for long range applications it can be used as a spy robot within short distances.

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