Android Controlled Spy Robot with Night Vision Camera & Temperature Sensor using Bluetooth

Sadaf Shaikh[1], Amol Wani[2], Karuna Shinde[3], S.M.Jog[4]
[1, 2, 3, 4] Department of Electronics & Telecommunications Engineering
[1, 2, 3, 4] NBN Sinhgad School of Engineering, Pune

Abstract- *A spy robot or any robotic vehicle can be operated from any android device very easily. A good user interface for handling the vehicle is provided by it. The vehicle is operated by the android device at a Bluetooth communication range which is good. The Bluetooth receiver which is at the receiver at the vehicle is used to transmit control movement data from the app to vehicle. The night vision camera which is mounted on robot allows efficient spying using infrared lighting even in darkest areas. We have also connected temperature sensor to sense real time temperature and provide output in the application. Such type of application is mostly used in any high temperature system or military system or to detect the situation over there. The project is designed to develop a robotic vehicle using Bluetooth, Android Cell Phone and an Android Application to control the robotic vehicle. Wireless camera sends back the real time video and audio inputs which can be seen on a remote monitor in the base station from where the robot is being controlled and action can be taken accordingly. The robotic vehicle can silently enter into an enemy area and through its camera eyes it can send us all the information.*

Keywords- Bluetooth module, electronics

I. INTRODUCTION

Being an Indian citizen we can never forget the 26/11 attacks where most of people lost their life. As a study, we found that one of the major reasons for such loss of lives is lack of planning. Since there were no devices like the camera for monitoring the right position of terrorist. Therefore, it is necessary to make a robot to face such type of situation. Recently a study has been carried out on the robot that can be used in war field with wireless camera. At war field a soldier can't directly enter at the enemies' location. It can be risky for his life. War field has recognized that the automatic devices such as camera are proved to be more efficient than the use of the human army or a human soldier. If we are able to use automatic devices then there is a benefit to carry weapons along with such devices. Therefore, use of such type of robots to do risky jobs at the war field can make it easy for Indian soldiers and can secure their life. In this project, the work system is divided in two ways where one is transmitter and another is receiver. At the transmitter section, the commands are transferred through push buttons to the receiver. The commands are: forward, reverse left, right and stop and according to these commands, the robot will take further action. For transmitting the signal RF technology is used to transmit the signal from one end to another. The proper range for transferring wireless signal from one point to another point is about 200 meters. The signal is wirelessly been sent via the transmitting antenna. At the receiver section, there are two motors which are interfaced along with the microcontroller. The rotations of motors are capable for moving the robotic vehicle in the war field. In this system, robot acts as a vehicle. The wireless camera should be mounted on the body of the robotic vehicle. The novelty of this paper is that, the wireless camera is capturing pictures in dark night vision using the IR (infrared) sensor. So this robot is very effective for spying in the war field. The night vision camera used in this project is known as the IR (Infrared) wireless camera. The IR (infrared) camera emits light rays which are not visible to the human eye. At the receiver section three sensors are used. The three sensors used at the receiver section are temperature sensor, infrared sensor and ultrasonic motion sensor. Ultrasonic motion sensors are used to sense object coming towards it.

The robot works on two modes:

1. Automatic mode: In the automatic mode, the robot can work automatically.
2. Manual mode: In manual mode, user has to control the robot using an android application installed in the mobile.

- Dc motor
- Bluetooth
- IR sensor
- Microcontroller
- Ultrasonic sensor
- Temperature sensor
- Battery
- Voltage Regulator

II. MANUSCRIPTS

A. Components and Specifications :

1. Dc Motor

The dc motor is an electrical machine that converts direct current electrical power into mechanical power. Most type produces rotation; linear motor directly produces force and motion in a straight line.

50-100 RPM
12V DC motors.
6mm shaft diameter with internal hole

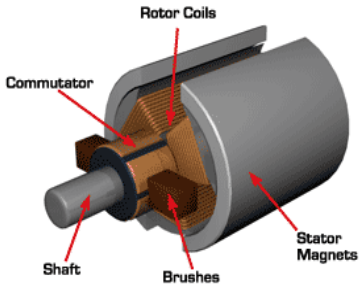

Figure 1. functioning of dc motor

2. Bluetooth:-

Bluetooth module is an easy to use module. Bluetooth SPP (Serial Port Protocol) module is designed for the transparent wireless serial connection setup.

The features of the Bluetooth module HC05 are as follows:

- Up to +4dBm RF transmits power.
- PIO control
- With integrated antenna.
- Low Power 1.8V Operation 1.8 to 3.6V I/O.
- UART interface with programmable baud rate.
- With edge connector.

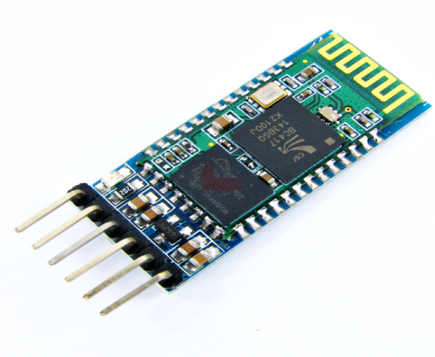

Figure 2.

3. Battery/Transformer:-

The circuit consists of a step-down transformer, rectifier, voltage regulator IC (7805) and some capacitors which are used for filtering purpose.

And for converting the high voltage into low voltage the step-down converters are used.
Output voltage- 12 v
Weight- 44gms

4. IR Sensor:-

An infrared sensor emits in order to sense some aspects of the surrounding.

It is an electronic device.

The IR sensor can measure the heat of an object & also detects the motion.

The passive IR sensors measures only the infrared radiations, rather than emitting it.

IR Obstacle, Line Proximity, Fire Colour Sensor, fire detection, line sensing.

Range of around 25 cm, Input Voltage: 5V DC

Figure 3. showing IR sensor and diodes

5. Microcontroller:-

Arduino is an open source project that creates microcontroller based kits for building digital devices and interactive objects that can sense and control physical devices. These systems provide sets of digital and analog outputs, pins that can interface to various expansion boards and other circuits.

Arduino ATmega328P
Digital I/O Pins: 14 (of which 6 provide PWM output)
Flash Memory: 32 KB (ATmega328P) of which 0.5 KB used by boot loader.
SRAM: 2 KB (Operating Voltage 5V)

Figure 4. shows microcontroller Arduino

6. Ultrasonic sensor:-

The Ultrasonic Sensor transmits a high-frequency sound pulse and then calculates the time that how long it takes for the echo of the sound to reflect back. The sensor consists of 2 openings on its front side. One opening is for transmitting ultrasonic waves, (such as a tiny speaker), the other one is for receiving them, (such as a tiny microphone). The speed of sound is approximately 1100 feet (341 meters) per second in air. This sensor uses this type of information along with the time difference between transmitting and receiving the sound pulse which is used to determine the distance of an object from itself. The following mathematical equation is used which is as follows:

Distance = Time x Speed of Sound divided by 2

Where,
Time = the time between the transmission of ultrasonic wave and when it is received
You must then divide this number by 2 as the sound wave has to travel to the object and back.

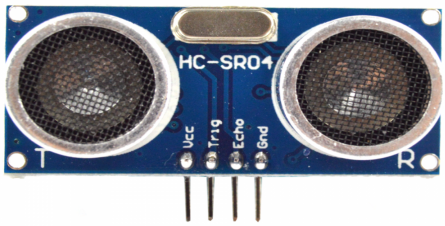

Figure 5. shows the ultrasonic sensor

7. Temperature sensor:-

In LM35 output is proportional to the temperature (in o C) & it is a precision IC temperature sensor. The sensor circuitry in LM35 is sealed and so it is not subjected to processes such as oxidation. LM35 measures temperature more accurately as compared to thermistor. It has ability such as low self heating and its temperature does not increase more than 0.1o C in still air. The operating temperature range of LM35 is from -55°C to 150°C. The output voltage of LM35 varies by 10mV in response to every o C rise/fall in temperature, i.e, 0.01V/ o C is scale factor of LM35.

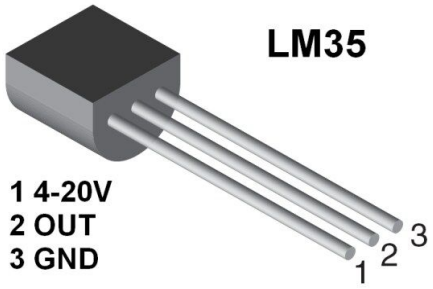

Figure 6. shows the ultrasonic sensor

8. 7805 voltage regulator:-

Fixed voltage output is not given by voltage sources in a circuit because they may have fluctuations in voltage. Voltage regulator (7805) gives the output voltage at a constant value. A voltage regulator (7805) integrated circuit (IC) is a member of 78xx series of fixed linear voltage regulator ICs and it is used to maintain such fluctuations. The xx in 78xx series indicates the fixed voltage it provides at its output. The Voltage regulator (7805) IC provides +5 volts regulated power supply and it has also provision to add heat sink.

The basic ratings of voltage regulator (7805) are as follows:

- Input voltage range 7V- 35V
- Current rating Ic = 1A
- Output voltage range VMax=5.2V ,VMin=4.8V

B. Assembly of the components:-

Before we start to assemble the components and materials the layout should be planned for the placing of compo¬nents on the wooden sheet as we are using wooden sheet as our basement

After planning of the layout on a wooden sheet we have to design printed circuit board (PCB). After designing printed circuit board (PCB) we have to place components on PCB. We have to solder the components as per design of PCB. Components should be placed in their particular location. First we have place voltage regulator, temperature sensor, ultrasonic sensor, infrared sensor.

Afterwards, the components like Battery, Bluetooth module, Dc motor, Connectors and Controller board should be placed.

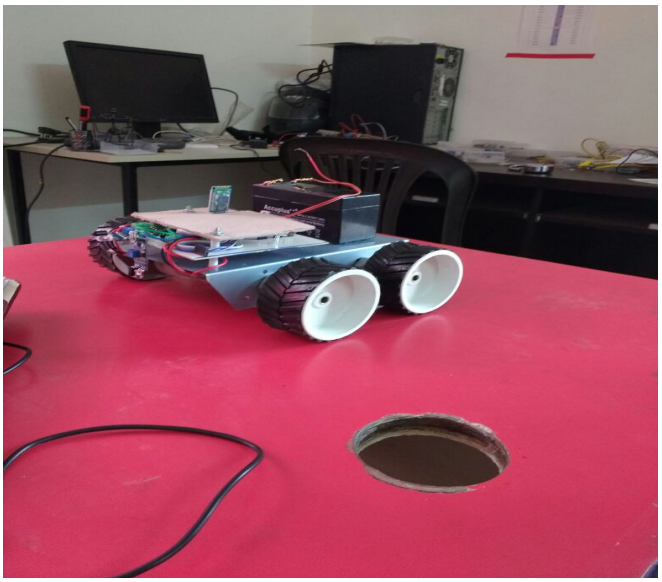

Figure 7.

III. METHODOLOGY

- Provide primary source of power using a 12v battery or a 230v AC transformer to the microcontroller (Arduino), DC motor.
- As the microcontroller works on 5V power supply, we have used voltage regulator (7805) which gives 5V power to microcontroller.
- We have used DC motor, to drive this motor we require motor driver IC(L293D) & this motor driver Ic require 12V power to work so direct connection from battery is given to L293D.
- The Bluetooth module is used to send character from mobile application to microcontroller.
- The Bluetooth send a character to microcontroller & microcontroller receives it and proceeds the further operation.
- The ultrasonic sensor is used to detect obstacles.
- The ultrasonic sensor sends a pulse in forward direction, these pulse travels in forward direction till the obstacle is detected.
- When the obstacle is detected the pulse reflects backward. When it comes back to ultrasonic sensor, sensor calculates the distance of obstacle from the time of pulse.
- When the distance of obstacle is less than 10cm then the robot automatically stops & moves backward for 10ms.
- The temperature sensor gives the temperature of surrounding.
- The night vision camera gives the real time video signal which is displayed on screen.
- The IR sensor is used for night vision effect.

IV. FUTURE SCOPE

We can connect this system directly to internet by using zig- bee with Wi-Fi by using internet. By using GUI software we do not require any simulation tool. For the vision of the robot halogen light can be used. The device can also control by giving it voice command and thereby making the device a voice recognition.

V. CONCLUSION

The idea of the paper is evolved with a fantasy to see the places we wish to see. The paper is prepared to create a version of a spying robot which enables us to observe the place of our interest or an area of danger. The size of the robot also helps us to use it as a spy robot. Thus to control the robot, we should be able to manipulate its path when it is necessary. A control unit is required to execute this idea. RF signal is used in this control unit. Using such type of signals encoding is done and the signal is sent through the transmitter. In the receiver end, to drive the motor these received signals are decoded and given as input to the motor. This helps us to manipulate the robot in the manner we want. A night vision camera mounted on top of the robot helps us to see the direction of motion. Due to the absence of human involvement there is a possibility that the robot will be lost. Therefore, manual control of the robot is required. If it cannot be used for long range applications due to short range of Bluetooth then it can be used as a spy robot within short distances.

VI. ACKNOWLEDGMENT

Our sincere thanks and deep gratitude to head of dept., Prof. Sawant our internal guide Prof. S.M.Jog and other faculty member, but also to all those individuals involved both directly and indirectly for their help in all aspect of the project .At last but not the least we express our sincere thanks to our institute's principal Dr.R.S.Prasad, for providing us the infrastructure and technical environment.

REFERENCES

[1] P. Saucy and F. Mondana, "Khep On The Web: open access to a mobile robot on the internet," IEEE Robot. Autom. Mag., vol. 7, no. 1, pp. 41–47, Mar. 2000..

[2] R. J. Schalkoff, Pattern Recognition: Statistical, Structural and Neural Approaches. New York: Wiley, 1992.

[3] The 8051 Microcontroller And Embedded Systems By Muhammad Ali Mazida, Janice Gllipscemazida, Rolin D. Mckinlaypearson Publications.

[4] Wireless Surveillance Robot with Motion Detection and

Live Video Transmission by A.Sivasoundari, S.Kalaimani, M.Balamurugan -International Journal of Emerging Science and Engineering (IJESE) ISSN: 2319–6378, Volume-I, Issue-6 April 2013..

[5] D. Schulz, W. Burgard, D. Fox, S. Thrun, and A. B. Cremers, "Web interface for mobile robots in public places," IEEE Robot. Autom. Mag., vol. 7, no. 1, pp. 48–56, Mar. 2000.

[6] J. Iovine, "PIC Robotics: A Beginner‟s Guide to Robotics Projects Using the PICmicro", McGraw-Hill, 2004.

[7] P. Robert, "Introduction to Gear Design", Continuing Education and Development, Course No: M03-016, 2012.

[8] IEEE xplore http://ieeexplore.ieee.org/search /searchresult.jsp?newsearch=true&queryText=spyrobot& x=0&y=0.

[9] Wireless Surveillance Robot with Motion Detection and Live Video Transmission by A.Sivasoundari, S.Kalaimani, M.Balamurugan -International Journal of Emerging Science and Engineering (IJESE) ISSN: 2319–6378, Volume-I, Issue-6 April 2013.