Surveillance Spy Robot with Wireless Night Vision Camera and Metal Detection

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Abstract: Saving people's lives and ensuring safety are very important in fact very essential. A Bluetooth controlled spy robot is an Arduinobased bot which is been supervised and handled using an android application. A spy robotic vehicle is an human replacement which is controlled by the human itself. In this paperthe most important objective is to develop the robotic vehicle to keep the track of all the unusual activities in the border regions, and reduce the intervention of intruders. This spy robot contains a wireless CCD camera which is used to transmit the live video footage of the war field environment to prevent the loss and damages of armed forces. This spy robot has features including metal detection and identification of the explosives in the restricted areas and it gives both latitude and longitude position of the explosives identified using gsm module.

1. Introduction

Technology has chief role in bringing about a qualitative change in all fields of robotics and automation. Nowadays robots are popularly used in industries, academics, research and development, military and others. In war fields, there is always a chance for losing lives of soldiers during wars and emergency situations. So we are implementing a solution where the soldiers are being replaced by a robot which is controlled wirelessly. Here this paper defines the project on intelligent spy robot. The main aim of this paper is to implement anperspicaciousspy bot which has capability to display the live streaming or the movement of the surrounding on the PC. An spy robot is an computerizedsystem which is well programmed to perform all the programmed activities which helps in replacing the human activities that provides highly accurate results and it easily transcends the limits of humans. The major innovation in the robotic arena is thehuman replacement, and the serial communication with the bot is made through Bluetooth technology. The Bluetooth moduleis beenused for the communication between the two devices. Here HC-05 a six pin Bluetooth moduleis been used to communicate between the spy bot and the android app. The main reason for using these robots is that it can be operated remotely and has the high capacity of reducing the risk of the armed forces. This robot mainly consists of the Arduinocontroller which acts as the heart of the spy bot. It consist of different type of sensor such as ultrasonic sensor which is been used to avoid obstacle and the metal sensor to detect the presence of metal substance. This bot is made up of four DC motors which are been connected to the motor drive and the entire bot is been powered by 12V battery. Here A CCD night vision camera is been equipped on the robotic car to monitor the live streaming of the surrounding environment.The wireless camera which is been fixed on the robotic car contains a wirelesss transmitter. The CCD camera is powered with a 9V voltage regulator and itrecords the live streaming of the environment and usingtransmitter unit it will transmit the data to the receiver end which is been connected to a PC. The robot also helps to detect the metal substance and gives the latitude and longitude positions of the area where the metal is detected. This bot can be used in wide range of defence application which reduces the loss of armed forces and counteract illegal activities.

2. Related works

Jignesh Patoliya et al., (2015) [1] The foremostobjective of this work is to constructa unmanned bot for the surveillance purpose, this bot tracks the people manoeuvres in the battle ground and reduce the risk from the trespassers. Armed Forces or entities need to undergo a lot of threats on their lives while spying. To overcome these risk we make use of the robot which will be more efficient and can act as a better spy illicit manoeuvres of their opposite entities. This unmanned bot can be used to spy in unknown areas such as huge caves in the border areas without risking of individuals life.

Suniksha B S et al., (2020) [2] In his work the robot is developed in such a way that it risks at the potentially dead scenarios. It makes use of wireless transmission of current situation in the war field and provides the safety and protection to their life from the unknown threat. Here we make use of WI-FI module for serial communication in long range. This robot also consist of various sensor which helps in identifying the different condition in war field and its eco- friendly.

Akash Singh et al., (2017) [3] Many robots are built for the various application like construction, textiles… etc across the world. This robot is controller via mobile application. Here Arduino is been interfaced with the Bluetooth module for the communication purpose via the android app. Arduino and the Bluetooth module can be interfaced though the UART protocol. The motion of the robot is controlled via mobile application through commands.

Sarmad Hameed et al., (2019) [4] In this work the main intention was to develop a spy robot using the various controllers such as PIC 16F877 and PIC 16F628A for all the controlling operations of the robot. It also been mounted by a wireless CCD camera for the live streaming of the surrounding environment and it also avoids threats from intruders.

Wai Mo MoKhaing et al., (2014) [5] in this spybot we make use PIC micro controllers for the control operations of the bot. the live footages of the unknown environment will be monitored using the CCD camera this helps us to prevent huge risk of armed forces. This bot has been powered by a rechargeable 12V battery and the live streaming can be observed through laptop are other digital source.

Richa Parmar et al., (2017) [6] In this advance military spy robot will be very effective in such a situations with the help of a night vision camera, and robotic arms which can grab the objects and cut wire. Hence it can be sent to such dangerous locations and can be accomplish the objectives.

Rabbani Rasha et al., (2018) [7] here an android based robot has been developed via Bluetoothbased communication system using the Bluetooth module (HC 05) which is been connected to Arduino. Arduino acts as the main heart for the entire operations. The CCD camera is been connected and its been monitored via android device. The robot is endangered with camouflage.

Ratnesh Kumar et al., (2016) [8] outline is usage of a mobile phone worked metal detector. This metal detector is constructed on the robot and controlled via mobile phone. The metal identifier works such a way that the metal detector sensor detects any electrical or metallic object identified near it. If the circuit detects any metal substance it creates a sound to the end client via the cell Phone.

 M. Yuvaraju et al., [9] many landmines are supressed in the huge amount in the border arears which are mostly made up of metals or the other chemical compositions. This work is based on the detection of metal substance present at the borders using the metal detection sensor and chemical senso. It uses Arduino uno for the operation control and use IR sensor for line following. This system avoids the risk taken by many of our soldiers.

M. Sirisha et al., (2018) [10] A lots of soldiers sacrifice their life in the border region due to unknown stepping of landmines and other explosives. This system is designed in such a way that it detects the presence of metal substance using the metal detection circuit. As soon as the metal is detected it alerts the nearby base station via GSM. The entire bot is been controlled using Bluetooth and RF technology.

3. DESIGN OF SURVEILLANCE robotat the borders using the metal detection

Our main aim is to design and develop a robotic vehicle that is remotely operated via humanoid application it is connected to a wireless camera for observance purposes. The mechanism contains Arduino uno that serves as the main controller of the system, the wireless information transmission is administrated through the Bluetooth module. Here the camera can send the instantaneous video of the sector with the night sight capability with the employment of wireless communication. This type of robot is primarily used for spying functions within the war field. The whole system is power-driven with a 12V battery and consists of twilight vision camera and captures the pictures and transmits them to the receiver unit connected to a display unit. It additionally consists of various sensing element like supersonic sensors for object detection and IR sensor for detecting pits. This also includes the detection of metal using the sensor and offers the precise location of the metal using the gsm module.
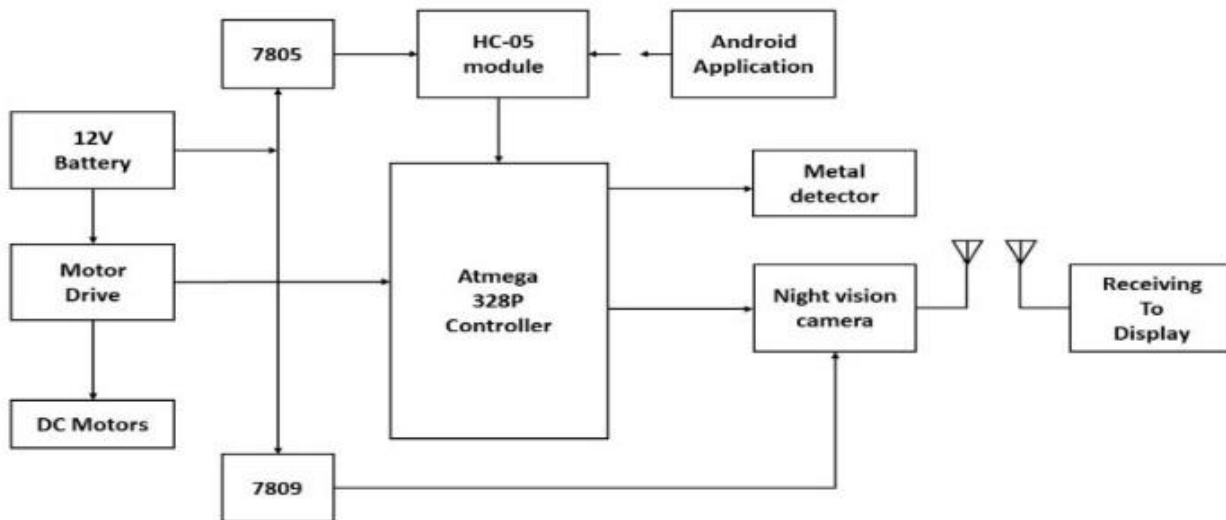
Figure1: Schematic representation of the surveillance robot

From figure 1 it gives the complete idea of the design of robot which is controlled via Bluetooth module (HC-05), includes wireless CCD camera and metal detector.

Power Supply Unit: Supply unit acts as the main elementary unit of any electronic devices. It is used to deliver the required amount of dc voltage or power for their specific function. Here we make use of a +12V rechargeable Power Supply for powering entire robot.

Ultrasonic Sensor: Ultrasonic sensors are used to generate or sense ultrasound energy. These sensors can be further divided into three categories such as transmitters, transceivers, and receivers. In which the transmitter converts the dc signals into high frequency ultrasound waves, receiver converts ultrasound waves into dc electrical signals, and transceivers performs both transmitting and receiving the ultrasound waves.

Relay Driver Unit: Relay is the component which allows a low-voltage circuits to switch to a comparatively high current on and off circuits, or to manage the signals that must be electrically confined from managing circuit.

7805 and 7809: 7805 and 7809 are voltage regulators which provide constant +5volts and +9volts respectively for a +12volts power supply. +12volts input is given to the input pin of the voltage regulator IC's, by regulating the input to +5 and +9volts. The outputs of the voltage regulators are connected to the required components.

Wireless Camera:In this robot We make use of a wireless camera, CCD cameras which are widely obtainable on the market. The camera is powered by (7809) +9 volts DC voltage supply. The camera consists of a receiver, which is placed across the remote station. The output of the camera is in the form of visual signals which is transmitted to the receiver. The camera receiver which is connected to the display unit or a computer through which we will are able to see the captured live video signals.

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BluetoothModule (HC-O5):Bluetooth module are transparent wireless serial connection setup. Which are easy to operate and as well as interface. It a six pin device i.e VCC, GND, TX, RX, KEY and STATUS. This

module is been made up of master and slave devices which are combined together. The interface part is shown below:

1.   The Tx pin from module is connected to the Rx pin of the Arduino board while the Rx pin of Bluetooth module been connected to the Tx pin of Arduino. The GND pin is given to the GND of the Arduino and power supply pin of Arduino is given to the power pin.

2.   To have the appropriate communication, the masterdevice must be connected to the slave device. Once pairing is done between two devices, the device asks to enter the password.

3.   The password will be generally 0000 or 1234.
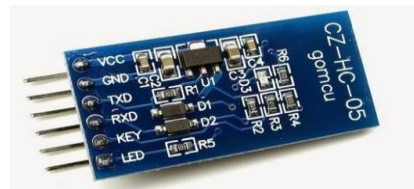
Motor drive: The controllers are not that efficient in terms of current to drive the motors as the require high amount of current. Motor drivers take low current control signals from controllers and convert them into high currrent signals sufficient to drive the motor. Motor driver shield L293D for arduino is used using this we are able to control 4 DC motors. It works on the principle of H-Bridge.

GSM Module (SIM800): In this system we make use of SIM800 GSM which is an quad-band based module. It can operate on different modes of frequency i.e 800MHz,900MHzand 1950MHz frequencies. This module helps us to transmit the exact latitude and longitude position of the metal substance detected via SMS to the near by base station.It can be operated at a low power mode.

Metal detector: In this robot metal detector is mainly used for the detection of bombs or other land mines that are buried underground in the surrounding area. The detector consists of handheld unit and a sensorunit, if the sensor comes in contact with metal it gives the indication of the metal presence by change in the sound or blink of light.

4.   Implementationofspyrobot

The surveillance robot is been operated and controlled using a Bluetooth serial communication. Itconsist of a wireless CCD camera which transmits the live coverage of the unknown places without any hazards to the human life. This system alsoconsist of a metal detector which sense the presence of the metals or the explosive type of things and alerts the near by base station by giving the latitude and longitude position of the substance detected. Using this we can spot many landmines which have been buried in the war field and can save many lives in the war field.
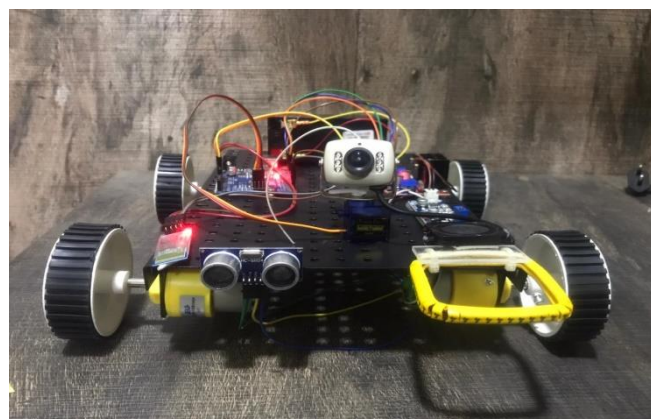

Figure 2: Model of the surveillance robot

Figure2 illustrates the model of the surveillance robot which controlled via Bluetooth module with help of android applicationsof CCD camera and metal detector.
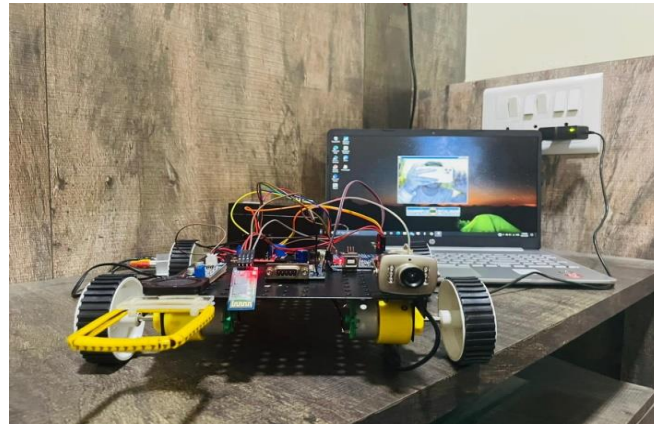

Figure 3: Image of live streaming

Figure3 The image shows the live streaming from the night vision camera, here wireless CCD camera is being used which is supplied with +9volts and the visuals can obtained through display unit.
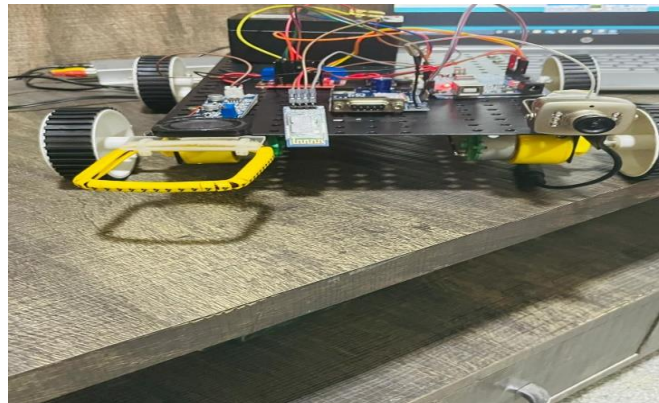

Figure 4: Metal detector sensor

Figure4It includes the metal detector and identification of the explosives in the restricted areas and it gives both latitude and longitude position of the explosives identified using gsm module.

5. Conclusion

The ultimate goal of this experimental robot is to create an user friendly spy bot. this surveillance bot can easily navigate, capture the live streaming of the surrounding environment and transmits it wirelessly this warns the soldiers about the dangerous situation of that environment and gives the clear cut view to soldiers. The spy bot here is designed for the short distance surveillance by ensuring the safety of the environment. The CCD night vision camera helps the soldiers to know about the unusual activities around them so that they can plan their safety measures accordingly. Another purpose of this article is developing a robot car that can find the nearest landmines or the other explosives which are mostly made up of the metal. This robot tracks the metal parts on its track and produces the buzzer sound and also alerts the near by base station about the detection of the metal by giving its latitude and longitude position of the area where the metal is detected. This helps in saving many life of the armed force. This bot construction is cost effective and its very easy to operate.

6. Future enhancements

This version of the system is the cheapest and basic with only important features being added. Here are some of the improvements that can be done to enhance the overall approach.We can increase the range of wireless transmission using ZigBee.Face recognition can be added to the system for security purpose.This system can beincorporated witha variety of sensors such asfire sensor, temperature sensor, light sensor.

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