IOSR Journal of Engineering (IOSRJEN) **www.iosrjen.org**
ISSN (e): 2250-3021, ISSN (p): 2278-8719
Volume 9, PP 15-19

Border Surveillance Using Ip Camera

Gaurav Golatkar[1], Prathmesh Ambekar[2], Prashant Jadhav[3], Rohan Jadhav[4], Prajakta Borole[5]
(Department of Electronics, Atharva College of Engineering, India)

Abstract: *Military people have huge risk on their lives while entering an unknown territory. This Paper demonstrates problem and effects of landmines in defense field.The proposing system is consisting of a robot that will serve as an appropriate machine for the defense sector to reduce the loss of human life and will also prevent from illegal activities. The main objective behind developing this robot is for the surveillance of human activities in the war field or border regions in order to reduce infiltrations from the enemy side. It will help all the military people and armed forces to know the condition of territory before entering in it. The system is consisting of night vision wireless camera, PIR sensor for human detection and mine detection unit which are interfaced with Arduino Uno can transmit the information through NRF module.*
Keywords: *Mine detection, Robot, Spy camera, Wi-Fi network, Wireless control*

I. Introduction

Robotics is bringing innovatory changes in the world by introducing new technologies. One of the basic feature of this robots used in military operations is that they can be controlled remotely by human beings. So, a robot that has an aptitude not only to improve current surveillance system but also to detect the buried mines and lets user to control it wirelessly to avoid human causalities. Also, it can be used for the purpose of spying on enemy territories to collect information from enemy terrain and monitor that information at a far secure area, and safely devise a plan for the counter. The system is more focus on human safety and lesser the human efforts. It allows surveillance of any disaster affected area where the human beings can't go, tracking the location of terrorist organizations and then plan attack at suitable time.

There are six main section of this system. Section I deals with introduction of this system. Section II explains the structure of robot and interfacing of the sensors with Arduino. The two chiefly used sensors are PIR sensor and Metal Detector. Interfacing of PIR sensor is done in such way that to detect human presence near the robot. It's programmed in such way that whenever we want to detect human presence, it's stops moving starts searching for human presence and as soon as it detect, then it send alert about human detection to controller. Secondly the core element of this system is mine detection. For this purpose, metal detector is used which detects the metal 20cm underneath the ground and displays the consequences of mine detection on the LCD (liquid crystal display). Camera is also installed in this system to give real time information. It is connected to Wi-Fi network so that it can send information to display device connected on same network. The Arduino is used to control the overall working of the robot. This paper explains all the working of sensors with Arduino in the flowcharts given in section III.

Section IV explains the hardware implementation and fabrication of the system as this system has the capability to move in all possible directions, a special type of chassis is used to ensure the movement in all diagonals. For the wireless movement, NRF (Nordic semiconductor radio frequency) is used that ensures the competent control between both ends of the robot. A battery is required. Therefore, we used a Li-ion battery that gives 7.2Ah with robust power supply. LCD module has been installed, which exhibits the current operating status of the robot. When any key is pressed, the LCD displays theresponse of the respective input and indicates the detection of mine and humans.Section V and Section VI includes the advantages and disadvantages along with the future scope of the system.

II. Architecture

This system has very simple working architecture. This system uses metal detector for mine detection, NRF for wireless transmission and PIR sensor for human detection. The figure below shows the architecture of the system. The LCD on the controller displays the status of the system. The PIR sensor is programmed to detect humans or any moving object at a particular distance and can be turned on/off by the user. Camera module is installed on the robot for video streaming and this module can be rotated horizontally up to 180-degree. The NRF on the receiver side follows the instruction of the NRF on the transmitter side. A message will pop out on the LCD screen on the controller, whenever a metal, human or any moving object is detected. The block diagram of proposed system is as shown below.

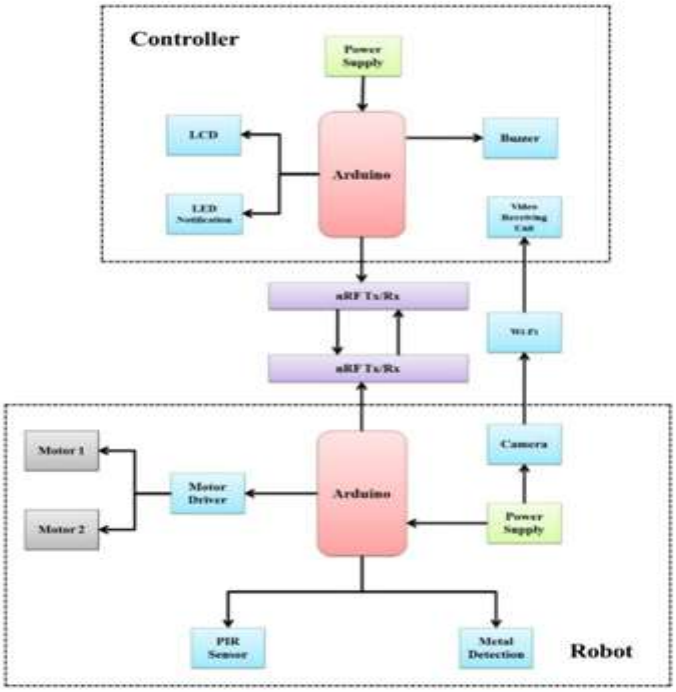

Fig.1 block diagram

III. Working

When user turns on the robot, the NRF module placed on robot which is interfaced with Arduino searches NRF present on controller. Once it gets connected, it starts working and according to direction of joystick the robot starts moving i.e. forward, backward, left, right, clockwise, anticlockwise rotations. The NRF module on robot works according to the instructions of NRF module placed on controller unit. These instructions are decoded to perform specified task. The specially designed motor driver circuits are intended to drive the motor in required manner. When any mines come in a way, robot stops moving and display the message "Mine Detected" on LCD placed on controller. Also, in case we want to check human presence near the robot, then press a key on controller which will turn on the PIR sensor present on robot and it displays the message "Human Interruption" on LCD as soon as human detected. A wireless camera is also installed in robot to broadcast the real time video on device which is connected on same network. Both the robot and controller are powered by Li-ion 9 V battery.

IV. Construction Parts And Modules

This section explains about all the parts and modules that are used in making of system. The modules used in system are wireless module, controller module, sensors, LCD and Camera module.

4.1 Wireless Module

To avoid the human interface in battlefield, the system can be control using wireless communication. For wireless communication, the system uses NRF module as transceiver that uses low pass protocol (Enhanced Shock Burst™) for low influence wireless communication devices. It has one transmitter module, one receiver module that uses RF for their communication. When system is turned on, the transmission side of NRF instantly searches for the receiving NRF and pair with it and build a connection. If there is any error in pairing the transmitter and receiver, the message would be displayed on LCD "Connection Error".

Interfacing of NRF module with Arduino:

The following fig shows the interfacing of Arduino with nRF24L0P.There are 7 pins of NRF have to be connected while the 8th pin IRQ doesn't need to connect. Connect pins of NRF to Arduino in following ways [3]:

Table 1 Pin connection of nrf with arduino

nRF24L0P1	Arduino
CSI	Pin 10
MOSI	Pin 11
MISO	Pin 12
SCK	Pin 13

During sending the message through this module, user specifies the sender's and receiver's address as well as the size of that particular message, which we are going to transmit through this module.

4.1.1 Controller:

The control unit of robot consists of joystick that is used to control the movement of the robot.There is an LCD that displays the alert if mine detection occurs. It also indicates human interruption if any occurs. The NRF is used to connect transmitter side with receiver side. It has Arduino that control all working. The transmitter side directs the receiver end by sending a predefined code using wireless transmitter NRF and on the receiver. The mini Wi-Fi IP camera placed on robot sends the captured video to video receiving unit such as computer, laptop, smartphone which are connected on same network.

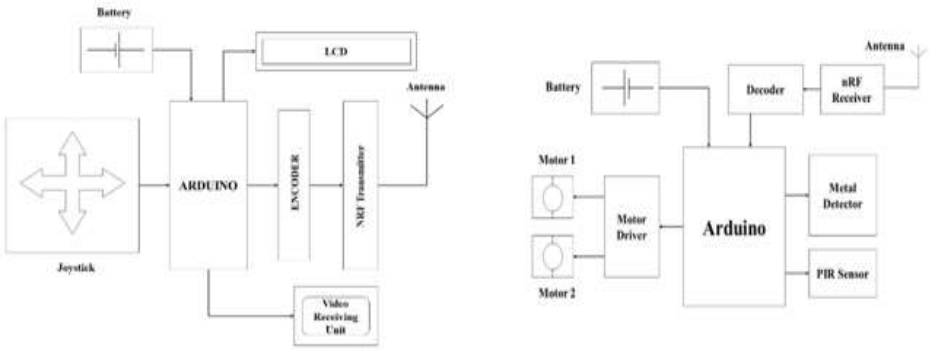

Fig. 2 Circuit configuration of robot and controller

4.1.2 Robot:

The robot unit is consisting of Arduino, metal detector, motors, battery, and NRF that receive signals transmitted by controller. At the receiver end, the signals and inputs are determined which are transmitted through NRF transmitter side. It has a metal detector that is used to detect mine underneath the ground. In addition to that, PIR sensor is used to detect the human interruption near the device. Fig shows the receiver side of the system.The receiver side follows the directions given by transmitter side. It drives the motors as according to joystick movement. The receiver side cannot be used unless it is being operated by transmitter side.

4.2 SensorModules:

A sensor is used to sense the outside environment and updates the controller. In proposed system, it has two sensors. They are metal detector and passive infrared (PIR) sensors.

4.2.1 Metal Detector:

The metal detector is used to find the metal from a specific distance. It is employed such that it can find the concealed and buried metal. The metal detector that system uses is an oscillator to generate an AC current. When this AC current passes from coil, it generates an alternating magnetic field that helps in detecting the metal.If a portion of a metal is in the range of coil, the eddy current will be induced and make a magnetic field of its own. The difference of the magnetic field caused by metal is used to detect the metal.Fig shows the operating principle of metal detector showing electromagnetic field lines and eddy currents [2].

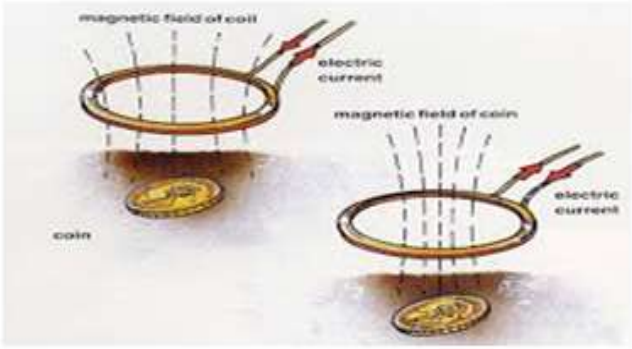

Fig.3 Working principle of metal detector

4.2.2 Passive Infrared Sensor:

The term PIR is the short form of the Passive Infrared.PIR sensors allow you to sense motion, almost always used to detect whether a human has moved in or out of the sensors range. They are small, inexpensive, low-power, easy to use and don't wear out.The term "passive" indicates that the sensor does not actively take part in the process, which means, it does not emit the referred IR signals itself, rather passively detects the infrared radiations coming from the human body in the surrounding area.The detected radiations are converted into an electrical charge, which is proportional to the detected level of the radiation. Then this charge is further improved by a built in FET and fed to the output pin of the device which becomes applicable to an external circuit for further triggering and amplification of the alarm stages. The PIR sensor range is up to 10 meters [5].

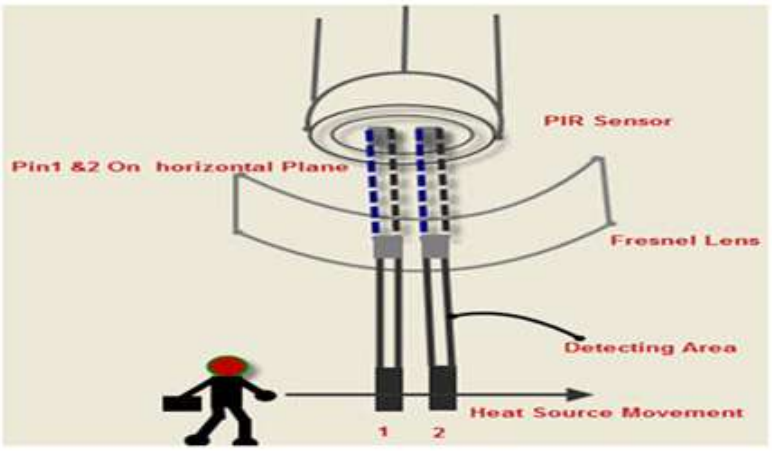

Fig.4 Working principle of pir sensor

1.3 Motor Driver:

A motor driver is an integrated circuit chip which is usually used to control motors in autonomous robots. Motor driver act as an interface between Arduino and the motors. The most commonly used motor driver IC's are from the L293 series such as L293D, L293NE, etc.These ICs are designed to control 2 DC motors simultaneously. L293D consist of two H-bridge. H-bridge is a circuit which allows the voltage to be flown in either direction. In a single L293D chip there are two h-Bridge circuit inside the IC which can rotate two dc motor independently. Due its size it is very much used in robotic application for controlling DC motors.

1.4 Camera Module:

For the competent working of remote control, there was a need to attach a wireless camera so that user could see the accurate location of the robot and can send the robot where humans cannot go securely.Therefore, camera module is installed in proposed system.The camera chosen has good assortment of wireless transmission and displays the location in high quality output. The camera used in this system is IP camera.An Internet protocol camera, or IP camera, is a type of digital video camera commonly employed for surveillance, and which, unlike analog closed circuit television (CCTV) cameras, can send and receive data via a computer network and the Internet.In this new system, the network manager does not need to be in one place, as these

cameras can be accessed over the internet.It also requires a personal computer to configure your camera and an internet-connected video device to act as a remote viewing station [6].

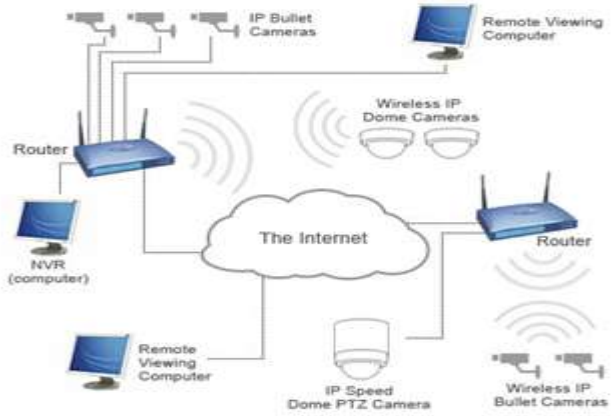

Fig.5 Ip camera

V. Future Scope

This system has room for GSM module which can provide us with position of mines and also automation can be controlled wirelessly. This system uses large amount of power for its working, so battery drains quickly. In case of sudden power failure all the data from the system can be erased. Therefore, a solar panel can be mounted on it to increase its efficiency. It can be modified by adding a fire shield apparatus to the tank so it can pass through flames. Robot mechanism can also have a password protection feature. It can then be controlled only when correct passkey is applied to it.

VI. Conclusion

The surveillance has always been quite sensitive task with so many risk. So, it's better to use the robot for this job instead of people.In order to offer a secure and safe border surveillance, the proposed system has camera that captures real time video in enemy territory, hazardous area, etc. User can see all this activity on any device that is connected to the same network. Also, it is possible to detect mines that may be come in the way of robot and informs user about those mine by sending alert message to user. The robot is equipped with PIR sensors which comes in handy when human body come in the vicinity of sensor. The robot definitely reduced the human effort in border area.

Reference

[1] Habib M.K., *"Mine detection and sensing technologies-new development potentials in the context of humanitarian demining,"* in Industrial Electronics Society, The 27th Annual Conference of the IEEE, Vol. 32001.

[2] Brown, C..; Zoubir, A.M.; Chant, I.J.; Abeynayake, C., *"Landmine detection using single sensor metal detectors,"* in Acoustics, Speech, and Signal Processing (ICASSP), 2002 IEEE International Conference on, vol.4, no., pp.IV-3948-IV-3951, 13-17 May 2002.

[3] Christ, P.; Neuwinger, B.; Werner, F.; Ruckert, U., *"Performance analysis of the nRF24L01 ultra-low-power transceiver in a multitransmitter and multi-receiver scenario,"* in Sensors, 2011 IEEE , vol.no, pp.1205-1208, 28-31 Oct. 2011.

[4] Borker, Kunal,Rohan Gaikwad, and Ajaysingh Rajput. *"Wireless Controlled Surveillance Robot."International Journal* 2.2 (2014).

[5] Ying-Wen Bai, Chen-Chien Cheng and Zi-Li XieDepartment of Electrical Engineering,Fu Jen Catholic University, IEEE 2013 "*Use of Ultrasonic Signal Coding and PIR Sensors to Enhance the Sensing Reliability of an Embedded Surveillance System*".

[6] Jignesh Patoliya, Haard Mehta, Hitesh Patel1,2,3V. T. Patel Department of Electronics and Communication Engineering Charotar University of Science and Technology, Changa, Anand, Gujarat: 388421, India, "*Arduino Controlled War Field Spy Robot usingNight Vision Wireless Camera and AndroidApplication*", 2015.