AN IOT BASED SURVEILLANCE ROBOT

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Abstract: In this paper, we present a modern approach for surveillance at remote and border areas using multifunctional robot based on current IOT used in defense and military. In today's world border military force is facing huge destruction. Hence, most of the military organizations take the help of military robots to carry out risky operations which cannot be handled by humans. In this project, we can control the robot with the help of mobile or laptop through the Internet of Things (IoT) and we also get live streaming of video with the help of camera from the robot. The robot can be controlled and monitored both in the manual as well as in automated mode with the help of Arduino microcontroller. This robot also uses various sensors that collect data and sends it to the Arduino microcontroller which controls the robot behaviour Along with the obtained live streamed video output, here the user can also obtain the presence of metal bombs using metal detectors which are the additional feature of this robot. Thus the action of surveillance can be performed.

Keywords: Arduino, Surveillance, IoT, Blynk Software, ESP8266 12e, Ultrasonic sensors.

I. INTRODUCTION

Surveillance is mainly required in the areas such as border areas, public places, offices and in industries for security purpose. It is mainly used for monitoring activities. The act of surveillance can be performed both indoor as well as in outdoor areas by humans or with the help of embedded systems such as robots and other automation devices. A robot is nothing but an automatic electronic mechanical device that is capable of performing programmed activities thus replacing human work, providing highly accurate results and easily overcoming the limitations of human beings. Thus replacing humans in the surveillance fields is one of the great advancement in robotics.

The robot consists of Arduino Uno microcontroller which known as the heart of the robot. This robot also consists of DC motors, wheel chassis, battery, Wi-Fi module and various types of sensors such as an ultrasonic sensor for obstacle Detection, IR sensor. The robot can either operated automatically or manually. User end communicates with the robot by implementing the concept of the Internet Of Things. This can be achieved through blynk software, which is used for IOT developing projects. Here we send the commands to the robot by means of blynk software and they are received by Arduino microcontroller via Wi-Fi module since both are interfaced with each other. Thus we can control the robot in a wireless manner.

In this project, we use a wireless transmitting camera that provides audio and video information that can be received at the user end and action of surveillance can be performed.

A. Existing System

Already existing systems use robots that have a limited range of communication as they are based on RF Technology, and Bluetooth. There are some existing projects that use short-range wireless camera also some existing robots can only be controlled with a manual mode which needs human Supervision throughout the whole surveillance process.

B. Proposed System

By interfacing Wi-Fi module with Arduino, we can get an unlimited range of operation. Robots can be operated in both modes manual and automatic modes. By using Arduino microcontroller, the cost and complexity of the system can be reduced. Here the communication with the robot can occur in a more secure manner.

II. SYSTEM DESIGN

Here we have divided the whole system into two major parts - one is the user and other is the robot. User part can possess a laptop or mobile for communicating with the robot end. Thus by using a laptop or mobile the user section can be handled easily and portable one compared to those systems that use a typical stationary computer system. The communication can be performed with RF technology or by using a Zigbee device or by using Bluetooth technology, but all these come at the cost of limited range. Thus in order to increase the range system we can go connecting the user section with the internet which is the main concept of the Internet of Things. For connecting the user system with the internet, here we have used Blynk software to develop IoT applications. Thus through this Blynk software, we can easily send commands and can easily control the robotic vehicle.

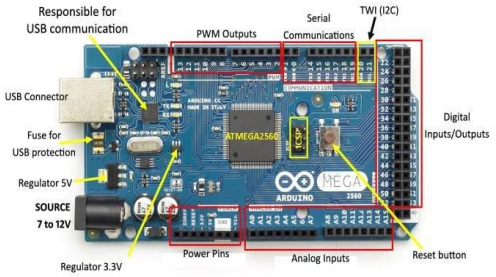
At the robot end, we are using an Arduino microcontroller placed on the chassis of the robot, which is an integral part of the robotic vehicle. Below the chassis, the wheels are connected with dual H Bridge motors. Each motor requires 12v of power supply, supplied by means of an external battery source. The motors are interfaced with the Arduino through dual H- Bridge motor driver. The microcontroller is coded with IDE software in order to operate the robot in appropriate directions. This is the manual mode operation that is associated with it. Several sensors such as an ultrasonic sensor, infrared sensor are also used which are interfaced with the microcontroller in the respective I/O

pins. The ultrasonic sensor operates by reflection principle of light, that is by transmission and reception of signals obstacles are detected. In short, it follows the principle of bats termed as echolocation.

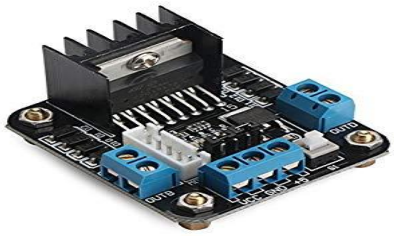
III. HARDWARE USED

This surveillance robot requires a lot of essential software and hardware components for proper functioning. Due to advancement in technology and an increase in crimes, these surveillance robots are used in remote as well as domestic areas. The main components used in our project and their specifications and functions are as follows,

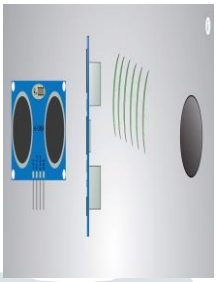
1. Arduino Mega 2560
   - The Arduino Mega 2560 is a microcontroller board based on the ATmega2560.
   - It has 54 digital input/output pins, 16 analog inputs, 4 UARTs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button.
   - It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.



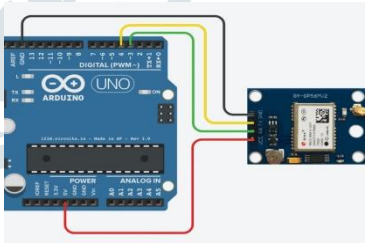
2. Dual H-Bridge DC Motor Drivers
   - The L298N H-bridge Dual Motor Controller Module 2A with Arduino.
   - This allows you to control the speed and direction of two DC motors, or control one bipolar stepper motor with ease.
   - The L298N H-bridge module can be used with motors that have a voltage of between 5 and 35V DC.



3. Ultrasonic Sensor
   - The HC-SR04 Ultrasonic Module has 4 pins, Ground, VCC, Trig and Echo.
   - It emits an ultrasound at 40, 000 Hz which travels through the air and if there is an object or obstacle on its path It will bounce back to the module.
   - Considering the travel time and the speed of the sound you can calculate the distance. The Ground and the VCC pins of the module needs to be connected to the Ground and the 5 volts pins on the Arduino Board respectively and the trig and echo pins to any Digital I/O pin on the Arduino Board.



4. GPS Module
   - The NEO-6M GPS receiver module uses USART communication to communicate with microcontroller or PC terminal.
   - **G**lobal **P**ositioning **S**ystem (GPS) makes use of signals sent by satellites in space and ground stations on Earth to accurately determine its position on Earth.
   - It receives information like latitude, longitude, altitude, UTC time, etc. from the satellites in the form of NMEA string. This string needs to be parsed to extract the information that we want to use.
   - It uses the standard NMEA protocol to transmit the position data via serial port.



6. Wi-Fi Module
   - The ESP8266 12e module which is low cost, selfcontained chip consists of TCP/IP protocol stack that is used to provide network access to any microcontroller.
   - Each module comes pre-programmed with an AT command set firmware, meaning, you can simply hook this up to your Arduino device.

7. Camera Module

- The SC03MPC comes in a compact format with a built in lens and a 4-Pin PH2.0 socket connector that provides easy access to both power and serial data. SC03MPC is an upgraded design of SC03MPA which has on board built-in infrared LED's for IR illuminations. SC03MPC module uses a CMOS VGA color image sensor along with VC0706 chip that provides a low cost and low powered camera system.

IV. SOFTWARE USED

1. BLYNK

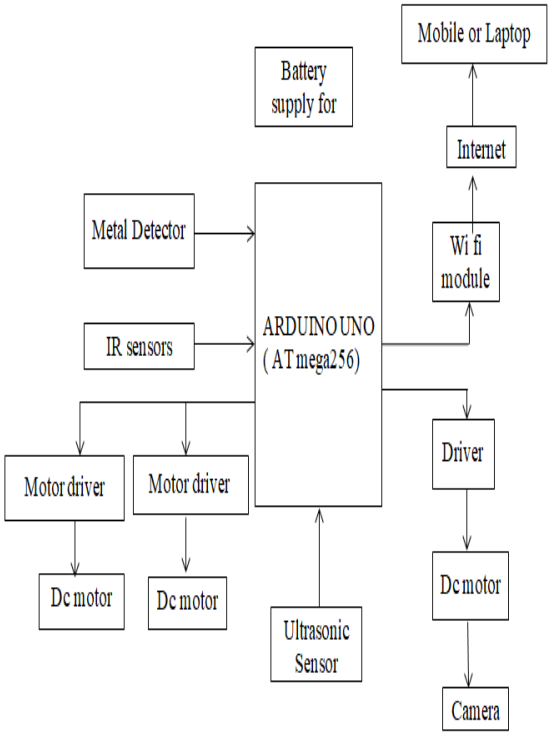
It is a Platform with iOS and Android apps which is used to control Arduino, Raspberry Pi, and the likes over the Internet Essentially, it includes three components: a Blynk app for the smartphone, the Blynk server, and Blynk library (firmware), which is compatible with a variety of makers' hardware. Both the Blynk server and Blynk library are the open source.

Simply It's a digital dashboard where you can build a graphic interface for your project by simply dragging and dropping widgets. it's supporting hardware of your choice. Whether your Arduino or Raspberry Pi is linked to the Internet over Wi-Fi, Ethernet or this new ESP8266 chip, Blynk will get you online and ready for the Internet Of Things.

2. ARDUINO SOFTWARE (IDE)

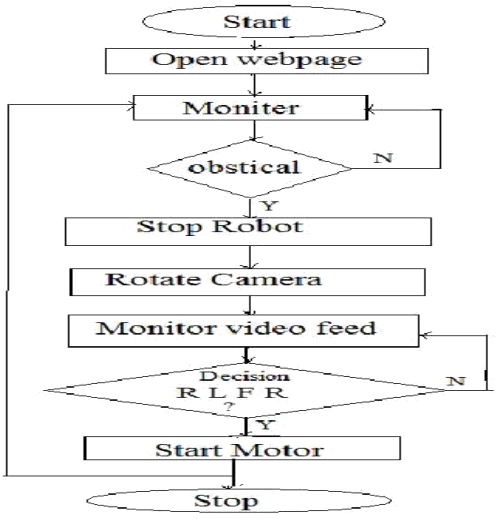
It is open source software that is used to write codes and upload it to the Arduino board. The Arduino IDE contains a text editor for writing codes, a message area, a text console, a series of menus along with toolbar with buttons. The programming codes are known as the sketch. The sketches are saved with the file extension .ino. It runs on Windows, MAC, and LINUX. Thus through this software, we can code for the robotic movements and also for the sensors interfaced with the Arduino board.

V. BLOCK DIGRAM



VI. METHODLOGY

- After the overall hardware connection at first we do movement of the robot which is done using the GPS module and Wi-Fi module.
- Wi-Fi module helps in connecting the robot with internet so that we can control the robot from anywhere.
- So the robot is connected with the internet so we can send the GPS location in the form of latitudinal and longitudinal via internet to the robot.
- Then the GPS module and motor driver help in taking the robot the destination.
- If there is any obstacle in the path then the ultrasonic sensor is used to detect the obstacles and go to the correct path



- And camera that is attached to the robot can continuously record all the thing and send to control room and from there action is taken.

VII. APPLICATIONS

Following are the main applications of this multifunctional robot:

- By combining camera features with the robot we can easily monitor indoor as well as outdoor locations activities during the daytime and at night.
- Remote areas can also be explored.
- It can be Used to record and send video output of the required environment.

VIII. CONCLUSION

In this paper, the framework for making an IoT based robot for surveillance purpose is proposed. It overcomes all the problem of limited range surveillance by using the concept of IOT technology. We can control the robot with the help of laptop, mobile or manually. Automatic monitoring can also be done. Our proposed robotic system is small in size thus maneuvering into area where human access is impossible. Wireless technology is one of the most integral technologies in the electronics and telecommunications field. This technology is used to serve our project as an excellent part of surveillance act. This provides highly efficient and a cost effective robot that replaces human work and reduces human labour efforts and performing monitoring works in a well effective manner.

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