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Multipurpose Surveillance Robot

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Abstract— **This paper proposes a Surveillance Robot system that utilizes IoT technology and an Android application to enhance security and surveillance measures. The system is powered by a solar panel and a 12V battery, providing continuous power supply for uninterrupted surveillance. The Surveillance Robot is equipped with a PIR motion detector that detects the presence of any person and triggers a high audio alert to notify the monitoring authorities. The front end of the Robot features an ESP32 IoT camera that provides a clear view of nearby images and war field status, with a laser used for shooting the person. The integration of IoT technology and the Android application enables the system to be remotely accessed and monitored, making it highly versatile and user-friendly. The proposed Surveillance Robot system offers an efficient and effective solution for enhancing security measures in various settings, with the potential to revolutionize the field of surveillance and security.**

***Keywords*— Solar photovoltaic (SPV), DC-DC boost converter, Maximum power point tracking (MPPT), Voltagesource co Power balance theory (PBT.**

I. INTRODUCTION

The current era is characterized by the increasing importance of security and surveillance in various settings. With the advent of advanced technology, researchers and engineers are consistently exploring innovative ways to design and implement highly efficient and effective systems for enhancing security measures. The proposed system, a Surveillance Robot controlled through an Android application using IoT technology, is an exemplary development that can revolutionize the field of surveillance and security.

The Surveillance Robot system is equipped with several components that enable it to operate efficiently and reliably. A solar panel and 12V battery are used to power the robot, providing continuous power supply even in the absence of electricity. This ensures that the system operates optimally without interruptions, thereby providing continuous surveillance and monitoring.

The Surveillance Robot also comes equipped with a PIR (Passive Infrared) motion detector that detects the presence of any person in the vicinity. The detector is highly sensitive and can pick up even slight movements, which triggers a high audio alert that immediately notifies the monitoring authorities. The audio alert system serves as a critical feature of the Surveillance Robot system, allowing quick and timely action to be taken in the event of suspicious activity.

The front end of the Surveillance Robot features an ESP32 IoT camera that provides a clear view of nearby images and war field status. The camera is designed to capture high-quality images and videos that can be used to identify any suspicious activity or to monitor the overall situation in the environment. Additionally, a laser is used for shooting the person, providing an added layer of security and protection.

The integration of IoT technology enables the Surveillance Robot system to be controlled through an Android application, allowing for remote access and monitoring. The Android application provides the user with real-time access to the surveillance system, enabling them to control and monitor the Robot from anywhere in the world. This feature makes the system highly versatile and user-friendly,

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enabling it to be used in a wide range of settings and environments.

In conclusion, the proposed Surveillance Robot system offers a highly efficient and effective solution for enhancing security measures. The system is designed to provide continuous surveillance and monitoring, even in the absence of electricity. The integration of IoT technology and the Android application makes the system highly versatile and user-friendly, while the PIR motion detector, audio alert system, and the ESP32 IoT camera make it highly reliable and efficient. This innovative development has the potential to revolutionize the field of surveillance and security, providing a reliable and effective solution for monitoring and securing various environments.

II. PROPOSED SYSTEM

This Surveillance Robot is controlled through Android Application using IOT. This Robot is powered using a Solar Panel and a 12V Battery to provide continuous power to Robot. It is Equipped with PIR motion Detector, which detect any presence of person and give a High Audio Alert to the Monitoring Authorities. A ESP32 IOT Camera is used in the Front end of this Robot, to get clear view of nearby image and War field status a laser is used for shooting the person. The following picture will show the proposed system.

Fig 1(a): Proposed System

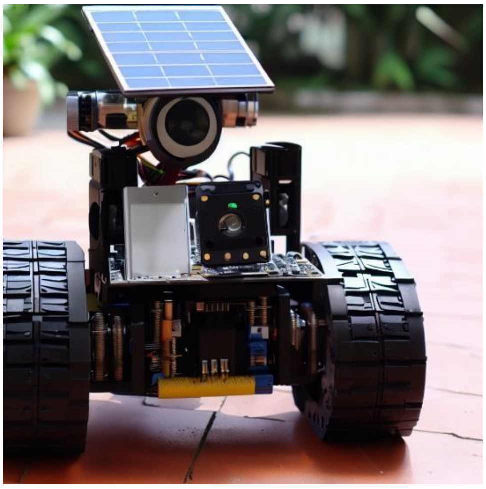

Fig 1(b): Proposed System

III. LITERATURE SURVEY

1. Raja et al. (2018) introduced a wearable device called MASS (Military Assistance and Surveillance System) that utilizees various sensors to monitor soldiers, including location, health conditions, and surroundings. It sends data to a base station, and the device also monitors pulse rate and transmits it to the base station using a GPS module.
2. Ghute et al. (2018) described a military surveillance robot system consisting of a single unit. It uses gyro sensors for navigation in hilly areas and metal detection for landmines. The system employs Bluetooth connectivity for wireless communication through a mobile application, limiting its range.
3. Prakash et al. (2018) presented a simple military surveillance robot controlled via remote commands. The Raspberry Pi 3 receives instructions and moves the robot accordingly. The Kinect sensor acts as a camera with depth measurement capabilities, providing grayscale representations of objects based on their distance.
4. Bolisetti et al. (2017) proposed an RF sensing-based target detector for energy-efficient target detection in harsh sensing environments. Sensor nodes make preliminary decisions before transmitting data to the control center, reducing the

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frequency of data exchange and increasing the lifetime of the IoT.

5.ElhajAbdalla et al. (2017) implemented a spy robot using a Raspberry Pi-based surveillance system with remote monitoring and control through IoT. PIR sensors detect living objects, and the information is sent to users via a web server. The Pi camera captures moving objects, which are simultaneously posted on a web page.

6. Majdghareeb et al. (2017) introduced a wireless robo-pi for landmine detection, aiming to replace human detectors. The detector wirelessly connects with a server to transmit the location of detected mines or images of the suspected area. The system can be made IoT-based for further communication.

7. Budiharto et al. (2014) designed a tracked robot with remote control for surveillance. It uses a 2.4 GHz video transmitter to deliver video streaming from the Raspberry Pi output. The robot's performance and sensor system are cost-effective, but ultrasonic sensors have limitations in identifying obstacles and interference between sensors.

8. Claudi et al. (2012) proposed a mobile autonomous robot called MARVIN for video surveillance. Its main objective is to detect human faces and autonomously keep a face in the center of the frame. The architecture of the robot achieves a balance between reactivity and accuracy, using real-time face-detection algorithms like LBP (Local Binary Patterns) for speed and accuracy.

9. Zheng et al. (2009) presented a miniature autonomous surveillance robot called BMS-1. It utilizes a flexible driving mechanism and spyroelectric sensors specifically designed for human motion detection. Photovoltaic sensors help detect dark locations for the robot's covert operations.

IV. BLOCK DIAGRAM

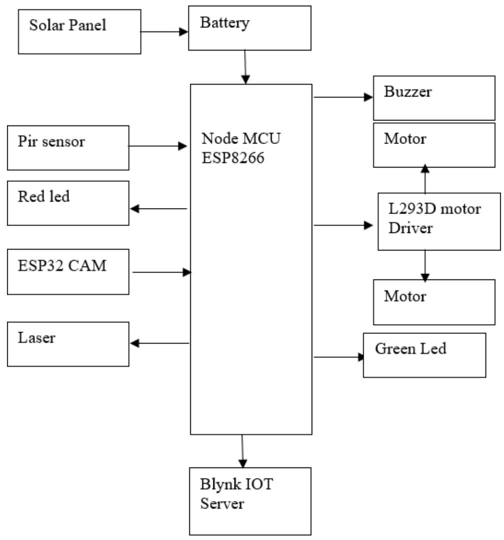

Fig 2: Block Diagram of Multipurpose Surveillance Robot

V. HARDWARE COMPONENTS

The monitoring system contains several components like power supply, ESP32, etc. This chapter gives a detailed review of each of this part along with its working.

- Solar panel
- Rechargeable battery
- Node MCU ESP8266
- Buzzer
- L293D Motor driver
- Green LED
- Laser
- ESP32 CAM
- RED LED
- PIR Sensor
- Blynk IoT Server

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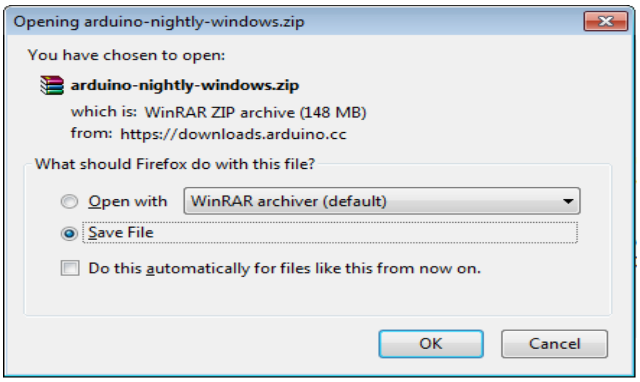
VI. SOFTWARE

ARDUINO UNO INSTALLATION:

In this we will get know of the process of installation of Arduino IDE and connecting Arduino uno to Arduino IDE

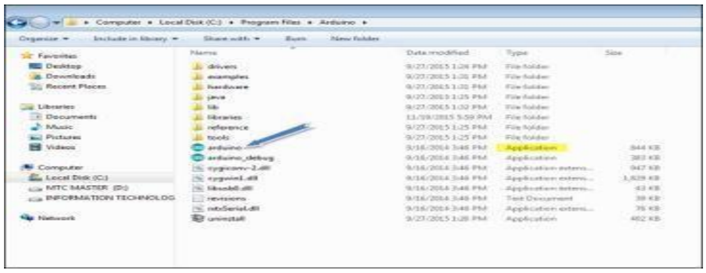
Step 1: First we must have our Arduino board (we can choose our favorite board) and a USB cable. In case we use Adriana UNO, Arduino Duemilanove, Nano, Arduino Mega 2560, or Diecimila, we will need a standard USB cable (A plug to B plug), t In case we use Arduino Nano, we will need an A to Mini-B cable.

Step 2 − Download Arduino IDE Software. We can get different versions of Arduino IDE from the Download page on the Arduino Official website. We must select wer software, which is compatible with wer operating system (Windows, IOS, or Linux).
After wear file download is complete, unzip the file



Step 3 − Power up our board. The Arduino Uno, Mega, Duemilanove and Arduino Nano automatically draw power from either, the USB connection to the computer or an external power supply. If we are using an Arduino Diecimila, we have to make sure that the board is configured to draw power from the USB connection. The power source is selected with a jumper, a small piece of plastic that fits onto two of the three pins between the USB and power jacks. Check that it is on the two pins closest to the USB port. Connect the Arduino board to wer computer using the USB cable. The green power LED (labeled PWR) should glow.

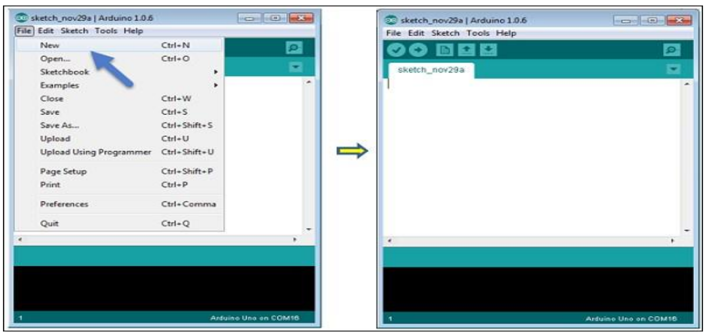
Step 4 − Launch Arduino IDE.



After our Arduino IDE software is downloaded, we need to unzip the folder. Inside the folder, we can find the application icon with an infinity label (application.exe).
Double click the icon to start the IDE.

Step 5 − Open our first project.
Once the software starts, we have two options

- Create a new project



- Open an existing project example.

To create a new project, select File → New.

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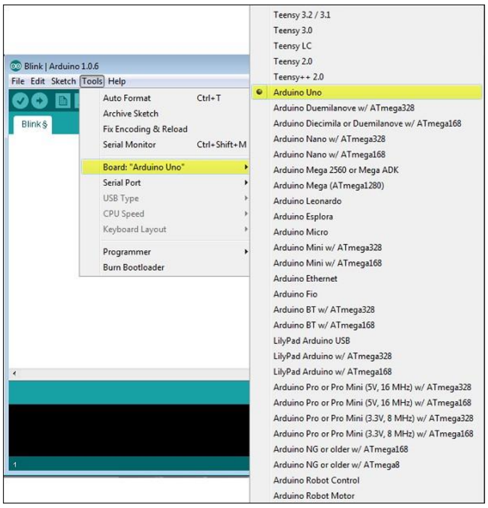
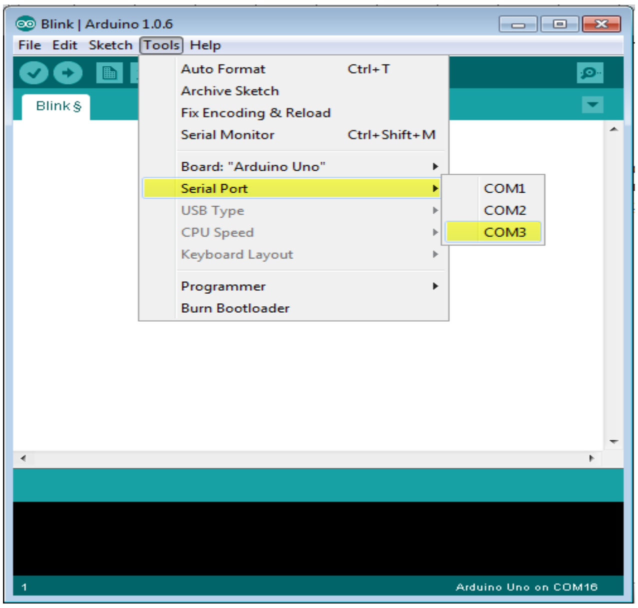
To open an existing project example, select File → Example → Basics → Blink.
Here, we are selecting just one of the examples with the name Blink. It turns the LED on and off with some time delay. We can select any other example from the list.

Step 6 − Select our Arduino board . To avoid any error while uploading wear program to the board, we must select the correct Arduino board name, which matches with the board connected to wer computer.
Go to Tools → Board and select wear board.
Here, we have selected Arduino Uno board according to our tutorial, but we must select the name matching the board that we are using.



Step 7 − Select wer serial port.
Select the serial device of the Arduino board. Go to Tools → Serial Port menu. This is likely to be COM3 or higher (COM1 and COM2 are usually reserved for hardware serial ports). To find out, we can disconnect wer Arduino board and re-open the menu, the entry that disappears should be of the Arduino board. Reconnect the board and select that serial port.
Step 8 − Upload the program to wer board.

Before explaining how we can upload our program to the board, we must demonstrate the function of each symbol appearing in the Arduino IDE toolbar.
Select the serial device of the Arduino board. Go to Tools → Serial Port menu. This is likely to be COM3 or higher (COM1 and COM2 are usually reserved for hardware serial ports). To find out, we can disconnect wer Arduino board and re-open the menu, the entry that disappears should be of the Arduino board. Reconnect the board and select that serial port

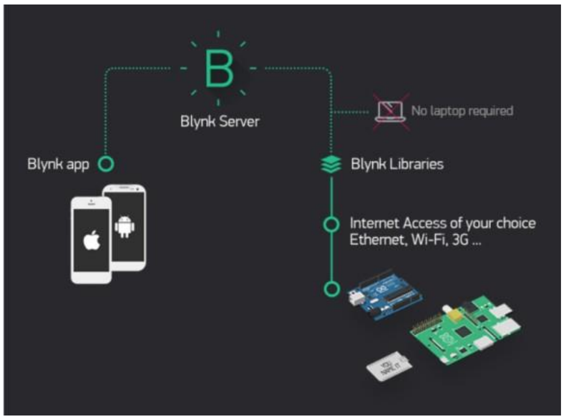


BLYNK APP
Blynk was designed for the Internet of Things. It can control hardware remotely, it can display sensor data, it can store data, vizualize it and do many other cool things.
There are three major components in the platform:

- **Blynk App** - allows to you create amazing interfaces for your projects using various widgets we provide.
- **Blynk Server** - responsible for all the communications between the smartphone and hardware. You can use our Blynk Cloud

or run your private Blynk server locally. It's open- source, could easily handle thousands of devices and can even be launched on a ESP32.

- **Blynk Libraries** - for all the popular hardware platforms - enable communication with the server and process all the incoming and outcoming commands.



VII. CONCLUSION

This robot was built by keeping military applications in mind. So, it comes with basic video surveillance and human detection so that it can detect underground persons etc. Further extensions are can be made in the same projects such as home automation, telemedicine system.The robot can be equipped with interactive voice feedback. It is possible to install ME (medical emergency) band in the robot to look after the health of an elderly person in the house.

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