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Intelligent Robot for Real Time Monitoring and Control using IOT

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Abstract: This article discusses a novel strategy for border and distant region monitoring that makes use of multipurpose robots and the latest innovations in IoT for military and defense applications. An autonomous border patrol vehicle may perform observational tasks in addition to those performed by human soldiers. One of our primary responsibilities while operating in a border region is to keep an eye out for intruders; this multipurpose robot is equipped with cameras and a live feed to do just that. Using the internet as a communication channel, the robotic car functions as a self-governing, autonomous vehicle. Security is the single most significant factor in a country's GDP growth, development, and overall economic health. There are a lot of troops keeping watch over the whole border to make sure the nation is safe. Over which can transfer tone spot to other location, where it's difficult for human performed their work, is being used to create this much more adequate. The primary goal of this study is to propose a method of border surveillance that makes use of a live-streaming rover that can be directed and moved in any direction that used an android app and wireless networks. Blink application cameras are used for the live video streaming. The blink application was developed using the embedded programming language. More sophisticated mechanisms will allow the rover to work on a variety of surfaces while maintaining touch with the ground at all times. Metal identification using robots may transmit real-time video and sensor data to a remote computer or "IOT" *internet of things for the primary purpose of monitoring country boundaries for 24-hour surveillance of any unlawful or dubious activities.

Keywords: surveillance robot, Internet of Things, wifi, remote surveillance and control, blink application

I INTRODUCTION

The border region is the site of strenuous bi-national combined effect and cooperation, particularly on issues of shared importance like the surroundings and the transportation infrastructure, and serves as a canal and source of vital trade, tourism, and student-exchange for both countries (India and Pakistan). The border region is a focal point for law enforcement's fight against transnational crime, and the fact that the ecosystems that make up the border region do not respect international borders only serves to highlight the significance of genuine interaction between the two nations in protecting their mutual national environment and habitats [1]. It is equipped with video cameras for monitoring purposes. Due to the attached robotic arm, it may be used for a variety of tasks. The primary use is border surveillance, where unlawful or suspicious activity, invasions, or ceasefire breaches may be monitored [1]. The standard CCTV security setup consists of cameras, digital video recorders (DVRs), and televisions. While watching live video feeds on a bank of television screens, a team of human operators looks for signs of anything out of the ordinary and responds accordingly. CMS (Central Monitoring System) technology is used by some modern systems to show live pictures on

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Computer displays; users may alter the display order of the images and add infrared (IR) sensors, which are commonly used to trigger an intruder alert. Pan-tilt devices allow humans to pick and move certain cameras to predetermined locations by use of a keyboard and a joystick. Drone operators in such a setting are prone to missing abnormal situations owing to human error, and before, incident-specific searches of DVR footage were the standard when looking for evidence to support a tracking hypothesis [2, 3, k4].

This study discusses a cutting-edge method of observation that makes use of a Robot. The surveillance setup is there for safety reasons. This infrastructure was built with the intention of creating a video-based, round-the-clock care system, complete with picture capture and frame storage for later verification. A video observation is a video recording of a person, place, or thing being watched.

The robot may be operated from a safe distance using a computer, smartphone, or tablet connected to the internet, and it can gather images from cameras using either a web browser or a wireless network [5, 6].

IP cameras, also known as Mobile cameras, are a kind of Internet-connected digital video camera that can both receive and transmit control and picture data. They are widely employed for surveillance, however in contrast to analog CCTV cameras, just a local neighbourhood network and internet connection are needed for recording [6]. Webcams make up the vast majority of IP cameras, however the phrase "IP camera" or "netcam" is often reserved for cameras that can be viewed directly through a network connection.

Specifically, we want to accomplish the following through our research:

- This rover is portable and simple to use, making it ideal for use in a variety of environments.
- In order to keep a constant eye on the border, this portable camera is mounted on a rover that can travel along the border.
- It's helpful in extreme climates where people couldn't survive, and it can save the life of a soldier risking his life protecting the nation at the border.

II EQUIPMENT AND METHODS

Existing Method

Closed-circuit television (CCTV), also commonly referred to as observation, is the practice of using video cameras to relay a signal to a specified location, on a restricted set of monitors. This practice is also known as "closed-circuit television" (CCTV). As compared to broadcast television, it is distinguished by the fact that the signal is not publicly sent. Instead, it may make use of point-to-point (P2P), point-to-multipoint (P2MP), or mesh wireless networks. lines instead. Although while practically every video camera fits this criterion, the phrase "surveillance camera" is most often used to refer to those cameras that are used for monitoring locations that may need monitoring, such as banks, shops, and some other locations where security is required. The application of video in distant education, where it serves as a significant instrument, is one of the few exceptions to the rule that video telephony is not often referred to as "CCTV."

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Exploring the Streaming Live Curiosity Blocks Flowchart:

Fig 1: Stream robot schematic representation **(Please refer the fig in the last pg of this article)**

The components shown in the block diagram are an ESP8266 node MCU, an L298n motor driver, a geared motor, a power supply, a battery, and an IP camera. The robot's motion is controlled by the Blynk App, and the platform is also used to show the values of the robot's output parameters. You may see the produced output as a message in the blynk app when an IR sensor has detected barriers in the immediate area. The rover's geared motor may be driven in any direction with the help of Motor Driver. When utilized for surveillance, an IP camera may record remotely to a mobile device or computer system for playback at a later time.

Proposed Method

There is an ESP8266 connected to the IR sensor. The red light on the node MCU turns on when it detects a Wi-Fi network, indicating an active internet connection.

The Motor Driver is responsible for operating the gear-driven motors. The H- bridge idea is the driving force behind the Motor Driver. Four motor driver pins are connected to the geared motor's four arms. To separate the motors from the control circuits, there must be motor drivers. Nevertheless, the controller circuit can only handle relatively weak current signals, whereas motors need much stronger ones. Motor drivers are devices that receive a lower power signal and convert it into a high-current signal suitable for driving a motor.

The Blynk app is used to manage the motor driver. There is an Internet of Things platform available in the form of the Blynk app. One of its features is remote hardware control.

- It has several uses, including data storage and visualization.
- Sensor information may be shown.
- The platform consists of three main parts:
- The Blynk app makes it possible to build user interfaces using a wide range of widgets.
- The Blynk server facilitates interaction between physical objects and mobile devices.
- To communicate with the server and handle all incoming and outgoing instructions, you need to use the Blynk libraries.
- To keep an eye on everything, an IP camera is utilized. IP WEBCAM is used to see the live video that is being streamed from an IP camera. The IP WEBCAM, a cutting-edge home cloud camera program that's completely free to use, makes internet video surveillance and administration a breeze.

IP WEBCAM's numerous other functions include the ability to take a picture at the same time as the video is being streamed, the ability to record both the video and the image, and the ability to save both in memory. A lower potential for harm to human life is achieved by this system.

III SYSTEM REQUIREMENTS

Software's

- Blynk App
- IPWEBCAM
- Arduino IDE software

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Hardware's

- Node MCU -ESP8266
- IR Sensor Geared Motors
- Motor Driver- L298n Mobile
- Power Supply- 12V battery

Specification of Hardware Descriptions

Node MCU -ESP8266

Fig 2: Node MCU -ESP8266
(Please refer the fig in the last pg of this article)

The Node MCU is a state-of-the-art open-source LUA-based firmware designed for the ESP8266 wireless-interface microcontroller. The ESP8266 Extension board/kit, which is included with the Node MCU firmware, allows you to experiment with the chip's capabilities.

- The hardware may be modified, customized, and even built upon, since Micro Controller is a freely available open-source platform.
- The ESP8266 wireless chip is included in the Node MCU development kit/board. The ESP8266 is an inexpensive Wi-Fi chip developed by ExpressiveSystems that uses the TCP/IP protocol. You may read more about ESP8266 here: Wireless Networking Board ESP8266
- The Node MCU Dev Kit has an updated version, the Node MCU Microcontroller v1.0 (Version2). Typically, this board is sold in a black PCB color.
- The Sensor (i.e. A0) and Virtual pins on the Node MCU Dev Kit's board are similar to those on an Arduino.
- It is compatible with a variety of serial communication standards, including UART, SPI, I2C, and others.

DC Motors

Fig 3: DC Motors **(Please refer the fig in the last pg of this article)**

Too much speed and not enough torque characterize the typical operation of DC motors. Boosting these presences is necessary for using these motors in robotic request. There are gearboxes designed for this same task. The output shaft of the gear train, which is connected to the shaft of the motor, will revolve considerably more slowly and produce temptingly greater horsepower than the input gear, which is what drives the motor. Gearhead DC motors [11]are DC motors that have had a gearbox added to their shafts; these motors are ideal for use in the construction of various types of hobby robots.

Motor Driver- L298n Mobile

This high-power L298N-based motor driver device is ideal for controlling DC and Stepper motors.

Fig 4: Motor Driver **(Please refer the fig in the last pg of this article)**

It features a 5V regulator on board and can deliver power to an open circuit using the existing L298 motor driver IC. There's support for up to 4 Stepper motor, or 2 DC motors with full direction and speed control. For use with microcontrollers, switches, relays, and other similar devices, this motor driver is ideal for robotics applications. Well suited for controlling DC Stepper motors in applications such as micro mice, line-following robotics, automation systems, etc. H-Bridges are bidirectional current-driving circuits that may be modulated in pulse width (PWM). Modulating the width of an electrical pulse is known as pulse width modulation. The brush of a motor is sometimes analogized to a water wheel, with the flowing electrons representing the water. Constant water flow across the wheel would represent the voltage, with higher values corresponding to greater water flow. PWM is used because motors

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have safe operating voltage ranges and may be destroyed if the power is applied too strongly or reduced too rapidly. Think of a water wheel, but instead of a steady stream of water, imagine that it is being struck by intermittent bursts of water. The duration of the pulses determines the rate of rotation of the water wheel. PWM control is the most effective method for extending motor life and ensuring their dependability.

Power Supply- 12V battery

It is possible to provide energy to the L298N motor controller module through screw terminals with a 3-pin 3.5mm pitch. It has connections for a motor's Vs power supply, ground, and a 5V logic supply (Vss).

The STMicroelectronics 78M05 5V regulator may be found on-board the module. It has a switch or jumper that allows you to turn it on or off. This jumper connects the motor power supply to the logic power supply (Vss), allowing the 5V regulator to function (Vs). Here, the 5V inputs terminal doubles as an output pin, dishing out 5V at a current of 0.5A. It may be used to power up 5V circuits like Arduino. [14]

Removing the jumper disables the 5V regulator, requiring 5V to be supplied independently through the 5V input port.

Fig 5: Power supply**(Please refer the fig in the last pg of this article)**

Specification of Software Descriptions

Blynk is a framework with applications for iOS and Android that can be used to control Arduino and bypass the web. It's an online panel of tools for creating a graphical user interface by dragging and dropping widgets.

Fig 6: Blynk Login Page **(Please refer the fig in the last pg of this article)**

Fig 7: Home Page **(Please refer the fig in the last pg of this article)**

The Blynk Arduino Libraries, that contributes to the firmware on your ESP8266, must also be installed. This reading is taken when anything, whether it a person or an item, appears in front of the crawler. Whenever an item communicates with rover, it is also classified in this way. As Rover is not constructed with AI like a robot, this is the result of each barrier Rover encounters. Hence, it labels all detectable objects as people.

Fig 8: Blynk App's Publishable Widget Display Page **(Please refer the fig in the last pg of this article)**

We may also obtain an alert if metal is located behind the robot by utilizing the Blynk app. When the robot detects the presence of any metals (iron, steel, copper, etc.). This proximity sensor will then send a signal to the ESP8266 when it detects metal in the immediate vicinity. And so this ESP8266 will pick up the signal from the proximity sensor, notify your phone, and display the data on the Blynk app.

IV RESULTS AND DISCUSSIONS

Fig 9: Robot Workflow Diagram **(Please refer the fig in the last pg of this article)**

You can see the essential components, including the Node MCUESP8266, Power Source, Motor Controller, and Geared motor. And Blynk App Client is utilized for rover movement control. Sensor data may be seen via Blynk's user interface. You can see how rover operates in the diagram up top. Blynk is used to track the rover's progress and take readings. A notification is sent and displayed

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in the app whenever a person enters the field of view of the camera. Connecting the Node MCU to a wireless network or the internet is required for this procedure. Using the V380 app, we can see the camera's live feed. The accompanying diagram displays the camera's output, which is actual, real-time video. WiFi connectivity is required for this. The mobile camera's Wi-Fi connection has to be connected with the same network used to control the rover.

Thus, we only have to ensure sure the rover and cameras are connected to the same network. If we know the IP address of what we're watching, we can take screenshots at any time. In the event of a security breach, we may additionally keep track of the circumstances surrounding the verification process. For substantiating claims, this is quite helpful.

In addition, we have the ability to rewatch the live footage through the replay feature should any suspicious events occur.

To function normally, a camera has to be placed somewhere with enough of natural light or near an artificial light source. Open CV is a computer vision library that excels in facial recognition and identification. This is a color setting that allows us to tell out the hues during our round-the-clock monitoring and photography. After the footage is captured, color differences become apparent. The robot recognizes its owner through camera, and we manually provide commands based on the information it receives. Unfortunately, the facial recognition algorithms required for this project [7-10] are not included in the binary version of Open CV currently available to install on the Raspberry Pi linux kernel through apt-get (version 2.3.x).

Photographs and video recordings may be stored on a computer or mobile device. After making a map of the area, it's time to go there and double-check everything. Photos and videos like this might be used as evidence or praise for the military and the police.

V CONCLUSION

This study details the development and deployment of a military-grade, intelligent observation rover that can monitor border areas in real time without the need for human observers. More infrastructures may be built with Pic microcontroller and open CV thanks to the Immigration Enforcement Live Streaming Design Implementation. After we provide a command, the monitoring robot begins transmitting footage in real time. You may capture video and images using this equipment. If we're going to use robots in lieu of human soldiers, they ought to be able to defend themselves and keep us safe. We equip them with laser guns so they can defend themselves. The laser gun may be used in either automated or manual mode, with the assistance of computer vision and a camera connected to a Raspberry Pi. Protecting the country with surveillance robots is a smart idea.

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Exploring the Streaming Live Curiosity Blocks Flowchart:

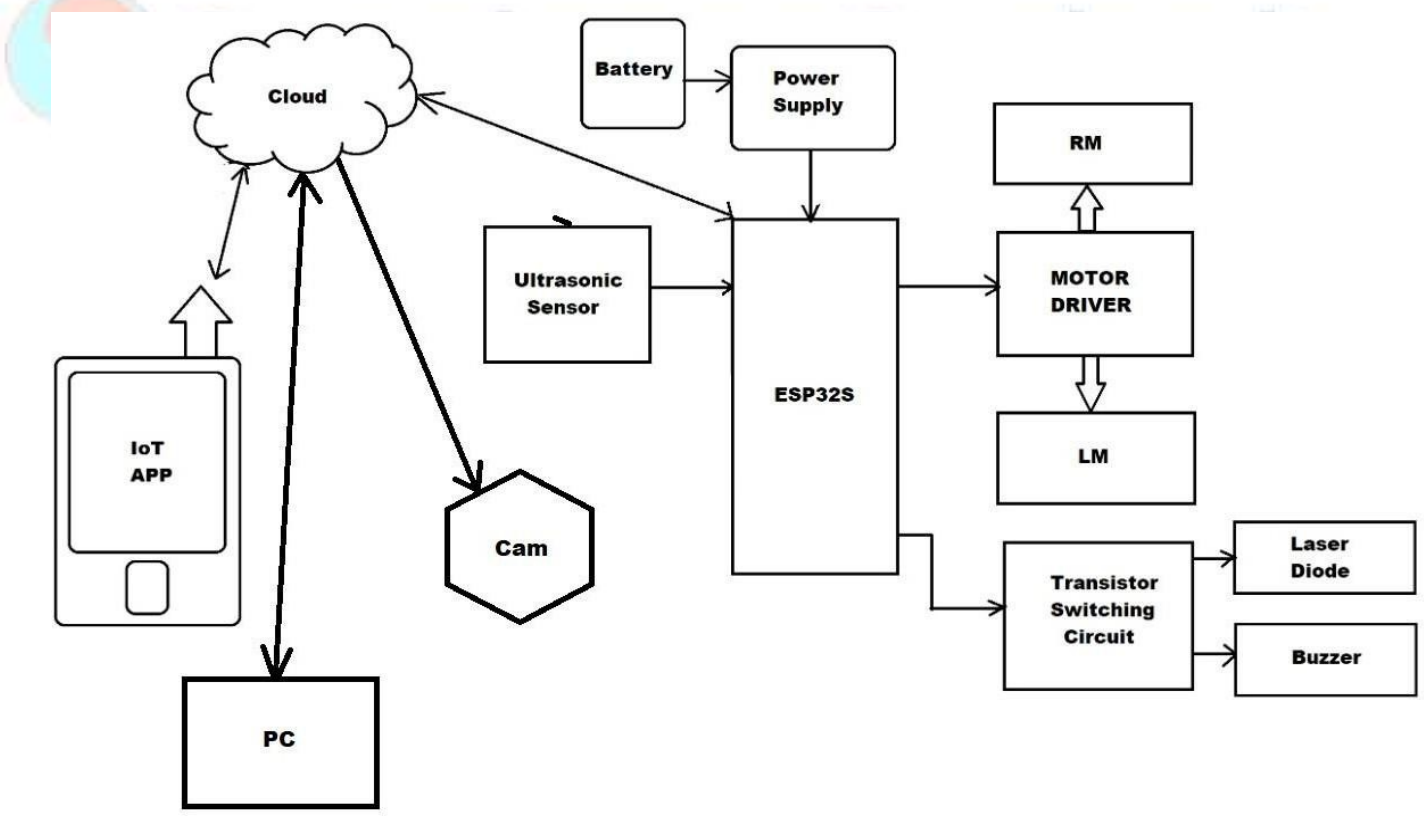

Fig 1: Stream robot schematic representation

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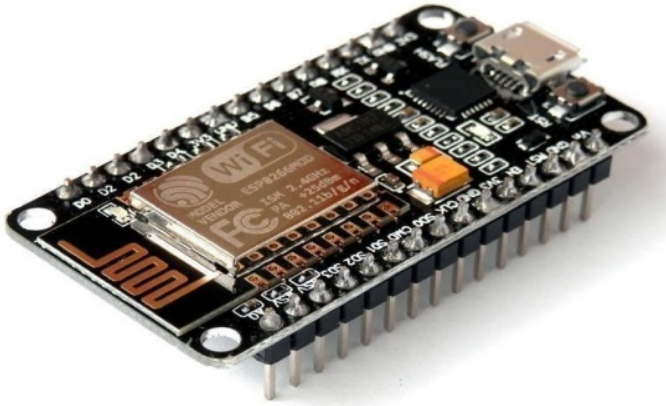

Fig 2: Node MCU -ESP8266

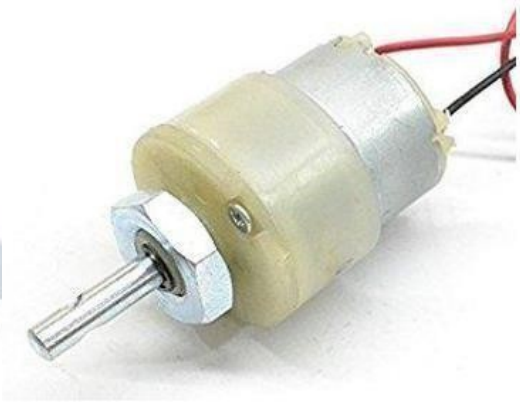

Fig 3: DC Motors

Fig 4: Motor Driver

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Fig 5: Power supply

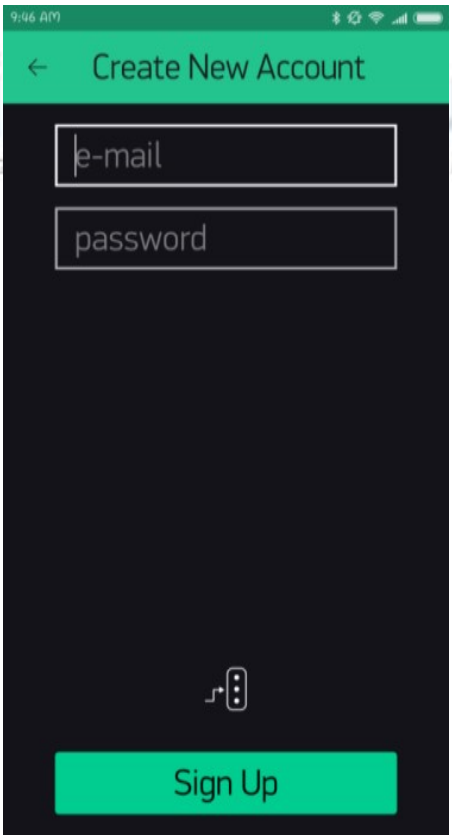

Fig 6: Blynk Login Page

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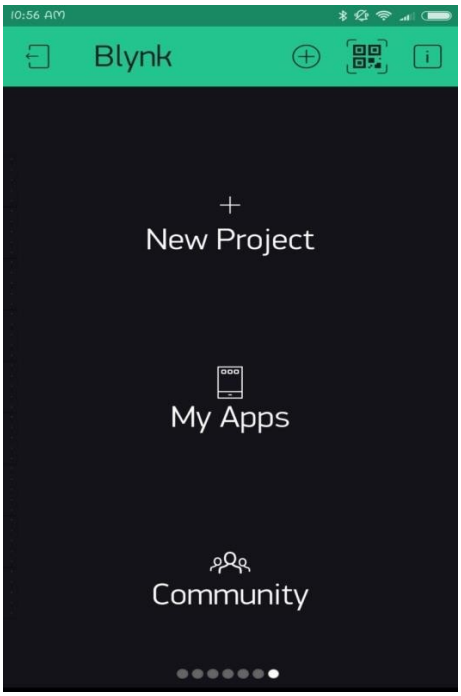

Fig 7: Home Page

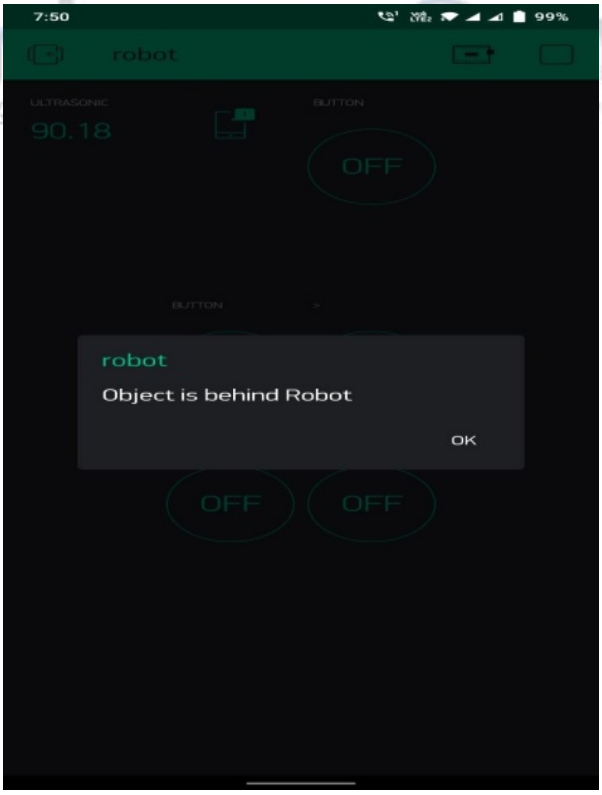

Fig 8: Blynk App's Publishable Widget Display Page

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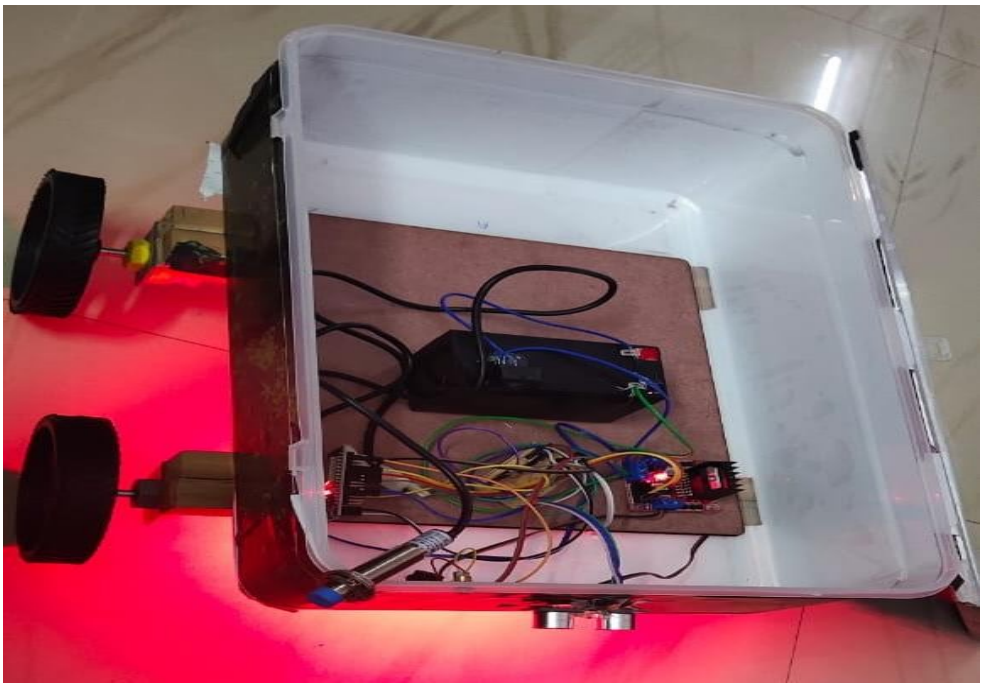

Fig 9: Robot Workflow Diagram