

adjustment ranges from 80MHz to 240MHz. Fully compliant with Wi-Fi 802.11b/g/n/e/i and Bluetooth 4.2 standards, it can be used as a master mode to build an independent network controller, or as a slave to other host MCUs to add networking capabilities to existing devices. ESP32-CAM can be widely used in various IoT applications. It is suitable for home smart devices, industrial wireless control, wireless monitoring, QR wireless identification, wireless positioning system signals and other IoT applications. It is an ideal solution for IoT applications.



Figure 4.1.5 ESP32 Camera Module

4.1.6 Pan Tilt Servo Assembly

Model	: SG90S Mini Servo.
Operating Voltage	: 4.8 – 6 V.
Operating Current	: 360 mA.
Rotating Angle	: 0 – 180 °.
Torque	: 2 – 2.2 kg/cm.

This pan-tilt arrangement is the perfect way to provide the connected camera full range motion with two micro servos included in the setup. The pan-tilt can rotate roughly 180° from side-to-side and can tilt up to downward around 150°. The cavity present at the top is the location where the camera is mounted. The servo connected to the assembly is SG90 9g servo motor. The operating voltage is about 3 to 7 Volts. The rotation of the Servo is about 180 Degrees.



Figure 4.1.6 Pan Tilt Servo Assembly

4.1.7 Buck Boost Converter

Model	: XL6009 Buck Boost Converter.
Operating Voltage	: 3.5 – 28 V.
Operating Current	: 3mA.
Weight	: 5 grams.
Frequency	: 150 kHz.

The buck-boost converter is a type of DC-DC converter that can produce an output voltage that is either higher or lower than the input voltage, making it a versatile power conversion topology for various applications in power electronics where input voltage regulation and output voltage requirements may vary. The buck-boost converter operates in two distinct modes: the "buck" mode, where the output voltage is lower than the input voltage, and the "boost" mode, where the output voltage is higher than the input voltage. The transition between these two modes is smooth, enabling the converter to maintain a stable output voltage under varying input conditions. The buck-boost converter operates using a switch, typically a transistor, and a diode, which control current flow through an inductor and a capacitor. During the switch's ON state, energy is stored in the inductor, and during the OFF state, the energy is transferred to the output

through the diode. The duty cycle of the switch, or the ratio of ON time to the total period of the switching cycle, determines the converter's output voltage. Adjusting the duty cycle allows the output voltage to be controlled and maintained at the desired level.



Figure 4.1.7 Buck Boost Converter

4.1.8 NEO6M GPS Module

Model	: U-Blox-NEO-6M.
Operating Voltage	: 2.7 – 3.6 V.
Operating Current	: 45mA.
Operating Temperature	: -40 – 80 °C.
Serial Baud Rate	: 4800 – 230400.

The NEO6M is a popular GPS (Global Positioning System) module manufactured by u-blox. It is commonly used in various applications that require accurate positioning and navigation capabilities. The module combines a GPS receiver with an integrated antenna, making it compact and easy to integrate into different electronic devices. The NEO-6M module receives signals from multiple GPS satellites, as well as other satellite constellations like GLONASS, Galileo, and BeiDou. These satellites transmit signals containing precise timing information and their own orbital data. The module processes the received satellite signals to extract essential information. It uses a combination of algorithms, including trilateration, to determine

the distance between the module and each satellite. By analyzing the time it takes for the signals to travel from the satellites to the module, the module can calculate the module's position. They take information from multiple satellites to calculate their precise position on the Earth's surface. Calculated distances from different satellites, the module can determine the latitude, longitude, and altitude of its position. Once the module has determined its position, it formats the information into NMEA (National Marine Electronics Association) sentences. GPS parameters, such as latitude, longitude, altitude, speed, and time. The host device can then utilize this data for various applications, such as mapping, navigation, tracking, or any other functionality that requires accurate position information.



Figure 4.1.8 NEO6M GPS Module

4.1.9 Blynk Application

Blynk offers native iOS and Android mobile apps which allow to remotely control connected devices and visualize data from them. This Application operates in two modes namely Developer Mode and End User Mode. The primary function of Developer Mode in the mobile app is to build and edit the Mobile Dashboard User interface (GUI) for the given Device Template. Mobile Dashboard is built from Widgets - modular UI elements which can be positioned on the canvas. Every Widget serves a special function (a button, a slider, a chart, etc). Every Widget has its own settings based on its functionality. **The End-user mode** mode is used by both the makers and the end-users. It's focused on devices, automations and notifications view and management with

the help of widgets and additional screens containing specific information about data that is set/sent/received to/from Blynk.Cloud and devices.



Figure 4.1.9 Blynk Application Logo

4.2 BLOCK DIAGRAM

The NODE MCU acts as the main processing unit. The other components connected to it follows and acts in and around the Node MCU. The motor driver is connected to the Node MCU which is used to control the motor speed and direction based on the user input. The vehicle consists of four motors for locomotion which is powered by three Lithium ion batteries each of 3.6 V, connected to the battery holder. The battery supplies power for the motor driver. A 5V supply is used to power ESP 8266. The NEO6M GPS module is connected through node MCU which is used to know the accurate location of the vehicle. The Buck Boost converter connected to the Li-ion battery is used to buck the voltage from 12V to 5V, which is used to supply ESP 32 Camera Module and Pan Tilt Servo arrangement. The ESP 32 camera module which holds the 2 MP camera which gives the live stream from the car. The servo arrangement is mainly used to rotate the camera setup all around 360 degrees. The pan servo motor is used to move the camera side by side by an angle of 180 degrees. The tilt servo motor is used to move the camera top and bottom by an angle of 180 degrees. Hence the overall camera setup can be viewed by an angle of 360 degrees. The Blynk application holds all the control of the car. The IEDs were used in complete destruction of the vehicle if caught during spying operation. In this actual setup a Buzzer setup is used as self-destruction mode.

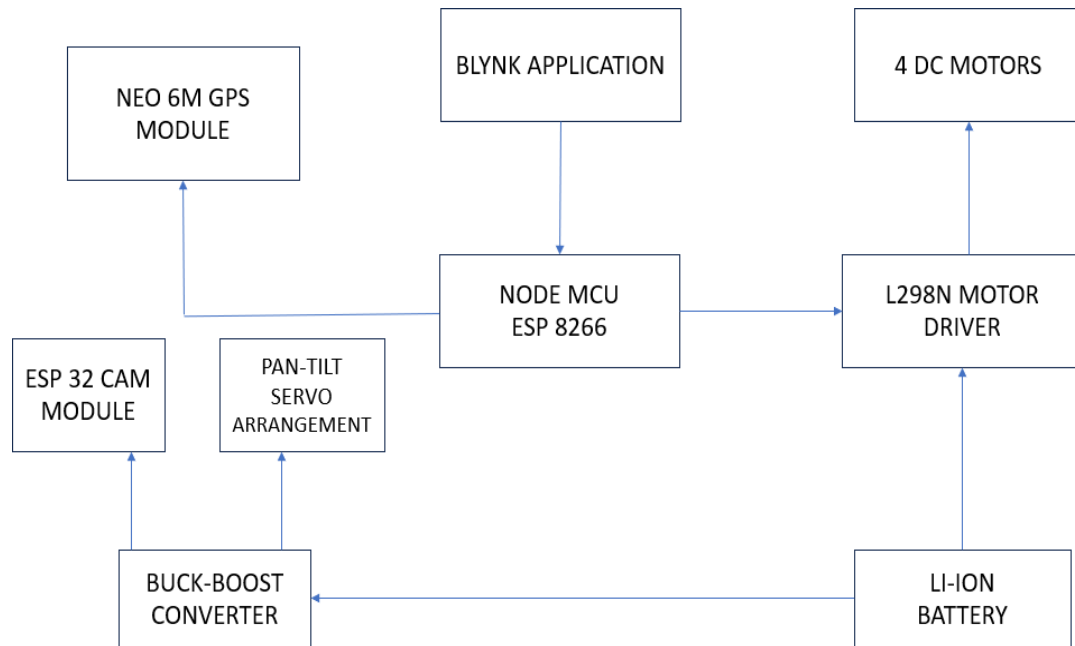


Figure 4.2 Block Diagram

4.3 FLOW CHART

At beginning of the algorithmic flowchart the supply received from the battery. Next the ESP 8266 and ESP 32 is connected to the personnel hotspot. Further the Blynk application is used for the complete control of the vehicle. For the complete view of the surrounding the Camera module is connected to the IP address provided by the ESP 32 Camera module. This is the overall operation of the vehicle. It is explained as a flowchart below

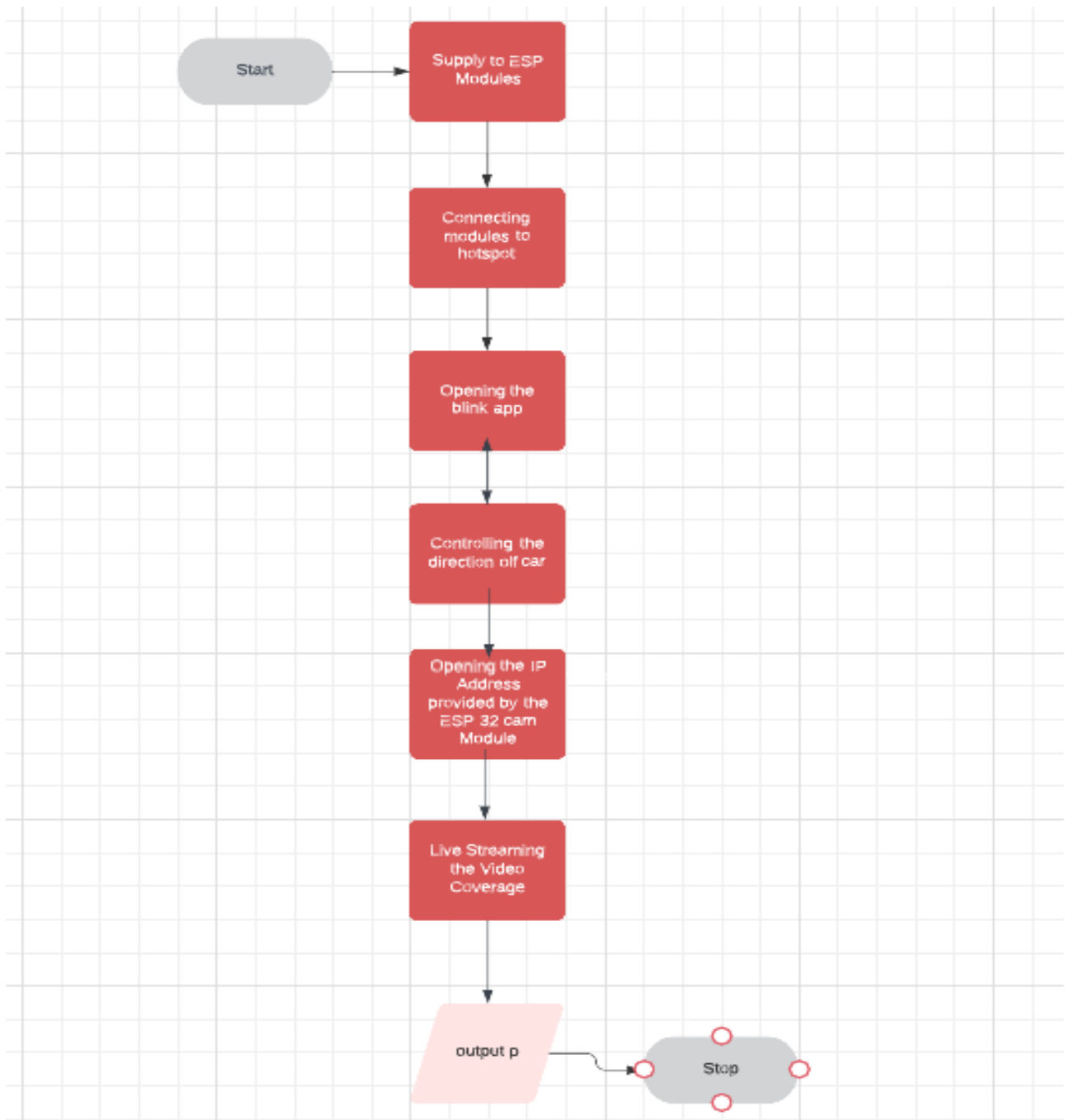


Figure 4.3 Flow Chart

CHAPTER 5

PRESENT WORK

5.1 CIRCUIT DIAGRAM

The main components involved in this project are Node MCU, ESP 32 CAM MODULE, Dual Shaft Motors, Servo Motor, IEDs, Buck Boost Converter, NEO6M GPS Module and Battery. Initially the Input pins D0 and D1 were connected to the two servo motor for the complete 360 degree view of the camera. D2 pin is used as enable for the motor driver. The other pins namely D3, D4, D5, D6 pins were used to control the direction of the as per the user input by connecting to the input pins 1, 2, 3, 4 of the motor driver respectively. These four input pins of the motor driver are made high or low depending upon the direction that the user wants to turn the car. D7 pin functions as the receiver pin of the Neo 6m GPS module which transmits the location data as longitude and latitude to the user in the blynk interface. D8 pin used to denote the self-destruction function of the car which is represented by the buzzer present in the car. The data pins D0, D1 is connected to the PWM (Pulse Width Modulation) pin of the servo motor. The servo motor has 3 pins namely PWM, +5V supply, ground. The 12V battery is connected parallel to the Buck-Boost converter. This Buck-Boost converter converts the +12 V supply to +5V supply. This +5V supply is in turn connected to the 2 Servos and Esp 32 CAM MODULE. This Esp 32 CAM MODULE is already programmed to connect to the Wi-Fi specified and to stream the video data in the Wi-Fi module through the IP address. The webserver consists of various functions. It has Led Intensity control slider, V-flip, H-flip, Camera quality control, etc...

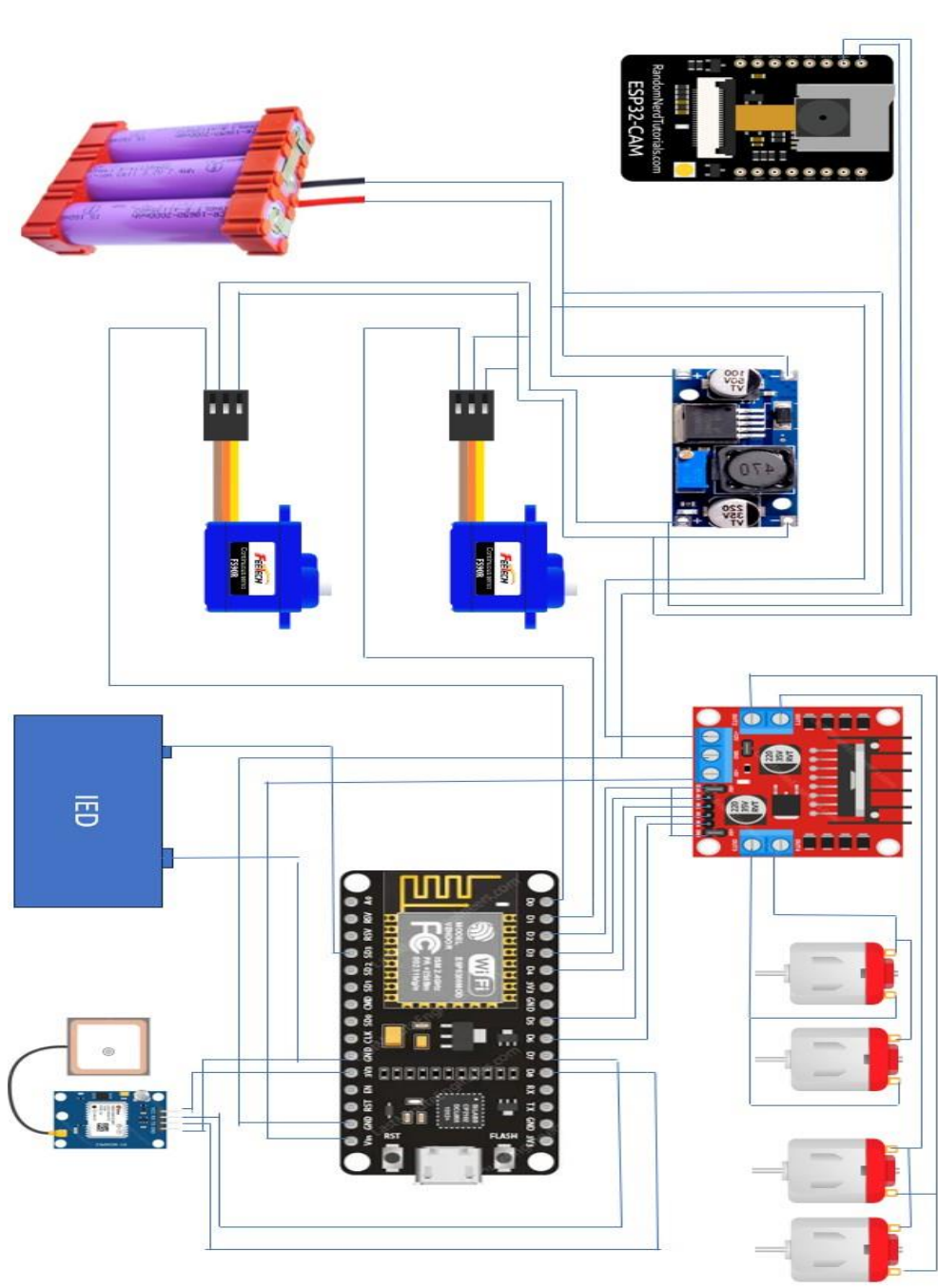


Figure 5.1 Connection Diagram