1.PROTOTYPE STATEMENT

1.1 Problem Statement:

- Now-a-days, No. of crimes happening in public places are increasing.
- In 2020, India has recorded an average of 80 people are murdered per day.
- In the same year, nearly 77 rape cases are recorded.
- For Every 3 minutes, A robbery is taking place.
- Chain and Mobile snatching are increased across the road sides. Similarly, 125 bikes stolen every day.

Objective of The Project:

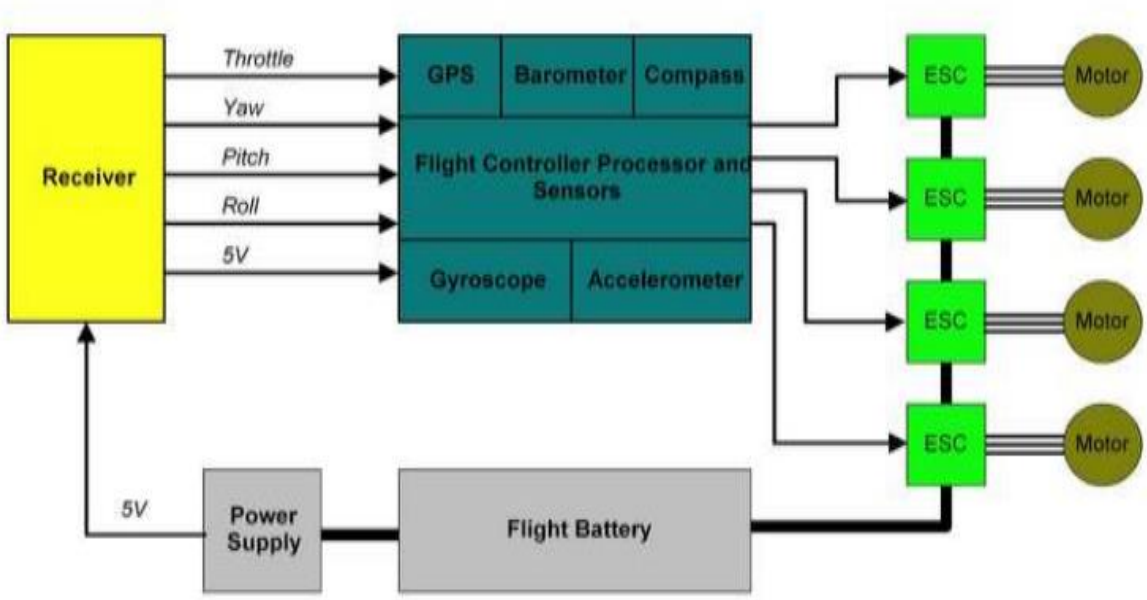
- To ensure equal security for all people.
- To ensure the safety of the physical assets of the people
- To improvise Artificial intelligence in Defence Systems of the nation.
- Continuous surveillance of vulnerable areas.
- User friendly drone

ABSTRACT:

In modern days, Drones are everywhere from war to pharmacy delivery. Drones can also be used in surveillance, rescuing people from remote areas. Modern technologies like Artificial Intelligence and Deep Learning must be implemented in our defence systems. Organisations and Institutes under Defence Ministry require Drones to locate other countries' soldiers, weapons and camps. In this project, we are going to develop a drone which can detect people or soldiers, drones, army camps etc. Using face detection and objection detection algorithms we will train models and can be used in real time. The video data from drone camera is sent to the servers. The video or image will be processed by the servers. Output will be given in the form of text messages and image. This drone technology can be used in anti-drone systems and anti-aircraft missiles to destroy other countries' drones or missiles. The drones can be made autonomous. So, they can communicate with each other for better performance. Therefore, using this technology, better surveillance can be done. It can help national and state police officers and rescue teams to locate victims of Natural disasters like floods, tsunami etc.

KEYWORDS: Drones, Deep Learning, YOLO, AUV, Artificial Intelligence

1.2. HIGH LEVEL DESIGN



1.3 MODULES AND THEIR DESCRIPTION

In components of drone system. There are 10 components in any functional drone

- Motors
- Propellers
- Electronic Speed Controllers (ESCs)
- Flight Controller (FC)
- RC Remote
- Radio Transmitter 11
- Radio Receiver
- Video Transmitter
- Video Receiver
- Battery

MOTOR

A2212 BLDC Motor is a 3-phase out-runner type popular brushless DC motor commonly used in Drones and other multirotor applications. The motor is rated for 1000KV and has an efficiency of 80%. The A2212 motor requires an ESC (Electronic speed controller) to control its speed. The motor can easily be controlled with our 30A ESC and when coupled with our 1045 Propeller Blades it can provide thrust up to 800gm. Four of these A2212 Motors can be easily mounted on the F450 Quadcopter Frame to provide a total thrust of 3.2kgs enabling you to build powerful drones.

SPECIFICATIONS OF A2212 1000KV BLDC MOTOR

12 18A (min) / 30A (recommended)

No Load Current: 500mA @10V

Nominal Current: 12A/60s

No. of Cells: 2S or 3S Li-Po

Thrust with 3S: 800gm (with 1045 propeller)

PROPELLER

Propellers are devices that transform rotary motion into linear thrust. Drone propellers provide lift for the aircraft by spinning and creating an airflow, which results in a pressure difference between the top and bottom surfaces of the propeller. This accelerates a mass of air in one direction, providing lift which counteracts the force of gravity. Propellers for multirotor drones such as hex copter, octocopter and quadcopter propellers, are arranged in pairs, spinning either clockwise or anti-clockwise to create a balance. Varying the speed of these propellers allows the drone to hover, ascend, descend, or affect its yaw, pitch and roll. propeller's motor, a process that is handled by an Electronic Speed Controller (ESC). The correct signal is fed to the ESC by the drone's flight controller, which relies on inputs from either the human pilot's controller 13 or an autopilot, and may also take into account information from an IMU (Inertial Measurement System), GPS and other sensors.

ELECTRONIC SPEED CONTROLLER (ESCs)

Electronic speed controllers (ESCs) are devices that allow drone flight controllers to control and adjust the speed of the aircraft's electric motors. A signal from the flight controller causes the ESC to raise or lower the voltage to the motor as required, thus changing the speed of the propeller. Due to the differences in motor technology, different ESCs are required for drones with brushed motors and those with brushless motors. Multirotor drones may have an ESC for each rotor, or an integrated device that handles all the rotors with one system. Many drone ECSs are designed as a system- on-chip (SoC), which means that all components, such as the microcontroller and power management unit, are integrated into a single module. This saves space and weight, making it an ideal solution for Swap (size, weight and power) constrained UAVs.

FLIGHT CONTROLLER

The flight controller uses the data gathered by the sensors to calculate the desired speed for each of the four motors. The flight controller sends this desired speed to the Electronic Speed Controllers (ESC's), which translates this desired speed into a signal that the motors can understand. Calculating the movements, fusing and filtering the sensory information, and estimating the safety and durability of a flight is all done by an algorithm. A fancy word that is used a lot nowadays which in essence is nothing more than a set of strict rules that every microchip on the board has to apply to. The most commonly used flight control algorithm is called PID control: Proportional Integral Derivative control. Within this area, there is a lot of research going on, which resulted in INDI: Incremental Nonlinear Dynamic Inversion. This algorithm reads out and reacts to incoming information way faster, therefore making the drone flight more stable.

RC REMOTE

A drone controller works by sending a radio signal from the remote control to the drone, which tells the drone what to do. Radio signals are sent from the radio transmitter in the drone controller and received by the drone's receiver. This is why the drone controller is sometimes simply called the drone radio transmitter or the drone radio controller.

RADIO TRANSMITTER

In electronics and telecommunications, a radio transmitter or just transmitter is an electronic device which produces radio waves with an antenna. The transmitter itself generates a radio frequency alternating current, which is applied to the antenna. When excited by this alternating current, the antenna radiates radio waves. Transmitters are necessary component parts of all electronic devices that communicate by radio, such as radio and television broadcasting stations, cell phones, walkie-talkies, wireless computer networks, Bluetooth enabled devices, garage door openers, two-way radios in aircraft, ships, spacecraft, radar sets and navigational beacons. The term transmitter is usually limited to equipment that generates radio waves for communication purposes; or radiolocation, such as radar and navigational transmitters. Generators of radio waves for heating or industrial purposes, such as microwave ovens or diathermy equipment, are not usually called transmitters, even though they often have similar circuits.

RADIO RECEIVER

The function of the radio receiver is to receive the signal and perform demodulation to recover the original message signal. The radio transmitter sends the signal at the initial stage. The antenna present at the transmitter side radiates the signal, which is captured by the other antenna present at the radio receiver. We have already discussed the process of transmission using a radio transmitter. The modulation process is the main principle in radio transmitters, where the signal is transmitted through the communication channel to the receiver. The main principle of the receiver is demodulation. Let's discuss the process of signal reception and recovery in the radio receiver.

VIDEO TRANSMITTER

17 Video transmitter or VTX in short is the component on the drone that transmits the video from our FPV cameras wirelessly to our FPV goggles. The sole purpose of the VTX is to transmit video and is independent on the camera or the camera settings. VTX is probably one of the simplest components to buy meaning to say all VTX are capable of getting the job done aka transmitting video. Even though technology has advanced FPV transmitters are still analog TRANSMITTING AT 640x480 RESOLUTION. Analog FPV VTX's are the limiting factor in determining the video quality, not the camera. Digital video transmitters like the Connex HD or Insight SE are an exception transmitting videos at 720p or 1080p. This capability comes at

a price digital transmitters make use of standalone HD cameras to capture video at high resolution making it relatively more expensive than analog transmitters and are usually large and bulky. Also digital cameras cannot transmit over large distances with most commercial transmitters only good for indoors or distances below 1km.

VIDEO RECEIVER

An audio/video receiver (AVR) is a consumer electronics component used in a home theatre. Its purpose is to receive audio and video signals from a number of sources, and to process them and provide power amplifiers to drive loudspeakers and route the video to displays such as a television, monitor or video projector. Inputs may come from a satellite receiver, radio, DVD players, Blu-ray Disc players, VCRs or video game consoles, among others. The AVR source selection and settings such as volume, are typically set by a remote controller.

BATTERY

The most common batteries used in drones are lithium polymer (LiPo) batteries. LiPo batteries are composed of a lithium-based cathode and anode separated by a polymer electrolyte. LiPo batteries differ from other lithium-ion (Li-ion) batteries in that they have a solid polymer electrolyte component rather than a liquid electrolyte. Common polymer electrolytes may be dry, porous or a gel, and include poly(methyl methacrylate) (PMMA), poly(acrylonitrile) (PAN), poly(vinylidene fluoride), and poly(ethylene oxide) (PEO). The science behind LiPo batteries is the same as in other Li-ion batteries: chemical energy is converted to electrical energy when electrons travel from the battery's anode to its cathode, creating an electrical current. The cathode contains a lithium metal oxide (such as lithium-cobalt oxide (LiCoO2)), which provides lithium ions, whereas the anode contains a lithium carbon (such as graphite). The anode and cathode are separated by an electrolyte that interacts with the anode to generate electrons, which creates a charge gradient in the cell. As the anode becomes negatively charged, the electrons travel along a conducting wire to the cathode. The whole system thus undergoes an electrochemical redox reaction (reduction/oxidation): the anode loses electrons and becomes oxidized while the cathode gains electrons and is reduced. Lithium-based batteries have a higher energy density compared to nickel cadmium or nickel metal hydride batteries, which means they can provide more energy for less weight. LiPo batteries rival Li-Ion batteries in terms of energy density, but are especially popular because they are less likely to leak. The energy density of LiPo batteries ranges from 140 - 200+ Wh/kg in terms of weight and 250 - 350+ Wh/L for volume. Volume energy density is important to consider when building a drone so the battery fits on the frame, but for performance calculations, the energy density by weight 19 is more relevant. With higher density comes higher cost, so your budget may also be a limiting factor. A technology that may soon rival LiPo batteries as the drone go-to are Sion Power's Licerion batteries. These batteries boast an energy density up to 500 Wh/kg and 1000 Wh/L. They also have a 50% lower liquid electrolyte volume compared to other Li-Ion batteries. They were

designed specifically for unmanned applications, notably high- altitude pseudo satellites (HAPS) and high-altitude longendurance (HALE) drones.

SOFTWARE COMPONENTS

1. Python
2. Google Collab
3. Open CV
4. NumPy
5. Visual Studio Code
6. Media Pipe
7. Blaze Model

1.4 PROTOTYPE DEVELOPMENT

HARDWARE OUTPUT