ANTI-RIOT DRONE WITH VIOLENCE DETECTION

by

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A project report submitted

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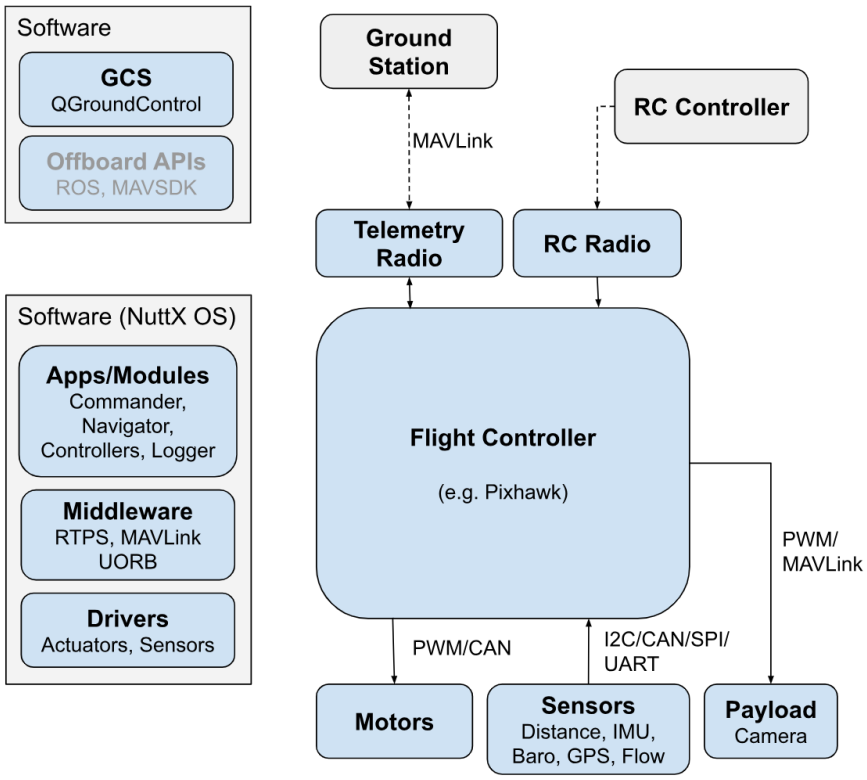
Introduction:

Riots and civil unrest present persistent challenges to law enforcement agencies globally, demanding innovative technological solutions to maintain public order and ensure the safety of both citizens and law enforcement personnel. As traditional methods often fall short in effectively managing such complex situations, the need for advanced tools, particularly in the form of anti-riot drones with autonomous capabilities, has become increasingly evident. These drones have the potential to revolutionize crowd control, surveillance, and situational awareness, offering a proactive and efficient approach to handling volatile scenarios.

Objectives:

The objective of this project is to design, develop, and implement an anti-riot drone equipped with autonomous features to enhance its effectiveness in handling crowd control situations. The drone should be capable of performing various tasks autonomously, such as monitoring and assessing the situation, dispersing non-lethal deterrents, and providing real-time data to the command center. The drone platform is based on a quadcopter model with a flight controller, a GPS, and a transmitter and receiver. The crowd detection module uses a machine lerning model to identify and estimate the density and distribution of the people in the scene. The delivery module uses a PID controller to optimize the flight path and speed of the drone and a dispenser to release the chocolates/Tear Gas capsules/Flowers at the desired location.

Design Architecture of Proposed Model:



Tools Used:

1.DM002 DIY REMOTE CONTROL QUADCOPTER COMPLETE KIT

2. Android moble – app for viewing and streaming

3. ESP32

4.Dropping mechanism

5. Light Weight material Holder

SOFTWARE USED:

- Python
- Google Collab
- Deep learning(Computer vision) Model
- PYCHARMN- For Machine Learning and Deep Learning

- MATLAB SIMULINK – USED FOR SIMULATING

Sensors in the Drone:

- Flight Controller Sensor (IMU): This is a multi-sensor unit combining an accelerometer, a gyroscope, and sometimes a magnetometer.
    - The accelerometer measures the drone's acceleration in different directions.
    - The gyroscope measures the drone's rotation rate around its axes.
    - The magnetometer measures the Earth's magnetic field, helping with orientation.
    - Together, these sensors provide the flight controller with crucial data to maintain stability and control the drone's position.
    - Barometer: This sensor measures atmospheric pressure, which can be used to determine the drone's altitude. This is especially important for maintaining a set height during flight.

- **Ultrasonic Sensor:** This sensor emits sound waves and measures the time it takes for the echo to return. This allows the drone to determine its distance to obstacles below it, helping to avoid collisions during landing or low-altitude flight.
- **GPS Module:** A GPS module uses signals from satellites to determine the drone's location. This enables features like autonomous navigation and waypoint flying, where the drone follows a pre-programmed path.
- **Optical Flow Sensor:** This sensor uses a camera or light source to track the ground beneath the drone, helping it maintain altitude and position even in environments with weak GPS signals.

PAYLOAD SPECIFICATION:

- Dispensing mechanism: Gravity-fed with a servo-controlled gate
- Material: ABS plastic box (lightweight and printable with 3D printing) or plastic cover
- Servo Motor:
    - Specification: Micro servo with sufficient torque to operate the gate smoothly (e.g., SG90 servo)
- Mounting:

- Mounting plate design specific to your S-500 frame attachment points
- Material: ABS plastic or plywood for rigidity

Theory:

The team implemented a Full fledged **"Do It Yourself Drone"**, with camera module. The Drone had an in built camera for capturing vidoes/ Photos, streamed and watched by the viewers via installation of the android application, paired by wifi of the drone and phone.

The captured images/ videos will be used as a data for deep learning/Computer vision model, which predicts whether the people involved are in a conflict or not.

This drone is also used for surveillance, which allows live streaming, via the android application.

PROPOSED OUTCOME(S):

- TO LOCATE THE RIOT OCCURRING PLACE AND DROP THE LETHAL WEAPON LIKE TEAR GAS

PROJECT PHOTOS:

Quadcopter Captured Images:

Quadcopter Kit Images: (Hardware Connections)

Quadcopter in state of rest:

Full Operation Kit used:

1.RC

2.Android Mobile

3. Quadcopter

Working Mode :

Deep learning model Images with prediction:

Drone Captured Prediction:

Input: Original Image

Output: **With prediction**

Team Members:

Conclusion:

We were successful in implementation of the drone kit, successfully determined the presence of riot and in capturing and streaming images and vidoes.