

Technical Project Report  
Eagle AI – Hack AI  
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## **Introduction:**

Consumer autonomous surveillance drones are unmanned aerial vehicles that are equipped with cameras and other sensors to monitor and record activity in a given area. These drones can be used for a variety of purposes, including home security, wildlife observation, and property surveillance. In this technical project report, the team will discuss the design and development of a consumer autonomous surveillance drone.

Our goal for this hackathon:

- Autonomous Drone Mapping
- Object Detection
- Drone Image Capturing

## **Objectives:**

- 1) To design a consumer autonomous surveillance drone that can be controlled remotely and can fly autonomously using pre-programmed flight paths.
- 2) To develop software that can control the drone's flight path, as well as its camera and sensor inputs.
- 3) To integrate the software with the drone's hardware to create a fully functional system.
- 4) To implement a robust object and face detection system to identify and alert to any strange people or things found on the consumer's property.

## **Design:**

The design of the consumer autonomous surveillance drone will consist of two main components: the hardware and the software. The hardware will include the drone itself, as well as its cameras and sensors. The software will control the drone's flight path, camera inputs, computer vision, and other functions. Machine learning libraries will be implemented into software as well such as OpenCV, Numpy, Math, and etc

## **Hardware:**

The drone will be the consumer DJI Tello drone, with four rotors to provide lift and stability. It will be made of lightweight materials to maximize flight time and maneuverability. The cameras and sensors are sufficient enough for capturing video and images. The drone will be powered by a rechargeable battery that will provide enough energy for regular 25-30 minute flight times.

## **Software:**

The software of the drone provides real-time video streaming, object detection and tracking, and autonomous flight. Real-time video streaming is achieved through the DJI Tello's built in camera and Wi-fi connectivity. The drone feed is sent to a PC that can be monitored. Object detection is achieved through YoloV5. Autonomous flight capabilities are achieved using the Python programming language and the DJI Tello SDK. Our software includes a flight controller module that uses the Tello SDK to control the drone's flight. The flight controller module can be programmed to fly the drone on a predefined path or to follow a moving object.

## **Functionality:**

Consumer autonomous surveillance drones come with a range of features that make them easy to use and effective. These drones are equipped with cameras that can capture live and dynamic footage. Our model can have its navigation programmed, which allows them to fly to specific locations and return to their point of origin automatically. These drones also can have their training models changed in order to have different focuses in the realm of object detection.

## **Limitations:**

While consumer autonomous surveillance drones come with many benefits they also come with some limitations. One of their main limitations is their battery life, which lasts around 25-30 min. This means users need to carefully ensure that their drone has enough battery life to complete its task and return to the charging port. Moreover, low-cost drones come with bandwidth limitations so much of the machine learning has to be facilitated through an outside computer. Drones can go out of range so manual control is only relevant within a certain distance.

## **Results:**

During this hackathon, the team was able to achieve object detection, autonomous drone mapping, manual override to user, image capturing, and recording of flight time. The updated drone with our machine learning algorithms can be used for a variety of purposes, including home security, property surveillance, and etc. The drone will be capable of flying autonomously using pre-programmed flight paths, as well as being controlled remotely(manual override). It will

be equipped with cameras and sensors to capture video and images, and machine learning algorithms for object recognition to help identify potential threats or suspicious activity.

## **Conclusion:**

In conclusion, the design and development of a consumer autonomous surveillance drone is a complex project that requires expertise in both hardware and software development, especially with a drone like the DJI's Tello. However, by following a structured development process, the team created a fully functional system that can provide valuable surveillance capabilities for a variety of purposes.