ABSTRACT

Today Object Detection and classifying objects inside a single frame that contains many objects is a time-consuming task. The accuracy rate has grown dramatically as a result of the deep learning technique. Despite new flight control laws, Unmanned Aerial Vehicles (UAVs) continue to grow in popularity for civilian and military uses, as well as personal use. This growing interest has accelerated the development of effective collision avoidance technologies. Such technologies are crucial for UAV operation, particularly in congested skies. Due to the cost and weight constraints of UAV payloads, camera-based solutions have become the de facto standard for collision avoidance navigation systems. This requires multitarget detection techniques from video that can be effectively run on board.

A drone is a quadcopter with on board sensors. This drone can be controlled using wi-fi and laptop, using a programming language called Python and a Python library called as drone kit. This paper will discuss a way for tracking a specific object known as object detection tracking methods, which may be used to track any arbitrary object chosen by the user, the camera of drone is used to take video frames along with all the sensor's information such as ultrasonic sensors, GPS etc. A train model will identify an object first and determines the direction at which the drone should fly so that it keeps following person.

KEYWORDS - UAV, drone, Single shot detector, Mobile-Net, OpenCV, etc.

TABLE OF CONTENTS

CHAPTER NO	TITLE	PAGE NO
	ABSTRACT	**5**
	LIST OF FIGURES	**8**
1	**INTRODUCTION**	
	1.1 OUTLINE OF THE PROJECT	**9**
	1.2 LITERATURE REVIEW	**10**
	1.3 OBJECTIVE OF THE PROJECT	**12**
2	**AIM AND SCOPE OF THE PRESENT INVESTIGATION**	
	2.1 AIM AND SCOPE OF THE PROJECT	**13**
	2.2 HARDWARE REQUIREMENTS	**13**
	2.3 SOFTWARE REQUIREMENTS	**13**
3	**EXPERIMENTAL OR MATERIALS AND METHODS, ALGORITHMS USED**	
	3.1 SYSTEM DESIGN	**15**
	3.1.1 EXISTING SYSTEM	**16**
	3.1.2 PROBLEM STATEMENT	**16**
	3.1.3 PROPOSED SYSTEM	**16**
	3.2 METHODS USED	**17**
	3.2.1 TAKE OFF	**17**
	3.2.2 SEARCHING FOR THE OBJECT TO TRACK	**18**
	3.2.3 FIND THE OBJECT AND PRINT ITS BOUNDING	**18**
	3.2.4 ADJUST YAW, VELOCITY AND ANGLE TO TRACK	
	3.2.5 LAND	**18**
	3.3 ALGORITHMS	
	3.3.1 Mobilenet SSD	
	3.3.2 Result	

4 RESULTS AND DISCUSSION

4.1 Results **26**

5 CONCLUSIONS **28**

6 REFERENCES **29**

7 APPENDIX

38

7.1 SOURCE CODE **32**

7.2 SCREENSHOTS **47**

7.3 PUBLICATION WITH PLAGIARISM REPORT

LIST OF FIGURES

FIG NO	TITLE	PAGE NO
1.1	INTRODUCTION	9
1.3	A typical UAV analysis model	12
3.1	The overall procedure diagram of the object detection and person tracking	15
3.3.1	Mobilenet SSD	18
3.3.1	Overview of models	21
3.3.2	Module Result	24
7.2	Screen shots	45

1. INTRODUCTION

1.1 OUTLINE OF THE PROJECT:

Recently Drones are becoming affordable, practical, and versatile, which is resulting in a reality where Drones are widely available in the sky for commercial and individual purposes. The UAV's has become more advantageous in the compact structure and low maintains and increased processing ability. In order to accomplish robust tracking on drones, UAVs outfitted with high-resolution cameras and running computer vision algorithms in real-time have recently received considerable study focus Annotations of high quality on large datasets are essential for the development of algorithms, therefore specific difficulties related to object detection are addressed. and person tracking algorithms applied to UAV applications involve the following. The video feed is acquired from a moving camera mounted on the UAV, where we detect the person in the drone camera and capture his activities for surveillance purpose, it can be used in logistics in remote location as well as cinematography etc. To achieve this task, we'll use the AR Drone's built-in sensors and actuators, but due to the built-in processor's limited computing power, we'll do our reasoning on an external computer (a regular laptop). The usage of Image Classification with the Mobile Net model to accomplish detection and classification is the subject of this paper. The entire system works by taking a frame from the camera and then using the on-board computer to detect an object. computer processes the image to detect the object using a Mobile-net classifier. Once the object is detected, the on-board goal is to predict the object's position in relation to the quadrotor and transmits the appropriate information to the flight controller to ensure proper tracking.

1.2 LITERATURE REVIEW

[1] Multi-Inertial Sensing Data for Real-Time Object Detection and tracking on a Drone To extract features from an image, this study employs the Oriented Fast and Rotated BRIEF[ORB] algorithm, as well as the Euclidean equation GPS and IMU to compute the relative position between the drone and the target.

[2] Target Tracking and Recognition Systems Using Unmanned Aerial Vehicles. This paper uses YOLO algorithm with custom dataset and train the algorithm for motion blurred images and low resolution.

[3] Multi-Target Detection and Tracking in Unmanned Aerial Vehicles with a Single Camera (UAVs). The Lucas-Kanade method is used in this research to recognize and track other fast-moving UAVs.

[4] Object Detection and Classification for Autonomous Drones. This paper aims to implement object detection and classification with high accuracy using SSD architecture combined with Mobile Net

[5] Agent Sharing Network with Multi-Drone based Single Object Tracking.This paper uses Agent Sharing Network [ASNet] for multiple drones to track and identify single object.

[6] Path Following with Quad Rotorcraft Switching Control: An Application This paper focus on estimation of track and road using UAV and here they used visual sensors to identify lane.

[7] Any flying drone can track and follow any object. The Drones may track an arbitrary target selected by the user in the video stream coming from the drone's front camera. The proportional-integral-derivative method is then used to direct the drone based on the location of the monitored object (PID controller). They employed a tracking-learning-detection technique in computer vision.

[8] Haar-like Features for Object Recognition and Tracking Application of Cascade classifiers on a quad-rotor UAV. In this research, to develop a functioning Unmanned Aerial Vehicle (UAV) capable of tracking an object, we used a Machine Learning-like vision system called Haar-similar features classifier. On-board image processing is handled by a single-board computer with a powerful processor.

[9] Object Detection in Real-Time (YOLO) approach, which is based on UAV, has been retrained to swiftly and accurately detect and distinguish objects in UAV photos.

[10] Drone Identification and Tracking Using Phase-Interferometric Doppler Radar This work focuses on UAV detection and tracking using phase interferometric doppler radar, where data is collected using a double channel doppler and multi radar called Doppler-azimuth, which will handle the processing.
[11] Deep Learning-Based Object Detection for Quadcopter Drones. The evolution of object detection in AI and deep learning-based drone cameras is discussed in this study. the main aim of this paper is delivering medical aids to patients. Here they used single shot detector and Mobile Net.

[12] With an embedded UAV, real-time visual object detection and tracking is possible. This is true even for embedded devices. A powerful neural network-based object tracking system could be deployed in real time. A modular implementation suited for on-the-fly execution is described and evaluated (based on the well-known Robot Operating System) SYSTEM ARCHITECTURE.

[13]. Deep Learning-Based Object Detection for Quadcopter Drones Widodo Budiharto1, Alexander A S Gunawan2, Jarot S. Suroso3, Andry Chowanda1, Aurello Patrik1, and Gaudi Utama1 1Computer Science Department, Bina Nusantara University's School of Computer Science.

[14]. Convolutional Neural Networks with Time Domain Motion Features for Drone Video Object Detection Yugui Zhang1 Liuqing Shen1 Xiaoyan Wang1 Hai-Miao Hu1, 2 1 Beijing Key Laboratory of Digital Media, School of Computer Science and Engineering 2 State Key Laboratory of Virtual Reality Technology and Systems

Beihang University, Beijing, China

1.3 OBJECTIVE OF THE PROJECT

This study was conducted based on several objectives which are:

a) To record and detect human activities for surveillance purpose,
b) It can be used in logistics in remote locations, and used in cinematography and photography etc.
c) Through using general unmanned aerial vehicle or drone and computer vision.

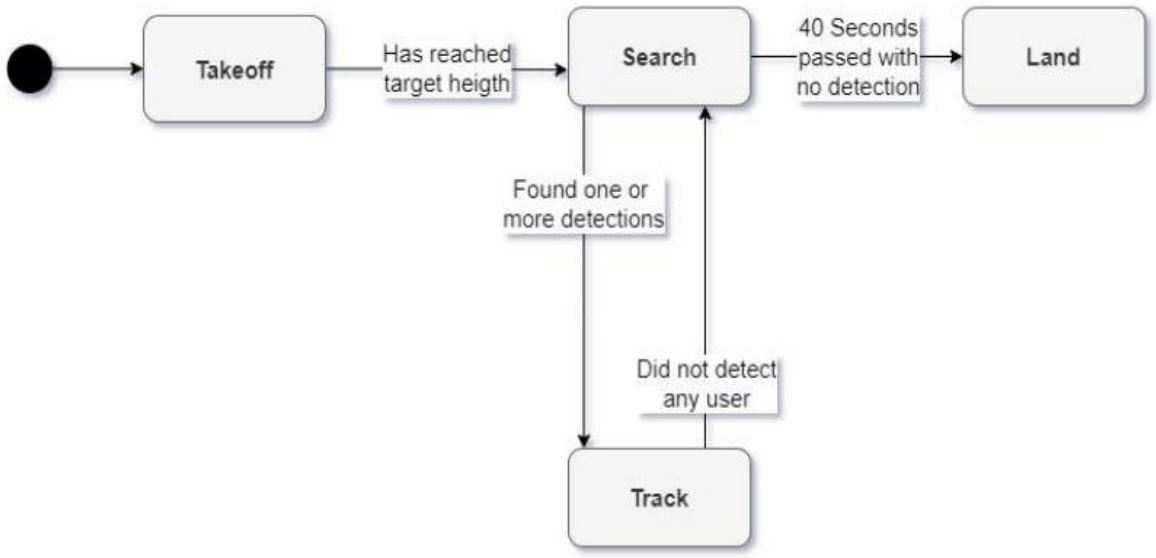

Figure 1. A typical UAV analysis model

2.AIM AND SCOPE OF THE PRESENT INVESTIGATION

2.1 AIM AND SCOPE OF THE PROJECT

The Aim of the project is based on object detection and person tracking. In this process we get the real time input through OpenCV. video is converted into images then the image is processed in open cv method. When the object detection takes place then the model will be able to identify human from objects, if human is in the video then UAV keeps on following for certain limit.

The scope of the project is working with a large number of features as it can capture video frames from long range that's the biggest advantage that can be used in surveillance purpose. Even, it has also the risk of overfly or any failure for that purpose we involved kill switch it going to terminate UAV, we used raspberry pi and APM 2.8 flight controller to perform all the necessary tasks.

2.2 HARDWARE REQUIREMENTS

- UAV: The main elements of our quadcopter includes Battery, APM 2.8 flight controller, GPS module, Raspberry-pi on board computer, USB camera, Ultra sonic sensor.
- APM 2.8 flight controller: it has ATMEGA 2560 processor and having 3 axis gyro meters on board, accelerometer and barometer by using this sensor on circuit board we can use this to control any UAV's.
- We use external GPS for pin point accuracy to find coordinates.
- Raspberry-pi is on board computer which run our python scripts, get frames from USB camera and send signals to flight controller.
- Ultra-sonic sensor: This sensor uses ultra-sonic sound to get distance.

2.3 SOFTWARE REQUIREMENTS

- Host computer: The host computer will reserve all the input frames from camera on raspberry pi and process each frame using OpenCV python for object detection and classification. Once the object is detected the Mobile Net classifier will determine the bounding boxes around the object and thus we can identify those objects along with labels.
- Mobile Net: There are 2 forms of blocks in MobileNetV2. One could be a one-stride residual block. Another choice for shrinking could be a block with a two stride. Both forms of blocks have 3 levels. Eleven convolution victimization is the first layer. These points should be reLU6ed. The second layer has a depth-wise convolution. Another eleven convolutions are employed inside the 3rd layer, However, there is no non-linearity at this time. Deep networks can only have the capability of a learning algorithm on the non-zero region as a

component of the output region if RELU is applied again, according to the statement.

- Drone Kit: Drone kit is a python library. Developers can use drone Kit-Python to make programmed that operate using an onboard companion computer, and use a low-latency link to communicate with the Arduino control board. Onboard apps can assist the autopilot in performing computationally hard or time-sensitive tasks, as well as contributing knowledge to the vehicle's action. Drone Kit python can also be used by base station apps that interface with vehicles over a higher latency RF-link.
- MAV-Link is used by the API to communicate with automobiles. By offering application support to a connected vehicle's data, status, and parameter information, it offers either task management or total control on vehicle movement and operations.

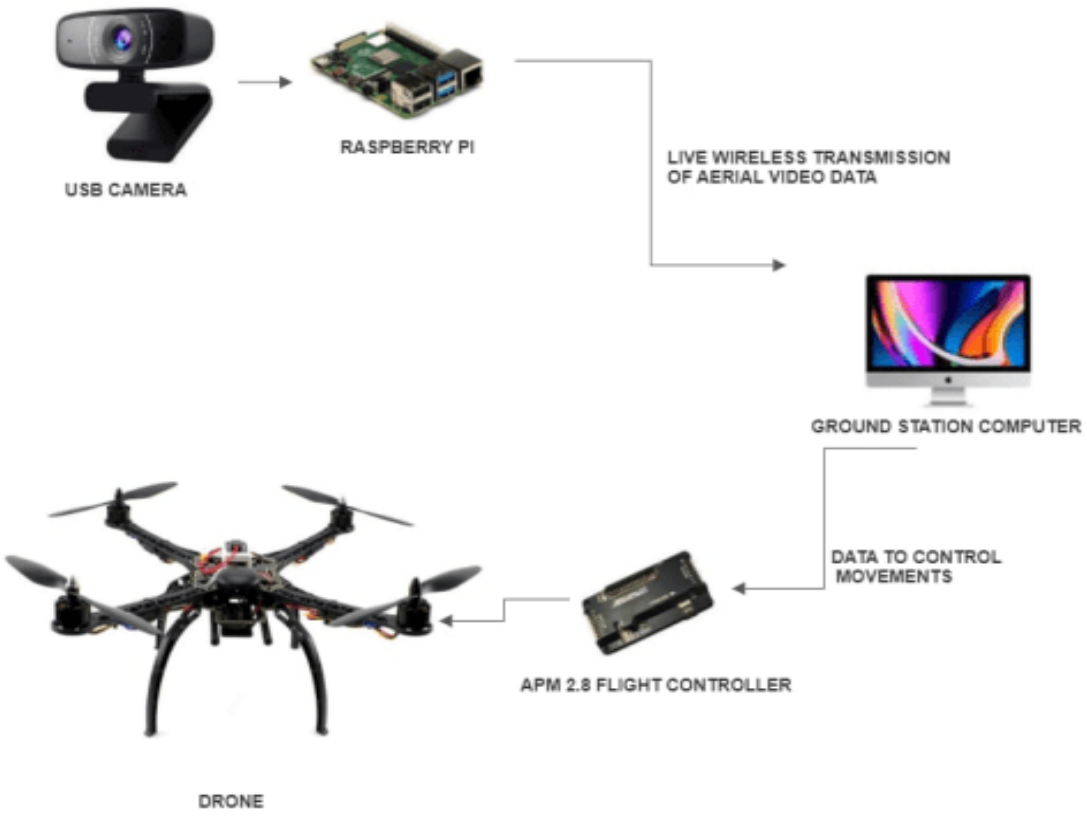

Figure .2 System Architecture