B.Tech. Project Report

on

Unmanned Arial Vehicle

Project Sudarshana

Submitted by
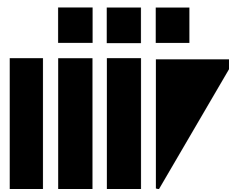
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March 2018

Declaration

We, Hari Pad Rajak and Vishal Nagarale, declare that this written submission represents our ideas in our own words and where other′s ideas or words have been included, We have adequately cited and referred the original sources. We also declare that We have adhered to all principles of academic honesty and integrity and have not mispresented or fabricated any idea/data/fact/source in our submission. We fully understand that any violation of the above will cause for disciplinary action by the institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been obtained.

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Abstract

Artificial Intelligence is the future of todays world. Drones, technically known as unmanned aerial vehicles (UAVs), are one such form of artificial intelligence which shall change the course of technology and the world soon. Drone technology has immense potential, not only for technological and economic growth, globally, but also for security reasons of the nation. Currently in India we don't have any technology used for security which is based on drones. So we come up with the idea of using drones for our day-to-day life surveillance and security. The drone will be one of the cheapest drone used for security and has a special feature of electric gun which can be used in case of emergency. The main problem of our society is the acknowledgment of crime happened much later than the crime, thats why many of proofs got destroyed due to any reason. The drone surveillance gives a better eye on each and every part of the society and help to reduce crime rate. We try to build a drone with face recognition technique embedded in it also with electric gun so that if any suspect found by drone it will immediately take appropriate action about it. The result of it will be the city will be under surveillence for 24x7 without using lot of manpower and resources, the drones are itself self-sufficient to have an eye on the society and immedietly inform the police if anything went wrong in the city.

Contents

Chapter 1

Introduction

New technologies undoubtedly create a potential for both malicious as well as beneficial use for society. Surveillance technologies are a prime example, having both enabled improvements in law enforcement and security, but at the same time creating unresolved implications for privacy and civil liberties. The drone technology is also one of them. There are at least 13 exhibitions in India that specifically cater to the surveillance and security *industry*[1], out of which one is Secure Cities Expo (Broucher 2013) which is the platform of providing homeland security solutions and technologies to government and private sector articipants. We are trying to develop such security system which will allow the authorities to operate from one place and has an eye on every part of city without physically going there. For this we want to embedded face recognition feature inside drone so that it can identify the culprits in the society if there any. The face is crucial for human identity. It is the feature which best distinguishes a person. Face recognition is an interesting and challenging problem, and impacts important applications in this security field.Face recognition is an easy task for humans but its entirely different task for a computer. Neurophysiologist David Hubel and Torsten Wiesel has shown that our brain has specialized nerve cells responding to specific local features of a scene, such as lines, edges, angles or movement. Since we dont see the world as scattered pieces, our visual cortex must somehow combine the diff erent sources of information into useful patterns. Automatic face recognition is all about extracting those meaningful features from an image,putting them into a useful representation and performing some classifications on them.Face recognition based on the geometric features of a face is probably the most

intuitive approach to Human identification.The whole process can be divided in three major steps where the first step is to find a good database of faces with multiple images for each individual.The next step is to detect faces in the database images and use them to train the face recognizer and the last step is to test the face recognizer to recognize faces it was trained for.

This report is organized as follows: In Chapter 2, we explain the present condition and present work about drones in India. In Chapter 3, we describe the whole mechanism of Face Detection and Recognition using special classifier or model. In Chapter 4, we show the implementation of the real-time face detection system with the help of images.Finally, we conclude in Chapter-5.

Chapter 2

Survey on Drones in India

Before getting into drones in India first of all we need to define a drone. SoDrones are unmanned aircraft that can fly autonomously without a human in control. Now the question comes what is the legal status of operating drones in India so the answer to it is after lot of ambiguity, The Office of the Director General of Civil Aviation (DGCA) finally released the Civil Aviation Requirements (CAR) for the operation of civil Remotely Piloted Aircraft System (RPAS), or as it is commonly known as, drones. As per the CAR, to operate a drone one will have to obtain a Unique Identification Number (UIN), an Unmanned Aircraft Operator Permit (UAOP) and comply with certain other operational requirements.

The DCGA has divided the drones into five categories based on their Maximum Take-Off Weight (MTOW)

1. Nano: Less than or equal to 250 grams.

2. Micro: Greater than 250 grams and less than or equal to 2 kg.

3. Mini: Greater than 2 kg and less than or equal to 25 kg.

4. Small: Greater than 25 kg and less than or equal to 150 kg.

5. Large: Greater than 150 kg.

Only defence forces, law-enforcement agencies and a few select government companies are allowed to use drones, but that is not stopping civilian droners from hitting the skies. Over the past two years, Indians have spent close to Rs 40 crore buying civil drones, as per estimates

of the Consortium of Unmanned Vehicle Systems India (CUVSI). There is issued notice by OFFICE OF THE DIRECTOR GENERAL OF CIVIL AVIATION about Requirements for Operation of Civil Remotely Piloted Aircraft System $(RPAS)$[2]. There is certain startups in India which are utilizing drone technology. For example *Airpix* used it for photography, *Garuda robotics* sells software and services for the UAV industry and few more.

India accounts for the highest percentage of the world's UAV imports(for defence purpose) at 22.5% According to SIPRIs arms transfers database and Statista, India and the United Kingdom are the largest importers of drones internationally. According to a Business Insider report based on SIPRI data, India accounted for 22.5 percent of drone imports between 1985-2014. That percentage shrinks to 13.2 percent when measured between 2010-2014, but still puts India in second place. In addition to its imports, India also has indigenous Unmanned Combat Aerial Vehicles (UCAVs) in its drone arsenal. On November 16, 2016, Indias Rustom-II, an armed Medium-Altitude, Long-Endurance (MALE) drone, successfully completed a test flight.

Probably not anyone reached to the face recognition and security using drones in India, so we taking the initiative and use the beautiful technology to make our life better and peaceful.

Chapter 3

Face Recognition using Haar Cascade

In this project, we present a face detection and tracking $algorithm^{[3]}$ in real time camera input environment. The entire face tracking algorithm is divided into two modules. The first module is face detection and second is face tracking. To detect the face in the image, Haar based algorithm is used. The implementation consist of 5 parts-

3.1 Import the Required modules

The Modules required to perform the facial recognition are cv2, os, image module and numpy. cv2 is the OpenCV module and contains the functions for face detection and recognition. OS will be used to maneuver with image and directory names.

3.2 Load the face detection cascade

To Load the face detection Cascade the first step is to detect the face in each image. Once we get the region of interest containing the face in the image, we use it for training the recognizer. For the purpose of face detection, we will use the Haar Cascade provided by OpenCV.Haarcascade frontalface default.xml is used for detecting the face.

3.3 Create the face recognizer object

The face recognizer object has functions like *FaceRecognizer.train* to train the recognizer and *FaceRecognizer.predict* to recognize a face. We have used Local Binary Patterns Histograms Face Recognizer to perform face recognition. With Local Binary Patterns it is possible to describe the texture and shape of a digital image. This is done by dividing an image into several small regions from which the features are extracted that can be used to get a measure for the similarity between the images.

3.4 Training

To create the function to prepare the training set, we will define a function that takes the absolute path to the image database as input argument and returns tuple of 2 list, one containing the detected faces and the other containing the corresponding label for that face. Now to perform the training using the Face Recognizer train function requires the same 2 arguments which is returned by the function.

3.5 Testing

For testing the Face Recognizer, we check if the recognition was correct by comparing the predicted label predicted with the actual label actual. The label actual is extracted using the os module and the string operations from the name of the image.

We are using this face recognition algorithm in our drone so that it can recognize the people captured by it's camera if they are trained over the model.

Chapter 4

Results

This is real time project. It takes less than 5 seconds to give result. It is based on Linux, can be work on computer or any board with Linux in it. It could be implemented anywhere. With raspberry pi it consists of very small hardware, so easy to implement.
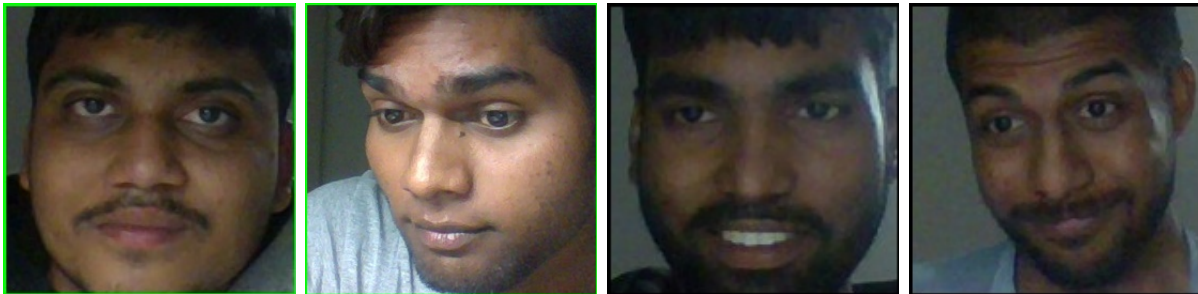

Figure 4.1: Pictures of 4 subjects

Figure 4.2: Face Recognize by System

Chapter 5

Conclusions

Thus using open cv library's haarcascade classifier we were successfully able to perform face detection with high efficency. We have used the open cv package to extract the features of face and then to compare them. Saved database should have more than one images of same face it make face recognition more accurate. Images and their corresponding labels being store in arrays. It compares every coming image with stored data and gives result. As done for nowwe get good results and our classifier able to distinguish between the subject but as the number of subjects increses may be the confidence value decreases and for that safety we need to increase the number of photos by any subject so that we have more data for training and the model will be trained better. The future scope of this as mention earlier is that increase number of subjects and also thier individual images and try to maximize the confidence value.

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