

## MSc Interim Project Plan

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<b>PROJECT TITLE:</b> <b>AUTOMATED VIDEO SURVEILLANCE</b>		
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### 1. AIMS AND OBJECTIVES

The aim of the project is to review techniques used for real-time intelligent video surveillance, and then develop a system using machine learning (ML) algorithms that are suitable for implementation on low cost processors. Knowledge of programming in C/C++ and Python languages are required."

To be specific, this project focusing on the detection and recognition of human face and eyes in the automobile to make the security of the driver[3]. Using the Open CV API on computer by GPU and finding the probability of the implement these above to other low cost processors like Arduino or Raspberry Pi.

### 2. BACKGROUND AND RELEVANCE

There are requirements for automated surveillance systems in commercial and military applications. In addition to the obvious security applications, video surveillance technology has been proposed to measure traffic flow, detect accidents on highways, and monitor pedestrian congestion in public spaces. Although surveillance cameras are already common in banks and stores, video information currently is used only "after the fact", thus losing its most important benefit as an active, real-time system.

With the advancement in information technology face and eyes recognition has become an important research area due to its worth in real world. There are many factors behind the rapid growth of development of face and eyes recognition systems like active algorithm development, big database of facial images and a number of evaluation methods for performance measurements of face and eyes recognition algorithms are available. Systems based on face and eyes recognition can be deployed to grant or restrict access to certain territory or a device[2].

The security of driver is especially important since every year thousands of car accident happens in the world. So a system based on the human face and eyes recognition to detect the state of the driver to remind them when an emergency occurs is quite beneficial.

### 3. SUMMARY OF RELATED WORK

To make sure the security of the human in different circumstances, many methods have been developed for the detection and recognition of human position or human face and eyes of person specifically or not.

Belhumeur et al. used the pattern classification approach to develop a face and eyes recognition algorithm that was not sensitive to high deviation in trajectory of light and face and eyes countenance [4].Bozkurt applied optical flow method and differential motion analysis for human tracking [5].Mazanec et al. worked on human face and eyes biometric. They used different algorithms like PCA, LDA and SVM [6].Hendriks et al., employed flame

recognition method for fire detection, by using video and application of Open Source Computer Vision (OpenCV) Library. They use the Graphical User Interface and eyes (GUI) based software. In his article he described the control of servo motors through ActiveX entering from the serial port and revealed that the detection can be triggered in real time [7]. These methods above are very accurate and high-precision, however these will cost a lot of calculation or cost large quantity of energy and GPU performance. These are suitable methods to follow in my project.

Other methods like Shardool Patil and Sardeshmukh [8] proposed an anti-theft system for automobile security based on face and eyes recognition and used ARM processor. Methods like this will be the higher target to achieve in my project.

#### 4. TOP LEVEL DESIGN

The main process of this design can be divided into 4 processes as below figure 1:

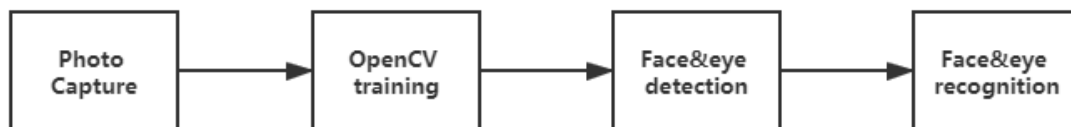


Figure 1

##### 1. Taking photos of human face and eyes

Once the driver is sitting on the driver's seat, this system would start to capture the photos of the driver. First recording a short time of video, then cut the video into several photos.

##### 2. Photos training

Sending the photos above into the database. During training an image is transformed from the original images of the training set into a set of features depending on the size of the database. Our defined algorithm counts the samples, if samples are fewer than it uses Fisher face recognizer and if samples are a lot like more than 100 then it uses Eigen face recognizer (shown in image training pseudo code). Then the weights for each image for the training set are calculated and stored. When an unknown or new image is captured, the weights are calculated and stored for this new image. In EmguCV the model state is saved in the form of YAML file. At least 10 to 20 images of one person are saved for training.[2]

##### 3. Face and eyes detection

Face and eye open situation will be detected according to data trained. Cascade Classifier algorithm is used for face and eyes detection. Cascade object detection is available in OpenCV library, it catches the image and cascade detector identifies the face of the captured image. A human face has common features that are extracted to a standard sized rectangle then image preprocessing algorithm will work to process image to grayscale image and histogram equalization. After that other face images are detected. [3]

##### 4. Face and eyes recognition and Alarm system.

Principal Component Analysis (PCA) algorithm is used in this process, when comparing the current face and eye state with the image of a driver when he is energetic and in a normal state, and finding the difference, the system will make an alert to the car driver and recommend the driver to slow their automobile down.

## 5. PROJECT WORKPLAN

PROJECT WORKPLAN	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Step1:Reading materials and making arrangements.								
Searching and reading articles concerning about Automated video surveillance	✓	✓	✓	✓	✓			
Writing Interim Project Report	✓	✓						
Writing Research Review Report		✓	✓					
Step2: Learning about object detection, recognition methods for video surveillance								
Getting deep into the specific methods that usually used in object detection.		✓	✓	✓	✓			
Finding ways to master the methods on how to recognise objects.		✓	✓	✓	✓			
Step3:Python,ML and Open CV learning. Tring to apply on the low cost processors								
Using and getting familiar with python and the connection of Open CV				✓	✓			
Learning the basic knowledge of ML				✓	✓			
Finding the probability of apply all these system on to a low cost processor				✓	✓	✓	✓	
Step4: : Summary and analysis								
Analyze the data result and limitations of this experiment							✓	✓
Discuss the problems met and the effect they cause and solutions							✓	✓
Give out some improvement can be developed and future applications							✓	✓

## 6. RISKS AND CRITICAL PATHS

- 1.After the whole process(the image capture, the training of images), will the results be useful datas and how to make adjustments according to the existence problem. The choosing of cameras, the video selected to train the data.
- 2.Masking the usage of python,C++ the connection with Open CV and how to make a modification with a existing program is the key point in this project.
- 3.If it is possible or effective to make all this system onto a low-price, low-cost processor? And the debugging of the system and the precision also need to be assessed, otherwise just using the computer with a usb camera as a whole system is also a nice choice

## 7. RESOURCE REQUIREMENTS

All resources for the project:

- 1.Computer
- 2.USB based camera
- 3.Board and platform to choose from ARMs, Arduino and so on.
- 4.A Scenes or a place to simulate the driver in the car.

## 8. KEY REFERENCES

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