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A Project Report on
ML Enabled Surveillance System for Societies

Submitted in partial fulfillment of the degree of
Bachelor of Engineering (Sem-VIII)

in

INFORMATION TECHNOLOGY

By

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1. Project Conception and Initiation

1.1 Abstract

- Today every society faces a problem of intruders and illegal vehicle parking.
- Many outsiders are entertained on the premises, which can make harm to the public and can damage their property.
- The register book can be easily manipulated by the intruders.
- The purpose of this idea is to successfully develop a system that will detect the vehicle number plate, recognize the human faces of the residential members and as well as for the outsiders in real-time.
- Our model will detect any intruder penetrating the society walls and as detected an alarm will be raised.

1.2 Objectives

- The objective of this system is to develop an efficient and intelligent security system which everyone can afford and everyone can rely on it.
- To track and monitor all the suspects On the premises and classify them and store it for further consequences.
- After satisfying all these constraints the algorithm will generate the best possible log which can be understood at ease. And will be globally accepted as a benchmark for security.

1.3 Literature Review

Sr. No	Topic	Published	Description	Drawbacks
1	REAL-TIME VEHICLE DETECTION AND TRACKING USING DEEP NEURAL NETWORKS	IEEE, International Centre for Wavelet Analysis and Its Applications, School of Information and Software Engineering, 2016	Dynamic vehicle detection using CNN. Trained using ImageNet dataset	Needs High processing power to run the get the output file. Includes less features
2	A New Approach For Vehicle Number Plate Detection	IEEE, Proceedings of 2018 Eleventh International Conference on Contemporary Computing (IC3), 2018	Firstly Grayscale conversion of the footage and then CCA for segregating and then noise reduction. After this character is segmented and applied OCR for fetching number plate.	Suitable for detecting vehicles at fixed places only. Includes less features
3	Forward Vehicle Detection Based on Incremental Learning and Fast R-CNN	IEEE, 13th International Conference on Computational Intelligence and Security, 2017	Used CNN for re-training on ImageNet dataset. And recognized real-time traffic which including cars of all type.	Only the vehicles are detected. No case of storing identity. Includes less features

Sr. No	Topic	Published	Description	Drawbacks
4	Video Based License Plate Recognition of Moving Vehicles Using Convolutional Neural Network	IEEE, 18th International Conference on Control, Automation and Systems (ICCAS), 2018	Uses AlexNet for training the ImageNet along with OpenALRP for detecting number plates.	Needs GPU computation to run. Output varies on any funky stickers on number plate. Includes less features
5	A Hidden Markov Model for Vehicle Detection and Counting	IEEE, 12th Conference on Computer and Robot Vision, 2015	Tracking and counting number of vehicles. Used matlab for hidden line.	Using matlab is not that convenient for such task. Accuracy can be varied if the driver drives in half lane. Includes less features

1.4 Problem Definition

- Security is one off the major problem faced in societies
- Boundaries of the society are less secure.
- Many outsider/salesman enter without permission.
- IN and OUT of the residential vehicle needs to be managed.
- No more information of the outsider is available.
- Many society face problem of illegal vehicle parking.
- Current technologies that have the similar functionality are costlier and not that capable.

1.5 Scope of the Project

- Detect residential and non-residential vehicle through vehicle number plate.
- Send a message to owner about his vehicle actions.
- Need of watchman will be overcome.
- Detect residential and non-residential member through face detection.
- Any intruder penetrating wall will be captured.

1.6 Technology stack

Software Requirements

- Ubuntu Operating system
- Python 3.7
- Mysql database
- Tkinter
- OPEN CV3
- Anaconda
- face_recognition
- Python math function
- Pillow
- ANPR/ALPR

Hardware Requirements

- Laptop or PC with minimum 4GB of RAM
- Minimum 250GB Hard disk
- Camera 2mp with 720p

1.7 Benefits for environment & Society

- Residential societies will be more secure than the traditional way.
- Its a global step towards going toward modernization.
- Our project also supports the initiative started by our prime minister towards smart cities.
- This will be going to impact our middle-class category of people more cheaply and effectively, consideration of the security of their family members.

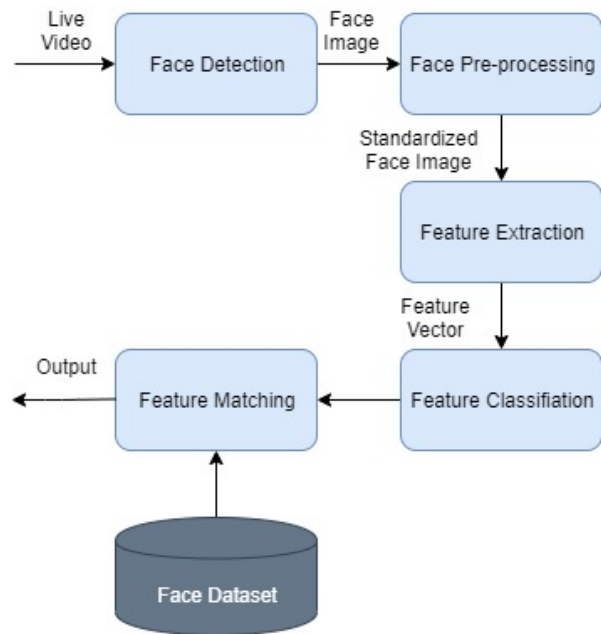
1.8 Project Timeline Chart

[illegible]

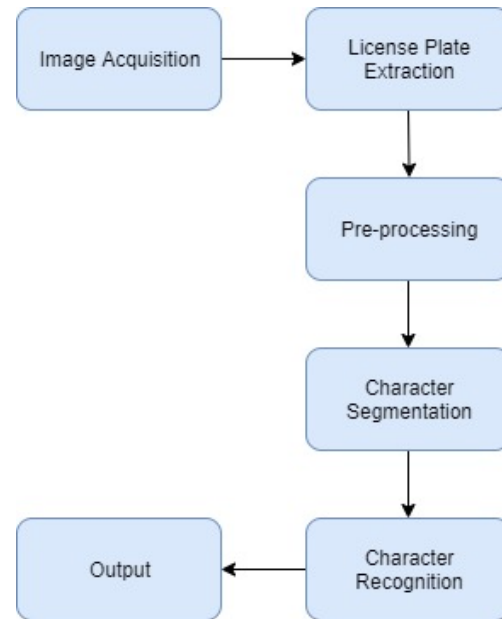
2. Project Design

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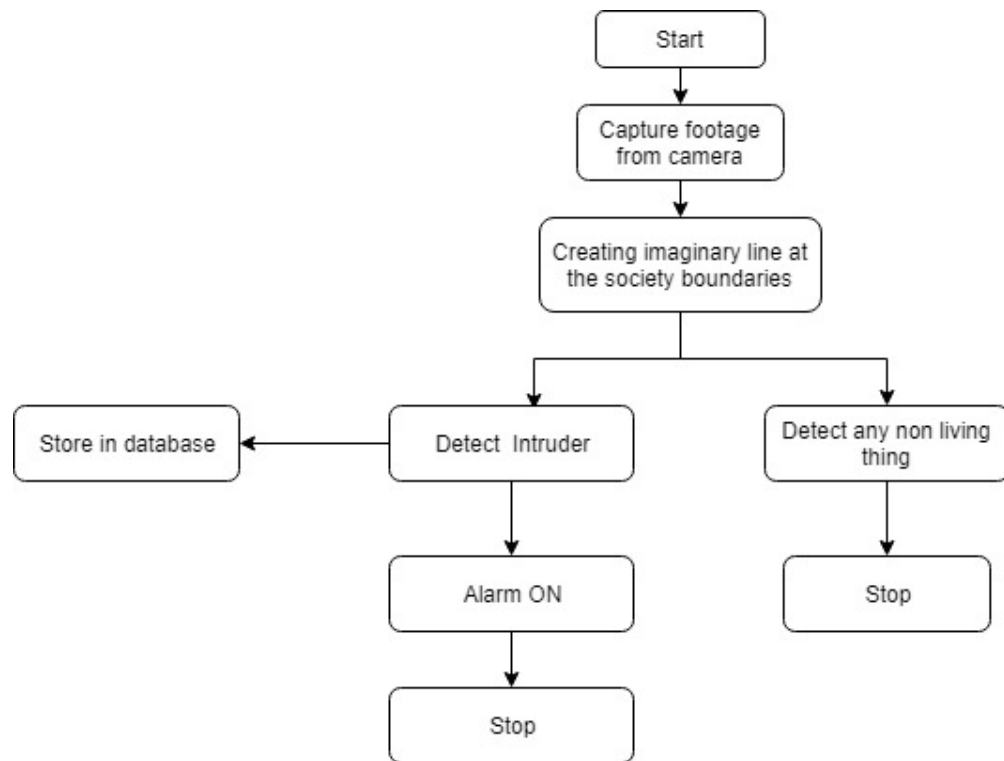
2.1 Proposed System Architecture



Face Detection module

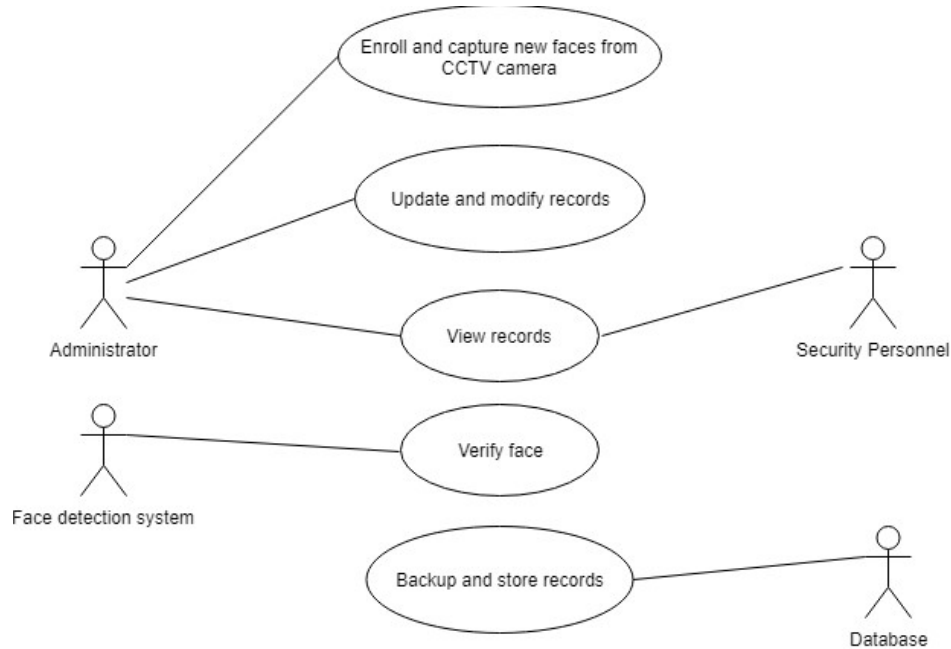


Number Plate Detection module

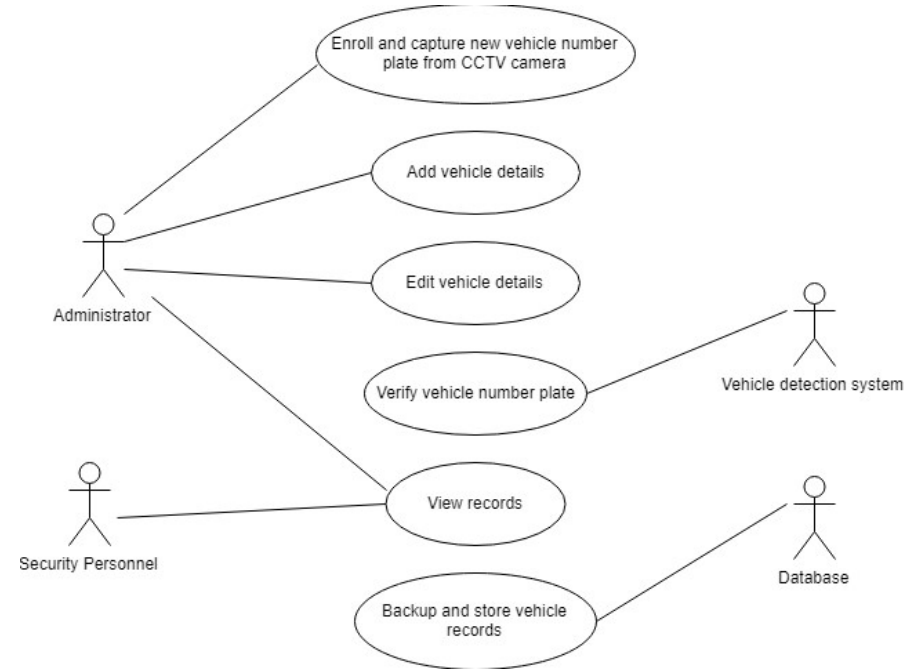


Imaginary Line module

2.2 Use Case diagram

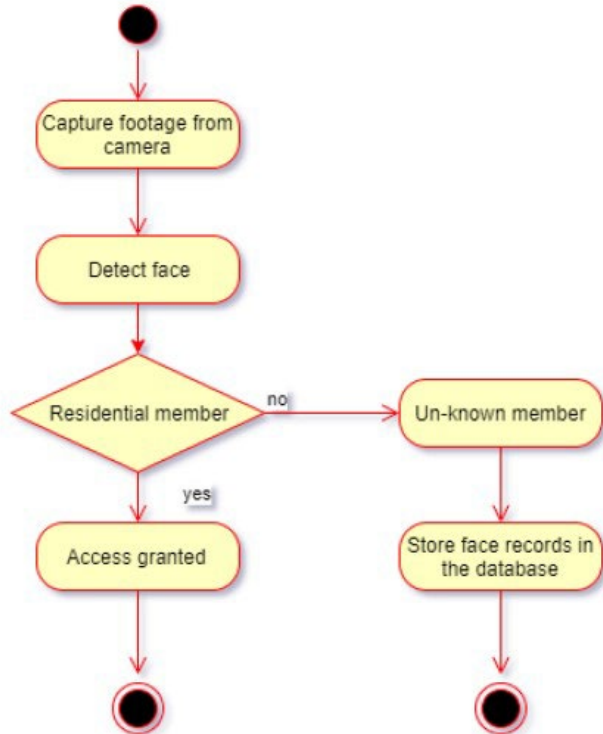


Usecase diagram for face detection

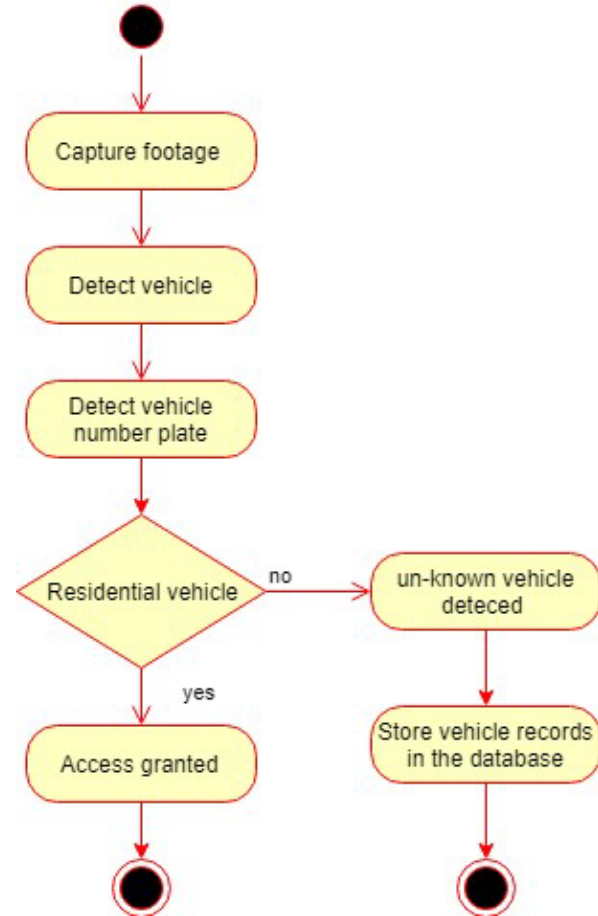


Usecase diagram for vehicle number plate detection

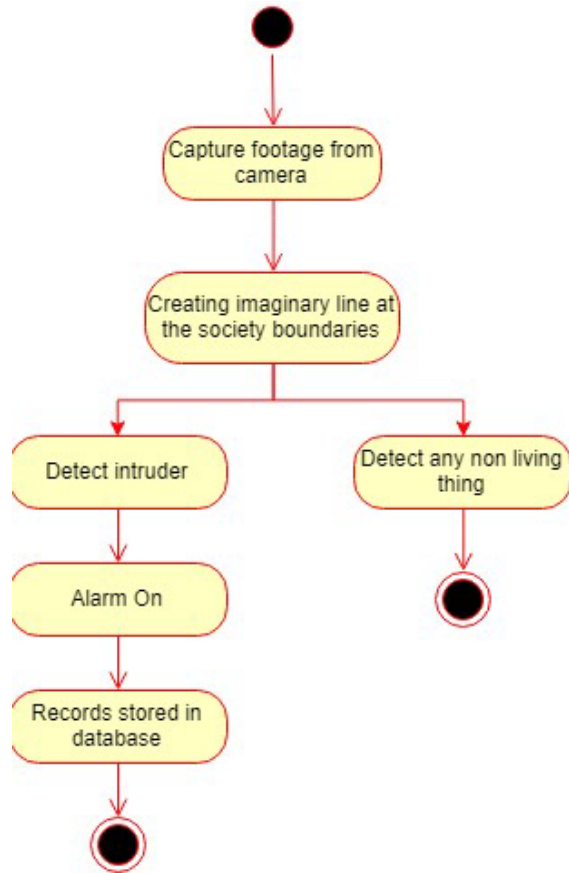
2.3 Activity diagram



Activity diagram for face detection

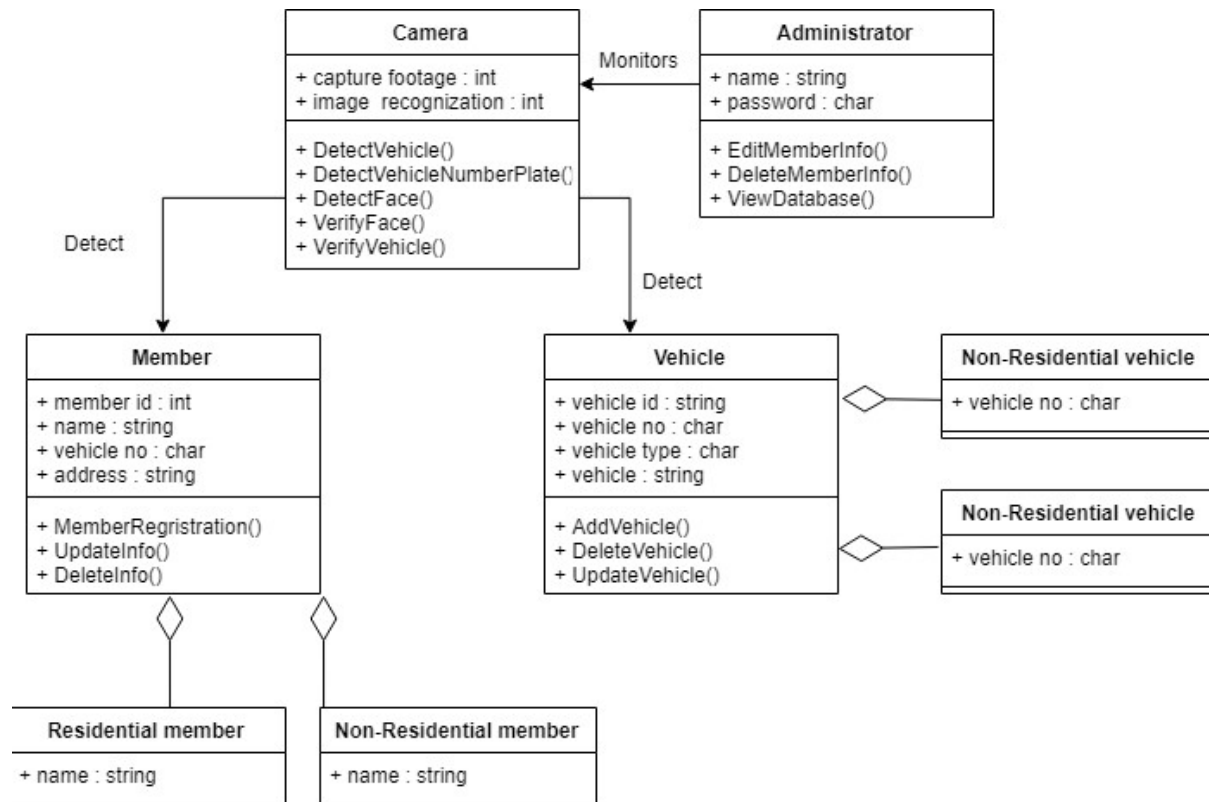


Activity diagram for vehicle number plate detection



Activity diagram for imaginary line module

2.4 Class Diagram



2.5 Results



The output for the face recognition module

In the above figure, we have used OpenCV3 and KNN classifier to perform face recognition. To build our face recognition module, we have first performed face detection, extract face embedding's from each face using deep learning, train a face recognition model on the embedding's, and then finally recognize faces in both images and video streams with OpenCV3.



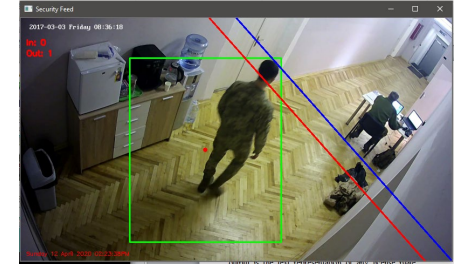
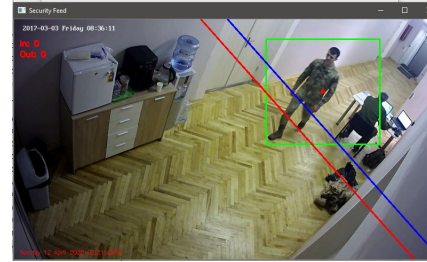
The output for human and object detection module

In the above figure, we have used YOLOv3 model for object detection and human detection. The object detection module is a part of imaginary line/virtual line module. Object detection is a computer vision task that involves both localizing one or more objects within an image and classifies each object in the image. Our model can detects common objects like cup, chair, phone, etc.



The output for the Vehicle number plate recognition module

We have used ANPR/ALPR is an open-source Automatic License Plate Recognition library to perform vehicle number plate recognition. The library analyses images and video streams to identify license plates. The output is the text representation of any license plate characters recognized in the processed image which was shown in figure .



Output for Imaginary line module

In the above two figures, we have used opencv2 to detect the person and python math function to create the blue and red line. Figure 1 shows that the person is coming IN and figure 2 shows that the person is going out from the imaginary line.

3. Conclusion and Future Scope

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In our work, we propose a system for vehicle detection and tracking in real-time. Our system is also used to detect the human face in real-time. This proposed system can be applied in the fields of the society security system and also in the smart vehicle parking system. However, there are limitations in our system. Our system struggles to detect human faces covered with any object such as cloth or any type of mask. Future works will contain the improvement of that.

References

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Publication

Pranav Chauhan, Sachin Gupta, Rohit Arava, Sameer Nanivadekar, Vishal Badgujar
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Emerging Trends in Information Technology and Engineering.

Thank You

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