A DESIGN REPORT

ON

FACE DETECTION AND RECOGNITION FOR AUTOMATIC ATTENDENCE SYSTEM

SUBMITTED BY

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UNDER THE GUIDANCE OF

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(AFFILIATED TO SOLAPUR UNIVERSITY, SOLAPUR)

(2017-18)

CERTIFICATE

This is to certify that the Design Report on project entitled **"FACE DETECTION AND RECOGNITION FOR AUTOMATIC ATTENDENCE SYSTEM"** is completed by the following students of BE (CSE) class in satisfactory manner under guidance of **Prof. S. S. JEURKAR.**

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The Design Report to be complete in partial fulfilment for the award of **Degree of Bachelor of Computer Science and Engineering** of Solapur university, Solapur.

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ACKNOWLEDGEMENT

We feel profound pleasure in bringing out this design report on **"FACE DETECTION AND RECOGNITION FOR AUTOMATIC ATTENDENCE SYSTEM".**

We are deeply indebted to **NKOCET, Solapur** and all the staff in the college who helped us directly or indirectly during our project work. We would like to express our sincere gratitude to our Principal **Dr. J. B. DAFEDAR** and **Prof. V. B. BINAGE** (Head of CSE Department) for giving us the opportunity to widen our knowledge and also for his constant encouragement and inspiration during our work. We would also like to Thank **Prof. R. D. UTTARKAR** our project Coordinator for his encouragement. Also, we are very thankful to our guide **Prof. S. S. JEURKAR** for giving much of their valuable time, precious guidance and constructive criticism for bringing out this report. It was our privilege and pleasure to work under her valuable training and guidance. We sincerely thank all Professors and our friends for valuable help and cooperation in undertaking this work.

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CHAPTER ONE

INTRODUCTION

1.1 GENERAL INTRODUCTION

Checking the performance of students and maintaining the attendance is a tedious process for institute. Each institute has adopted their own method of taking attendance i.e. calling the names or by passing the sheets. Several very popular automatic attendance systems currently in use are RFID, IRIS, FINGERPRINT etc. However, making queue is essential in these cases thus requires more time and it is intrusive in nature. Any damage to RFID card can make inappropriate attendance. Apart from this deploying these systems on large scale is not cost efficient. In order to have a system both time and cost efficient with no human intervention, facial recognition is the suitable solution also face is people's preliminary scheme of person identification. With the rapid development in the fields of image processing such as pattern recognition, facial recognition and signature recognition the efficiency of this system is keep on increasing.

This system is attempting to provide an automated attendance system that carries out the face recognition task through an image stream to record the attendance in lectures or sections and keeping the database of attendance. After creating the database of the students/ candidates, it requires almost zero efforts from the user side. Thus, intrusive nature is absent in this system and makes the system effective.

1.2 LITERATURE REVIEW

1. Paper Name: A design and implementation of a wireless iris recognition attendance management system.

Author: Seifedine Kadry, Khaled Smaili.

Iris recognition verification is one of the most reliable personal identification methods in biometrics. With the rapid development of iris recognition verification, a number of its applications have been proposed until now including time attendance system etc. In this paper, a wireless iris recognition attendance management system is designed and implemented using Daugman's Algorithm. This system based biometrics and wireless technique solves the problem of spurious attendance and the trouble of laying the corresponding network. It can make the users' attendances more easily and effectively.

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2. Paper Name: Robust Face Recognition via Adaptive Sparse Representation.

Author: Jing Wang, Canyi Lu, Meng Wang, Member, IEEE, Peipei Li.

Sparse Representation (or coding) based Classification (SRC) has gained great success in face recognition in recent years. However, SRC emphasizes the

sparsity too much and overlooks the correlation information which has been demonstrated to be critical in real-world face recognition problems. Besides, some work considers the correlation but overlooks the discriminative ability of sparsity. Different from these existing techniques, in this paper, we propose a framework called Adaptive Sparse Representation based Classification (ASRC) in which sparsity and correlation are jointly considered. Specifically, when the samples are of low correlation, ASRC selects the most discriminative samples for representation, like SRC; when the training samples are highly correlated, ASRC selects most of the correlated and discriminative samples for representation, rather than choosing some related samples randomly. In general, the representation model is adaptive to the correlation structure, which benefits from both norm and norm. Extensive experiments conducted on publicly available data sets verify the effectiveness and robustness of the proposed algorithm by comparing it with state-of-the-art methods.

1.2.1 Existing System

Traditional way of marking attendance involves a typical situation of students sitting in a classroom and the teacher calling out the names of the students individually to mark their attendance. The attendance is usually marked using hard resources - pen and paper. The huge attendance records that maintained are then used for later references.

1.3 PROBLEMS OF EXISTING SYSTEM

- It is cumbersome to maintain a huge set of records.
- It is time Consuming.
- Error-prone.
- Its leads to wastage of Resources.

1.4 SUMMARY

Traditional way of attendance system and existing system has some disadvantages. They are time consuming and not more efficient. The above dis-advantages can be overcome using the face biometric to develop an attendance system which makes the task of taking and maintaining attendance easy.

CHAPTER TWO
PROPOSED WORK

2.1 MOTIVATION

Today's era is of technological advancements. Many times, the user requires access to attendance for various reasons. The proposed system came into existence by observing various disadvantages of existing system. The system matches face with database image using Scale invariant feature transform algorithm. The system first, pre-processes the image then selects feature extraction and compares face with database face and then generates result. This reduces the user's efforts as well as increases the convenience of attendance system.

2.2 GOALS AND OBJECTIVES

GOAL:

- The goal of project is to infer the correct attendance for each student depending on face biometric.

OBJECTIVE:

- New scheme for face identification with caption-based supervision.
- To identify the face of student in the image.
- To improve the face identification performances.

2.3 PROPOSED SYSTEM

The proposed system is presenting an automated attendance system using image processing techniques. This work is experimented on students face using classification methods, Scale Invariant Feature Transform (SIFT)algorithms, etc. But improvements are expected to increase its efficiency of classification. This system automatically detects the student face and marks the attendance by recognizing their face. This system is developed by capturing real time human faces. The detected faces are matched against the reference faces in the dataset and marked the attendance for the attendees.

2.4 WORKING OF SYSTEM

This system is an automated attendance system with face recognition. The proposed attendance system mainly consists of Four phases; Image acquisition, Feature Extraction, Face Recognition, Faculty Recognition. The working of the system is depicted as follows:

- **Image Acquisition:** The system consists of a webcam that captures the image of the classroom and sends it to the image pre-processing. Then that image is sends for face detection.

- **Feature Extraction:** Feature extraction is done for distinguishing faces of different student using SIFT algorithm. In this system, eyes, nose and mouth are extracted. Feature extraction is helpful in face detection and recognition.

- **Face Recognition:** The face image is then compared with the stored image. If the face image is matched with the stored image then the face is recognized. Then for that particular student the attendance is recorded.

- **Faculty Recognition:** The image of staff is captured and pre-processing is done using SIFT algorithm and then compared with stored image in database. If matched then attendance in the excel format is forwarded to staff email-id.

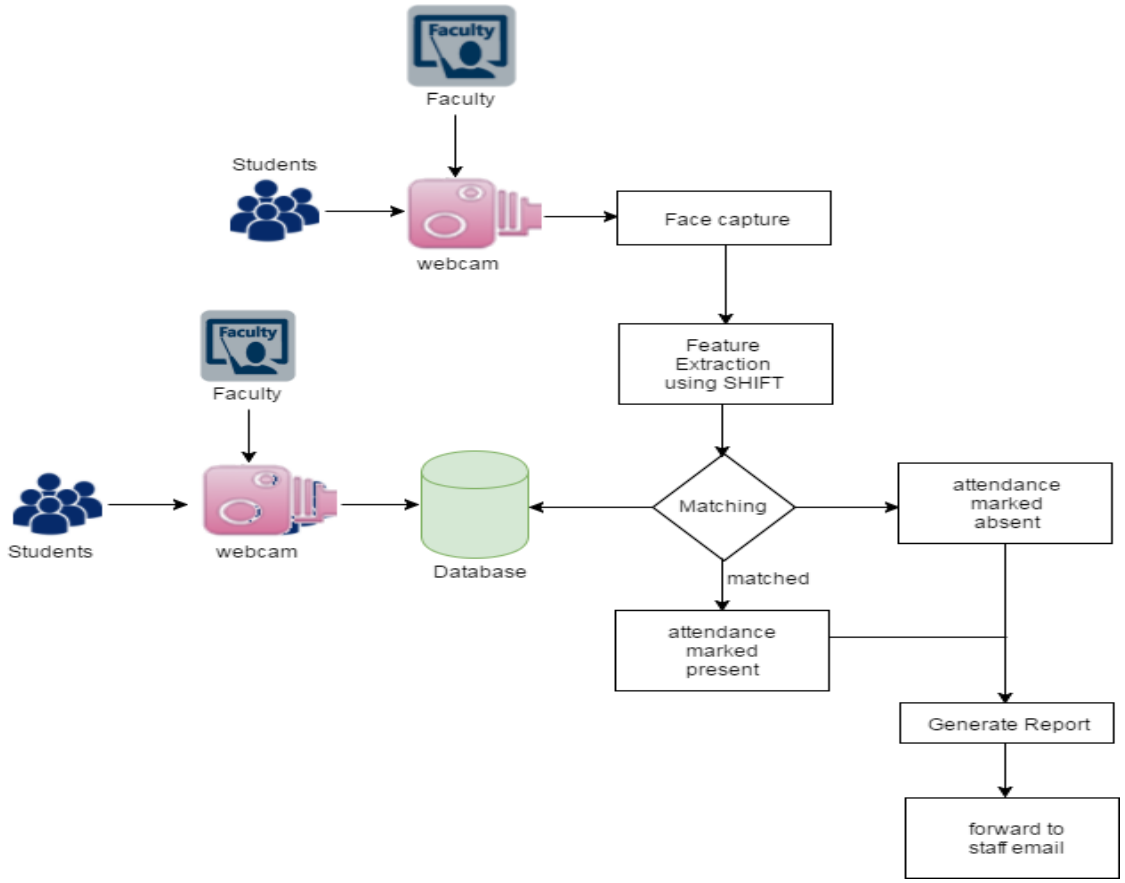


Fig 2.1 System Architecture

2.5 SUMMARY

This chapter gives the motivation for this system and explains how the face biometric based attendance system works and will facilitate the staff to maintain the attendance on their email-id.

CHAPTER THREE
SYSTEM REQUIREMENT

3.1 HARDWARE REQUIREMENT

- Processor : Pentium –IV.
- Speed : 1.1 GHz.
- RAM : 512 MB(min).
- Hard Disk : 40 GB.
- Key Board : Standard Windows Keyboard.
- Mouse : Two or Three Button Mouse.
- Monitor : LCD/LED.

3.2 SOFTWARE REQIUREMENT

- Operating system : Windows XP.
- Coding Language : Java/J2EE.
- Database : My SQL.

3.3 SUMMARY

The chapter describes the hardware and software requirements for developing the project.

CHAPTER FOUR

DETAILED DESIGN

4.1 DATAFLOW DIAGRAM

A data flow diagram (DFD) is a graphical representation of the "flow" of data through an information system, modelling its process aspects. A DFD is often used as a preliminary step to create an overview of the system without going into great detail. DFDs can also be used for the visualization of data processing (structured design). The fig. 4.1.1 shows the diagram for the system. The fig. 4.1.2 shows the level 1 data flow diagram. The fig. 4.1.3 shows the level 2 data flow diagram.

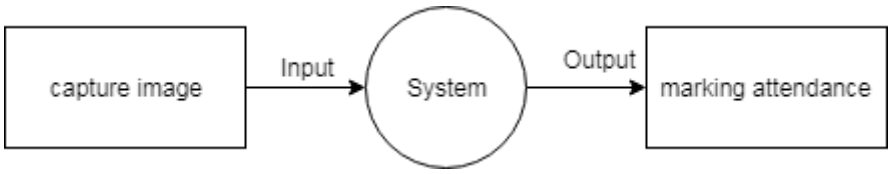


Fig 4.1.1 Level 0 DFD

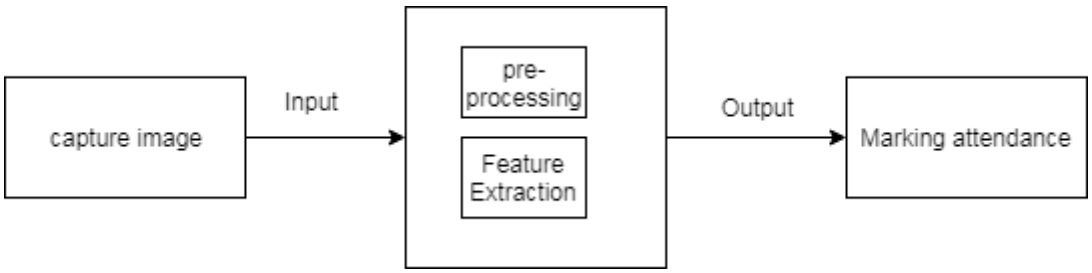


Fig 4.1.2 Level 1 DFD

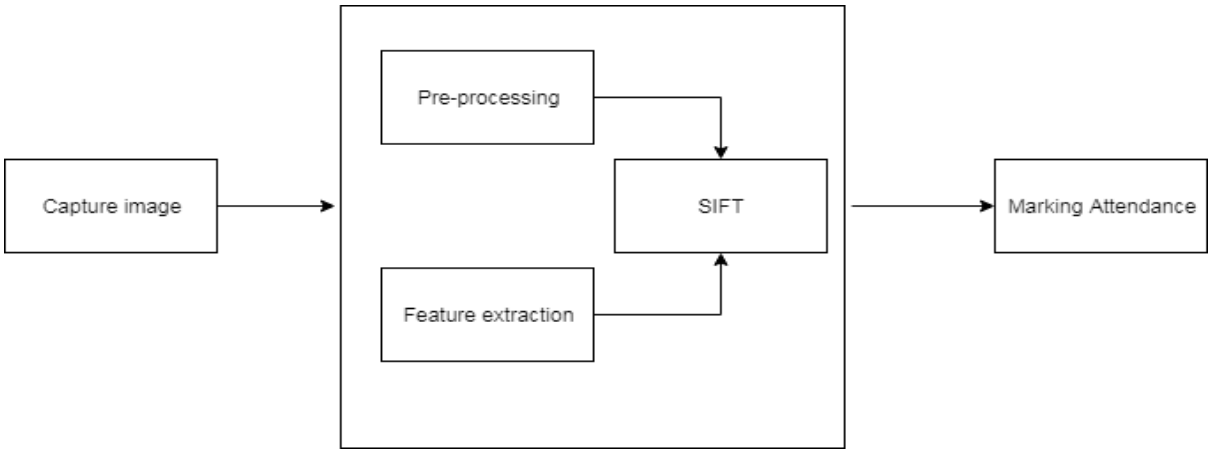


Fig 4.1.3 Level 2 DFD

4.2 USECASE DIAGRAM

A use case diagram at its simplest is a representation of a user's interaction with the system that shows the relationship between the user and the different use cases in which the user is involved. A use case diagram can identify the different types of users of a system and the different use cases and will often be accompanied by other types of diagrams as well. The fig. 4.2 shows the use case diagram for the system.

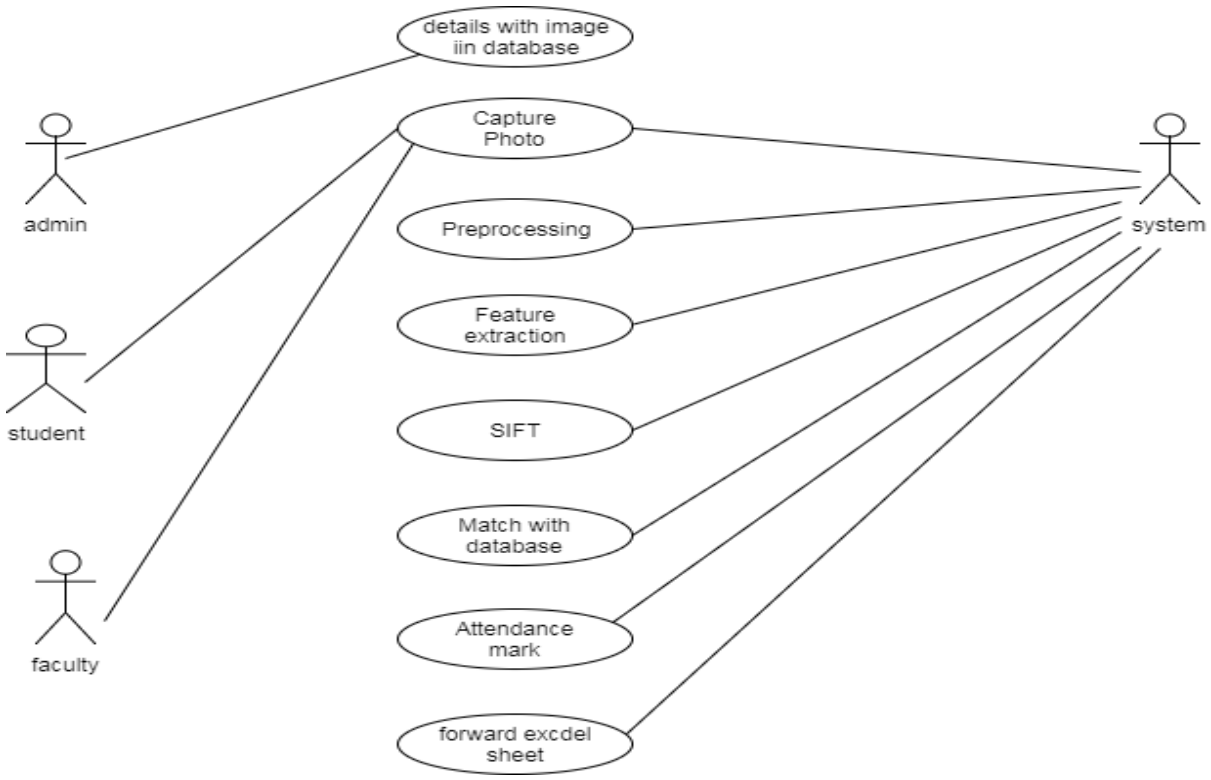


Fig 4.2 Use Case Diagram

4.3 ACTIVITY DIAGRAM

Activity diagrams are graphical representations of workflows of stepwise activities and actions with support for choice, iteration and concurrency. In the Unified Modelling Language, activity diagrams are intended to model both computational and organizational processes (i.e. workflows). Activity diagrams show the overall flow of control. The fig. 4.3 shows the activity diagram for the system.

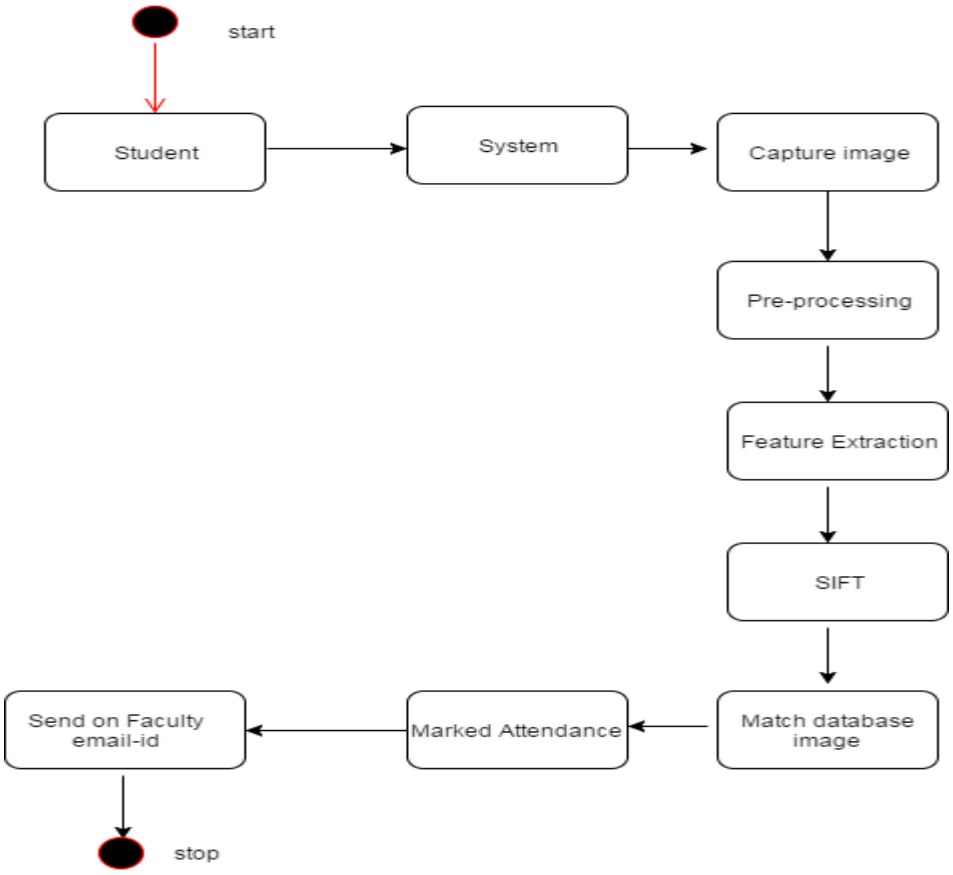


Fig 4.3 Activity Diagram

4.4 ALGORITHM DESIGN

SIFT Algorithm:

There are mainly four steps involved in SIFT algorithm. We will see them one-by-one.

1. Scale-space Extrema Detection

From the image above, it is obvious that we can't use the same window to detect key points with different scale. It is OK with small corner. But to detect larger corners we need larger windows. For this, scale-space filtering is used.

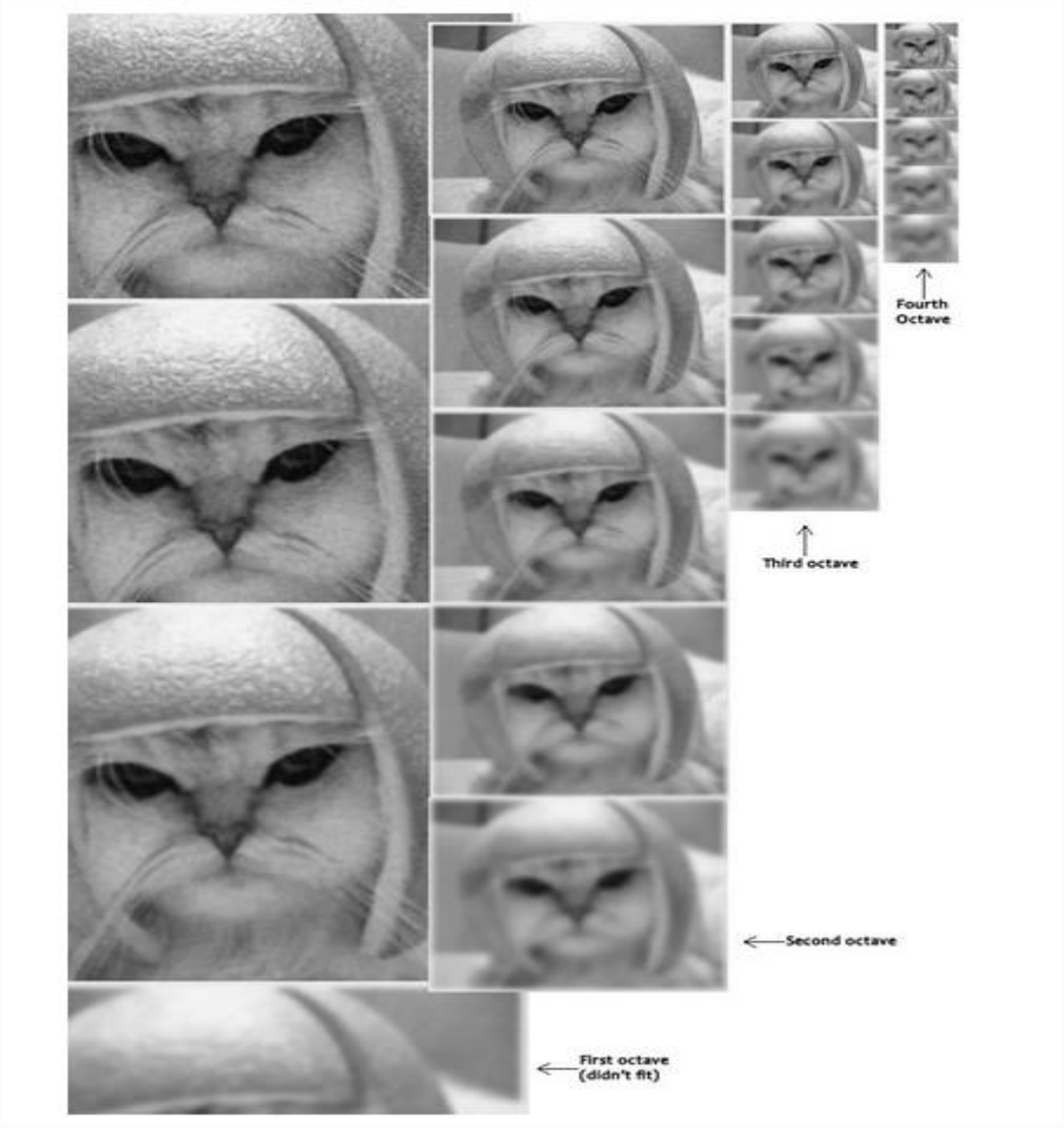
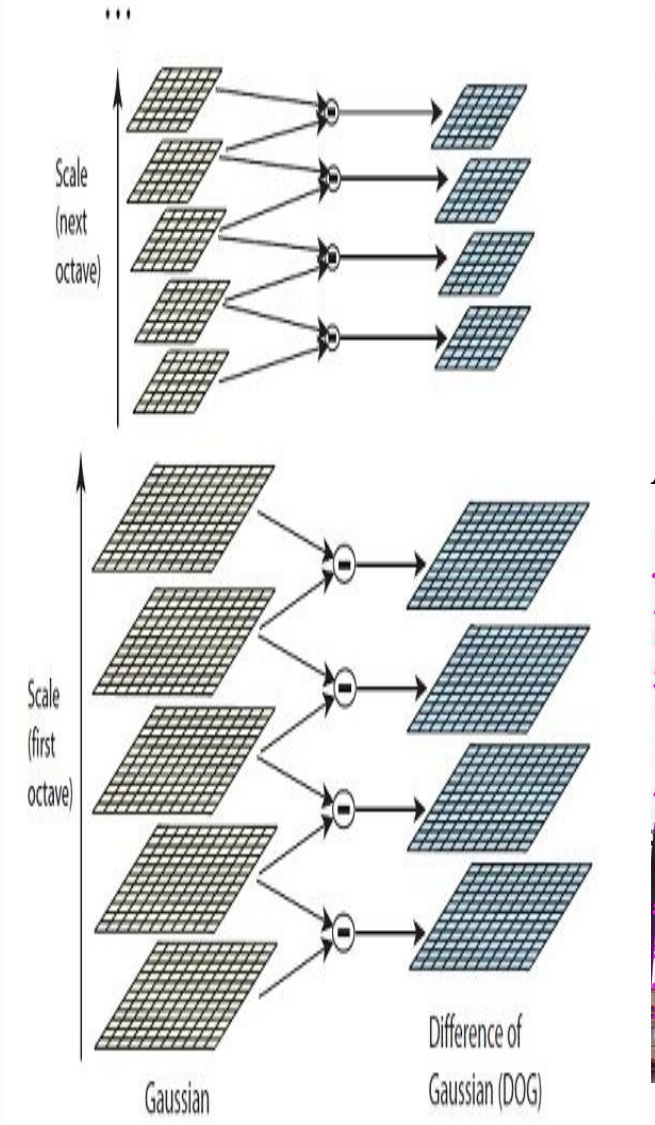
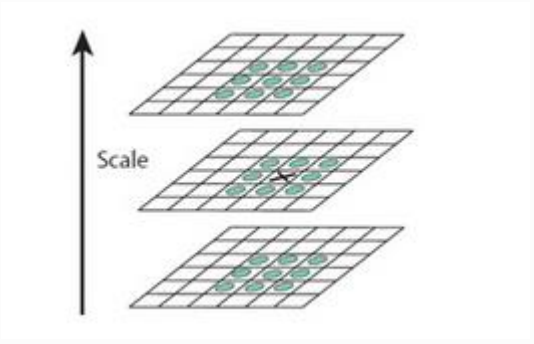


Fig 4.4.1 Constructing Scale Space

2. Key point Localization

Once potential key points locations are found, they have to be refined to get more accurate results. They used Taylor series expansion of scale space to get more accurate location of extrema, and if the intensity at these extrema is less than a threshold value it is rejected. This threshold is called **contrast Threshold** in OpenCV If this ratio is greater than a threshold, called **edge Threshold** in OpenCV, that key point is discarded.





Approximate key point location

Initial detection of key points

Fig 4.4.2 Approximate key point location

3. Orientation Assignment

Now an orientation is assigned to each key point to achieve invariance to image rotation. A neighbourhood is taken around the key point location depending on the scale, and the gradient magnitude and direction is calculated in that region. It creates key points with same location and scale, but different directions. It contributes to stability of matching.

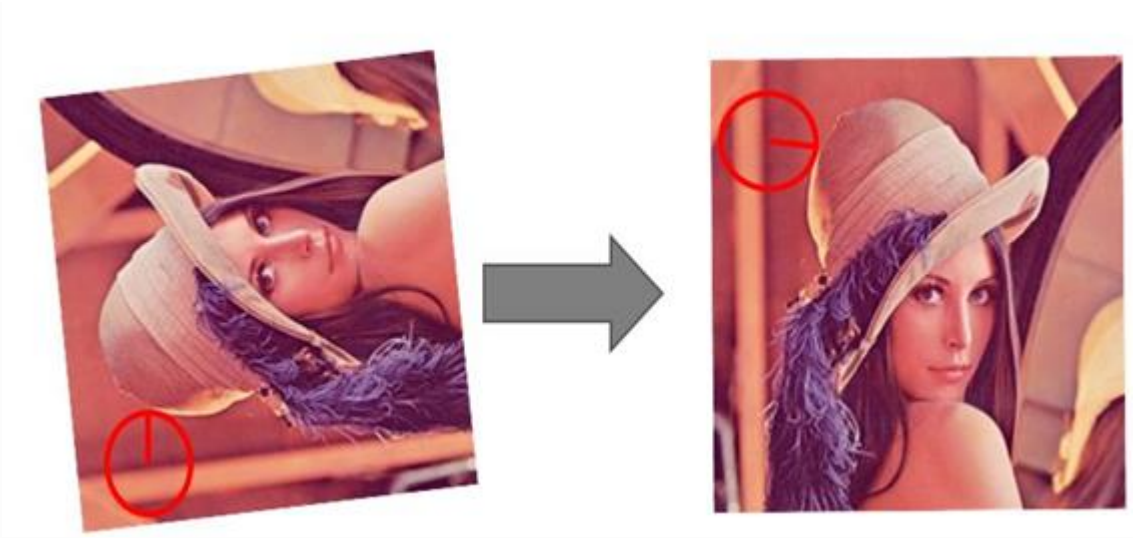
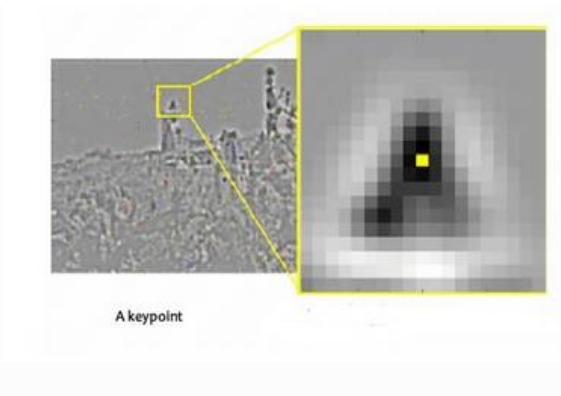
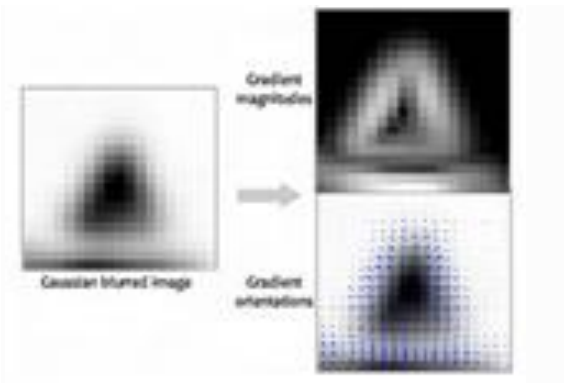


Fig 4.4.3 Orientation Assignment

4. Key point Descriptor

Now key point descriptor is created. A 16x16 neighbourhood around the key point is taken. It is divided into 16 sub-blocks of 4x4 size. For each sub-block, 8 bin orientation histograms are created. So total of 128 bin values are available. It is represented as a vector to form key point descriptor. In addition to this, several measures are taken to achieve robustness against illumination changes, rotation etc.





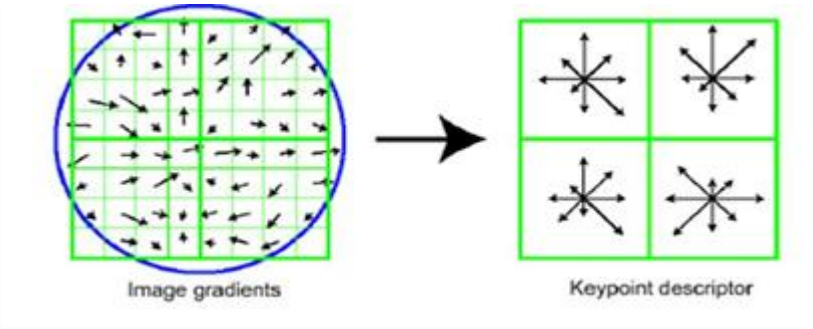


Fig 4.4.4 Key point Descriptor

5. Key point Matching

Key points between two images are matched by identifying their nearest neighbours. But in some cases, the second closest-match may be very near to the first. It may happen due to noise or some other reasons. In that case, ratio of closest-distance to second-closest distance is taken. If it is greater than 0.8, they are rejected. It eliminators around 90% of false matches while discards only 5% correct matches, as per the paper. So, this is a summary of SIFT algorithm. For more details and understanding, reading the original paper is highly recommended. Remember one thing, this algorithm is patented. So, this algorithm is included in Non-free module in OpenCV.

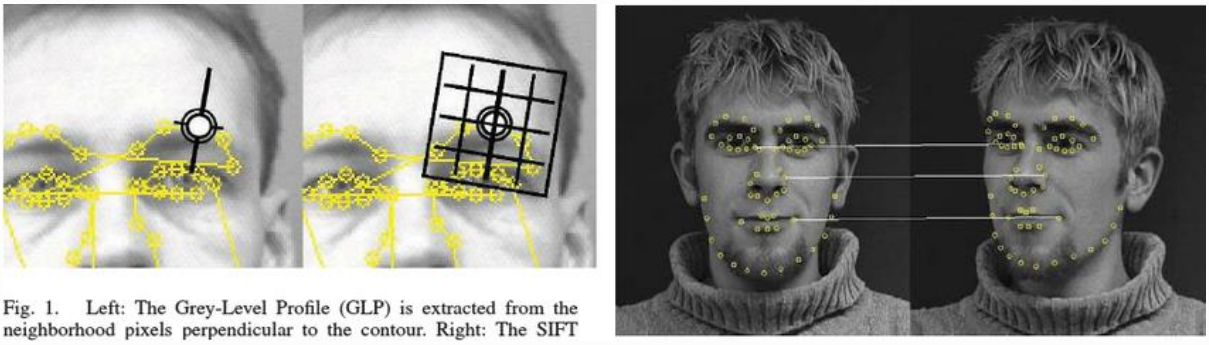


Fig. 1. Left: The Grey-Level Profile (GLP) is extracted from the neighborhood pixels perpendicular to the contour. Right: The SIFT

Fig 4.4.5 Key point Matching

4.5 SUMMARY

This chapter covers the design of the proposed system. The design is explained using DFD, Use Case, Activity diagram and Algorithm Design in detail.

CHAPTER FIVE

CONCLUSION

5.1 CONCLUSION

This project focuses on developing an automated attendance system. It saves time and effort, especially if it is a lecture with huge number of students. This attendance system shows the use of facial recognition technique for the purpose of student attendance and for the further process this record of student can be used in exam related issues. It is not possible to identify faces having similar facial features. The system can be extended to respond to the presence of newcomers in the classrooms. Also, means to mark attendance without the intervention of teachers in a classroom i.e. automatically marking attendance at the beginning of every hour can be implemented. It can be extended to video surveillance to detect frauds at crowded areas such as bus stands, theatres, railway stations where in by face recognition techniques, the identity of the culprits can be found.