SAVITRIBAI PHULE PUNE UNIVERSITY

A PRELIMINARY PROJECT REPORT ON

”Motion Detection & Multiple Faces Identification”

SUBMITTED TOWARDS THE
PARTIAL FULFILLMENT OF THE REQUIREMENTS OF

BACHELOR OF ENGINEERING (Computer Engineering)BY

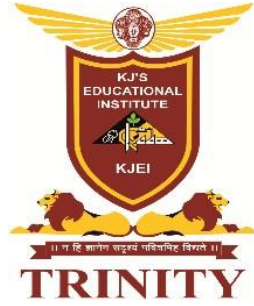|	
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CERTIFICATE

This is to certify that the Project Entitled

"MOTION DETECTION & MULTIPLE FACES IDENTIFICATION"

Submitted by

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is a bonafide work carried out by Students under the supervision of Prof. R. S. Waghole and it is submitted towards the partial fulfillment of the requirement of Bachelor of Engineering (Computer Engineering) Project.

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I am also thankful to my family members for encouragement and support

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Abstract

According to the Physics, when an object is motionless and has no speed, then it is considered to be at rest, and just the opposite is when an object is not at complete rest and has some movement or speed in some direction, either left-right, forward-backward, or up-down then it is considered to be in motion. In this article, we will try to detect it.

Motion detection has many real-life implementations or usages where it can prove its worthiness, such as for invigilation of online exams using a webcam as a security guard, etc.

In this project, we will try to implement a script through which we will detect motion using the Web-Camera of the desktop or laptop. The idea is that we will take two frames of the videos and try to find differences between them. If there is some kind of difference between the two frames, then it is clear that there is some kind of movement of an object in front of the camera, which creates the difference. Also, we can use the idea of face detection to detect facial expressions like smile, sad, crying, depression, frustration, etc. or detecting multiple faces in one single video frames.

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CHAPTER 1

INTRODUCTION

1.1 OVERVIEW

With the continuous development of machine learning and artificial intelligence technology, the methods of face detection, face recognition and face landmarks detection have changed greatly. As an important biological feature, human face has been widely used in the attendance system. The dynamic face recognition technology eliminates the need for the users to stop and wait for verification. The user only needs to appear within the scope of video surveillance and the system can automatically recognize it. Because of its real time and convenience, this technology has become a hot research direction of attendance system. Also, using surveillance camera to observe the movement of a moving object using Motion Detection algorithm.

1.1.1 Objective

The objective of this system is to create a face recognition application based on dynamic and multi-face recognition. It is designed to prevent users from using photos for attendance. The system incorporates the ability to recognize blinking moments. Finally, for user convenience, we also designed a user interaction interface for the system.

1.1.2 Scope

- **Requirements in scope**: The proposed system is built to keep an eye on every employee to check their work performance and also to give extra security to organization by identifying organization's employee.
- **Requirement out of scope**: The proposed system can be use online for proctored examination to supervise the students for any cheating and also can be used by college or any organization to make smart employee attendance using facial feature scan.
- **User interface:** This system uses machine learning algorithms; so, it doesn't require much more user interface except new face is detected by system.

CHAPTER 2

LITERATURE SURVEY

2.1 STUDY OF RESEARCH PAPER

1.Paper Name: Face Detection and recognition using opencv

Author: Maliha Khan, Sudeshna Chakraborty, Rani Astya, Shaveta Khepra

Abstract : Face detection and picture or video recognition is a popular subject of research on biometrics. Face recognition in a real-time setting has an exciting area and a rapidly growing challenge. Framework for the use of face recognition application authentication. This proposes the PCA (Principal Component Analysis) facial recognition system. The key component analysis (PCA) is a statistical method under the broad heading of factor analysis. The aim of the PCA is to reduce the large amount of data storage to the size of the feature space that is required to represent the data economically. The wide 1-D pixel vector made of the 2-D face picture in compact main elements of the space function is designed for facial recognition by the PCA. This is called a projection of self-space. The proper space is determined with the identification of the covariance matrix's own vectors, which are centered on a collection of fingerprint images. I build a camera-based real-time face recognition system and set an algorithm by developing programming on OpenCV, Haar Cascade, Eigenface, Fisher Face, LBPH, and Python.

2.Paper Name: Attendance System Based on dynamic face Detection

Author: Shizhen Huang, Haonan Luo

Abstract : A video-based attendance system is designed by using the method of real-time face recognition. The system supports multi-user attendance and face liveness detection at the same time. The system can automatically collect face data, which will be saved in the database as well as attendance results. The face detection part of the system is based on MTCNN (Multitask Convolutional Neural Network) algorithm, and the face recognition part is based on Face Net algorithm. The algorithm implementation is based on Tensor Flow framework, and the face liveness detection part is based on ERT (Ensemble of Regression Tree) algorithm, which can judge whether the user blinks. The attendance system is written in Python language, and the user interface is designed by Qt library. The experimental results show that the system achieves a good performance in real-time face recognition. The false accept rate and false rejection rate of face recognition are within 2%, and the recognition rate can be stable at 20 FPS.

3.Paper Name: A motion-based object detection method

Author : Chen Zhaoyang, Gao Haolin, Wang Kun

Abstract : To improve the performance of motion detection and object detection in security monitor, a motion based object detection method is proposed. Combining motion detection, target detection is proposed. This method first improved the accuracy of motion detection, then combined the result of motion detection and object detection. The experimental results show that proposed method can effectively improve the detection of small targets, reduce the false detection and negative detection rate, and decrease the computing cost.

4. Paper Name: Generalizing Capacity of Face Database For Face Recognition

Author: Stan Z. Li, Juwei Lu

Abstract : A face image can be represented by a point in a feature space such as spanned by a number of eigenfaces. In methods based on nearest neighbor classification, the representational capacity of face database depends on how prototypical face images are chosen to account for possible image variations and also how many prototypical images or their feature points are available. In this paper, we propose a novel method for generalizing the representational capacity of available face database. Any two feature points of the same class (individual) are generalized by the feature line passing through the points. The feature line covers more of the face space than the feature points and thus expands the capacity of the available database. In the feature line representation, the classification is based on the distance between the feature point of the query image and each of the feature lines of the prototypical images. Experiments are presented using a data set from five databases: the MIT, Cambridge, Bern, Yale and our own. There are 620 images of 124 individuals subject to varying viewpoint, illumination, and expression. The results show that the error rate of the proposed method is about 55%60% of that of the standard Eigenface method of Turk and Pentland. They also demonstrate that the recognition result can be used for inferring how the position of the input faces relative to the two retrieved faces.

5.Paper Name: A Real-Time System for Robust Multiple Face Detection, Tracking and Hand Posture Recognition in Color Video sequences

Author: Jean-Christophe Terrillon, Arnaud Pilpré, Yoshinori Niwa and Kazuhiko Yamamoto

Abstract: "DRUIDE", which stands for "Detection, Recognition, Unification, Interpretation, Decision, Evolution", is a novel, real-time system primarily designed for the detection and tracking of multiple human faces as well as for the simultaneous recognition of multiple hand postures in color video sequences and in complex environments. The system relies on the three fundamental cues of color, shape and motion, and integrates three mutually complementary sub-systems, in order to achieve high rates of detection, tracking and recognition. Preliminary experiments yield an average correct face detection rate of about 90%, and the additional use of tracking increases significantly the robustness of the proposed system, particularly to illumination conditions and to partial occlusions. Although we first focus specifically on human faces and hand postures, the ultimate goal of DRUIDE extends beyond human-computer interactions, to encompass the adaptive detection, tracking and recognition of various objects under unconstrained scene conditions.

CHAPTER 3

PROBLEM STATEMENT

3.1   PROBLEM STATEMENT

The hypothesized function of this monitoring system is to provide the users with information about the detection of an object's movement in order to deliver useful information about the motion with connection to the theory of motion through movement. The subjective experience of motion is simple hypothesized as the feedback from tiny movement and differences between two frames.

An effective monitoring system for motion assessment is presented. Several aspects for example the speed of the subject are considered while the assessment is being done. This monitoring system does not only serve motion movement as assessment, but also important in managing the subject data effectively and providing scientific information about object's movement.

Counterbalancing should be instituted to control for order effects and efforts made to ensure that all subjects complete objectives. New task is need to be developed drawing on the best features of existing tasks. A wide variety of human-machine interactions learning techniques have been used in human monitoring approaches for face recognition. This employs a large number of visual and physiological features, a fact which usually impedes the training process.

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CHAPTER 4

PROJECT REQUIREMENT

4.1 EXTERNAL INTERFACE REQUIREMENT

4.1.1 User Interface

Application-Based "Motion Detection & Multiple Faces Identification using Machine Learning".

4.1.2 Hardware Interfaces:

RAM: 8 GB (min)

Storage: 500 GB (HDD/SSD)

Processor: Intel i3 (or above) or AMD

4.1.3 Software Interfaces

Operating System: Windows 7 (or above) or AMD

IDE: Visual Studio

Programming Languages: Python, MySQL

4.2 NON-FUNCTIONAL REQUIREMENT

4.2.1 Performance Requirements

The performance of the functions and every module must be well. The overall performance of the software will enable the users to work efficiently. Performance of encryption of data should be fast. Performance of the providing virtual environment should be fast.

4.2.2 Safety Requirement

The application is designed in modules where errors can be detected and fixed easily. This makes it easier to install and update new functionality if required.

4.2.3 Software Quality Attributes

Our software has many qualities attribute that are given below: -

Adaptability: This software is adaptable by all users.

Availability: This software is freely available to all users. The availability of the software is easy for everyone.

Maintainability: After the deployment of the project if any error occurs then it can be easily maintained by the software developer.

Reliability: The performance of the software is better which will increase the reliability of the Software.

User Friendliness: Since, the software is a GUI application; the output generated is much user friendly in its behavior.

Integrity: Integrity refers to the extent to which access to software or data by unauthorized persons can be controlled.

Security: Users are authenticated using many security phases so reliable security is provided.

Testability: The software will be tested considering all the aspects.

CHAPTER 5

SYSTEM ANALYSIS
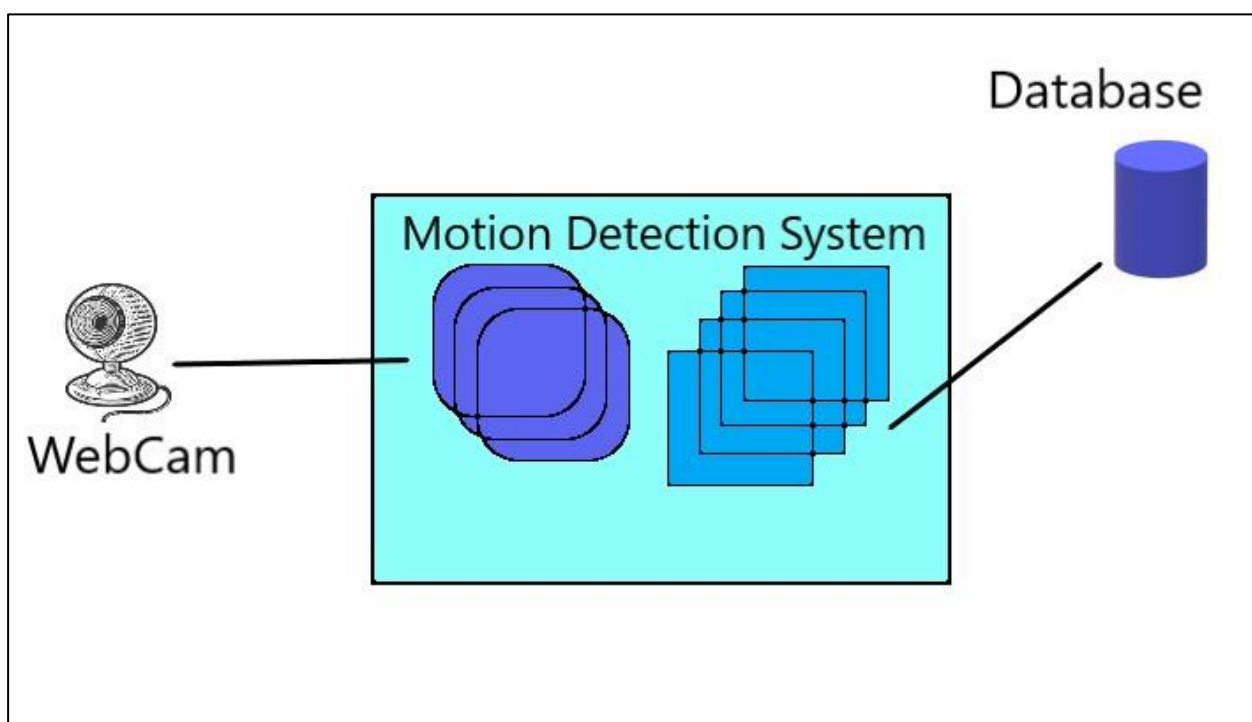
5.1 SYSTEM ARCHITECTURE

Figure 5.1: System Architecture

5.1.1 Working

As the title "Motion Detection & Multiple Faces Identification" suggests, it detects the motion of a moving object and also detects multiple faces and recognizes it by using database. To do this we use OpenCV Python module to use Webcam of system and start detecting motion of an object, using the GaussianBlur module of Python for grayscale of a picture frame.

As soon as Webcam take the video footage it captures picture frames and use the GaussainBlur module for grayscale and start detecting the motion of an object.

In Motion Detection system it divides the picture frames into pixels and starts finding the difference between first frame and other frames (except first frame). If difference is found, then there is motion else no motion take place.

Similarly, it will start scanning for facial feature using the CascadeClassifier module to detect multiple faces and start checking the features along with stored features of faces in database to recognize the face. By using CascadeClassifier of the OpenCV module we can easily detect multiple faces and use the database for storing of new faces and recognize the face for next time.

This project is built for providing digital attendance of employees in an organization and also to keep track of an employees work using motion detections.

5.1.2 Data Flow Diagram

In Data Flow Diagram,we Show that flow of data in our system in DFD0 we show that base DFD in which rectangle present input as well as output and circle show our system,In DFD1 we show actual input and actual output of system input of our system is text or image and output is rumor detected like wise in DFD 2 we present operation of user as well as admin
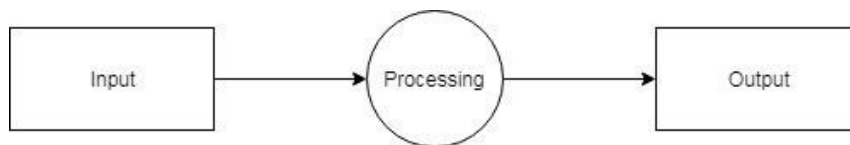

Figure 5.2: Data Flow Diagram

CHAPTER 6

SOFTWARE INFORMATION

Python is a high-level, general-purpose programming language. Its design philosophy emphasizes code readability with the use of significant indentation. Python is dynamically-typed and garbage-collected. It supports multiple programming paradigms, including structured (particularly procedural), object-oriented and functional programming. It is often described as a "batteries included" language due to its comprehensive standard library.

Guido van Rossum began working on Python in the late 1980s as a successor to the ABC programming language and first released it in 1991 as Python 0.9.0. Python 2.0 was released in 2000 and introduced new features such as list comprehensions, cycle-detecting garbage collection, reference counting, and Unicode support. Python 3.0, released in 2008, was a major revision that is not completely backward-compatible with earlier versions. Python 2 was discontinued with version 2.7.18 in 2020.

Python consistently ranks as one of the most popular programming languages.

Python is a multi-paradigm programming language. Object-oriented programming and structured programming are fully supported, and many of their features support functional programming and aspect-oriented programming (including metaprogramming and meta objects). Many other paradigms are supported via extensions, including design by contract and logic programming. Python uses dynamic typing and a combination of reference counting and a cycle-detecting garbage collector for memory management. It uses dynamic name resolution (late binding), which binds method and variable names during program execution.

Its design offers some support for functional programming in the Lisp tradition. It has filter, map and reduce functions; list comprehensions, dictionaries, sets, and generator expressions. The standard library has two modules (itertools and functools) that implement functional tools borrowed from Haskell and Standard ML.

CHAPTER 7

PROJECT PLAN

In this chapter we are going to have an overview about how much time does it took to complete each task like- Preliminray Survey Introduction and Problem Statement, Literature Survey, Project Statement, Software Requirement and Specification, System Design, Partial Report Submission, Architecture Design, Implementation, Deployment, Testing, Paper Publish, Report Submission and etc. This chapter also gives focus on stakeholder list which gives information about project type, customer of the proposed system, user and project member who developed the system.

7.1   STAKEHOLDER LIST

7.2   SYSTEM IMPLEMENTATION PLAN

The System Implementation plan table, shows the overall schedule of tasks compilation and time duration required for each task.

Sr. No.	Name/Title	Start Date	End Date
1	Preliminary Survey		
2	Introduction and Problem Statement		
3	Literature Survey		
4	Project Statement		
5	Software Requirement And Specification		
6	System Design		
7	Partial Report Submission		
8	Architecture Design		
9	Implementation		
10	Deployement		
11	Testing		
12	Paper Publish		
13	Report Submission		

CHAPTER 8

CONCLUSION

8.1 CONCLUSION

The proposed system is implemented to give extra security and to keep track of every employee's work in an organization. With the help of this system it is easy to check whether every employee works neatly or not according to their performance.

By using Motion Detection it is lot easy to keep track of every movements of employee in an organization. Also with the help of multiple faces detection and their identification can help in marking digital attendance of an employee and can avoid unauthorized access to the company's resources.

We also conclude that with the help of machine learning algorithms for motion and face detection it is possible to increase efficiency in an organization and also boost the existing security features.

CHAPTER 9

REFERENCES

1 Maliha Khan, Sudeshna Chakraborty, Rani Astya, Shaveta Khepra, "Face Detection and Recognition using OpenCV" in Institution of Electrical & Electronics Engineers, paper presentation, 2019.

2 Shizhen Huang, Haonan Luo, "Attendance System Based on dynamic face Detection" in Institution of Electrical & Electronics Engineers, paper presentation, 2020.

3 Chen Zhaoyang, Gao Haolin, Wang Kun , "A Motion-Based Object Detection Method," in Institution of Electrical & Electronics Engineers, paper presentation, 2020.

4 Stan Z. Li, Juwei Lu, "Generalizing Capacity of Face Database for Face Recognition," in Institution of Electrical & Electronics Engineers, paper presentation, 2020.

5 Jean-Christophe Terrillon, Arnaud Pilpré, Yoshinori Niwa and Kazuhiko Yamamoto, "A Real-Time System for Robust Multiple Face Detection, Tracking and Hand Posture Recognition in Color Video sequences", in Institution of Electrical & Electronics Engineers, paper presentation, 2020.

6 "Python (Programming Language)", https://en.wikipedia.org/wiki/Python_(programming_language), article on Python Programming Language, 2020.