# Face Fetch System (F$^2$S)

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*Abstract-* *Almost all organizations in this world believe in tracking down the entry of their visitors. They want their premises safe from threats, crime and danger. The FaceFetch System (F2S) completely eliminates buddy punching that leads to higher labour costs. Employees simply look into F2S display and within seconds they are identified and clocked in or clocked out. Providing the authentication by the face recognition rather than the old fashion ID Card which can anyone copy or can be duplicate forge*

*Face detection and recognition has transcended from an esoteric to a popular area of research in computer vision and one of the better and successful applications of image analysis and algorithm based understanding. Because of the intrinsic nature of the problem, computer vision is not only a computer science area of research, but also the object of neuro-scientific and psychological studies, mainly because of the general opinion that advances in computer image processing and understanding research will provide insights into how our brain work and vice versa.*

*Because of general curiosity and interest in the matter, the author has proposed to create an application that would allow user access to a particular machine based on an in-depth analysis of a person's facial features. This application will be developed using Intel's open source computer vision project, OpenCV[2] and Microsoft's .NET framework .*

*Keywords*- FaceDetection, FaceRecognition, Biometrics, Face Identification.

## I. INTRODUCTION

Although fingerprint biometrics is a popular biometric solution, facial biometrics is quickly becoming a popular choice as well. Biometric tech has greatly improved in the past few years, making facial solutions more accurate than ever. Biometric imaging is also more readily available, making it an excellent choice for various security applications[3].

For many business owners, time attendance and tracking are extremely important. No doubt, you want to avoid time card fraud and you may need to carefully track employees and visitors for security purposes[2].

One security option that you may want to consider to meet the needs of your company is a facial biometrics system. You can use 3d face recognition to prevent fraud and keep your company secure.

Over the last few years lots of efforts / work has been done in face detection and recognition as it's a best way for person Identification because it doesn't require human cooperation so that it became a hot topic in biometrics. Since lots of methods are introduced for detection and recognition which considered as a milestone.
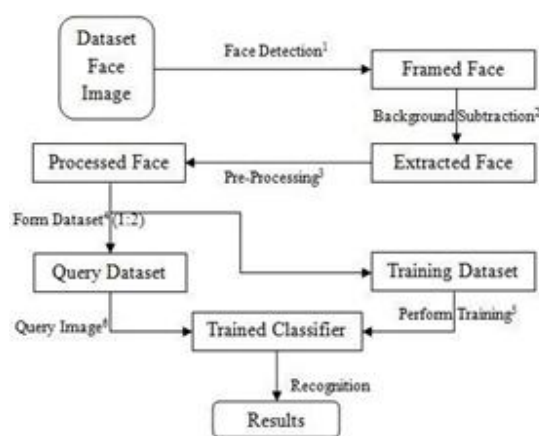


Fig.1 System's overview.

Although these methods are used several times for the same purpose separately for limited number of datasets in past but there is no work found who provides overall performance evaluation of said methods altogether by testing them on tough datasets like details of datasets will be provided in here. In current paper we developed a system for the said method's evaluation as a first milestone for camera based face detection and recognition for surveillance[2].

The facial recognition has been a problem worked on around the world for many persons; Over the past decade face detection and recognition have transcended from esoteric to popular areas of research in computer vision and one of the better and successful applications of image analysis and algorithm based understanding[3]. this problem has emerged in multiple fields and sciences, especially in computer science, others fields that are very interested In this technology are:
- ❖ Mechatronic,
- ❖ Robotic,

❖ criminalistics, etc

In this article author has work in this interesting topic using **EmguCV** cross platform .Net wrapper to the Intel OpenCV image processing library and C#(C Sharp) .Net, these library's allow me capture and process image of a capture device in real time.

The main goal of this article is show and explains the easiest way how implement a face detector and recognizer in real time for multiple persons using Principal Component Analysis (PCA) with eigenface for implement it in multiple fields.

Because of the intrinsic nature of the problem, computer vision is not only a computer science area of research, but also the object of neuro-scientific and psychological studies also, mainly because of the general opinion that advances in computer image processing and understanding research will provide insights into how our brain work and vice versa.

**Proposed Solution**

Facial recognition is a computer application composes for complex algorithms that use mathematical and metrical techniques, these get the image in raster mode(digital format) [3] and then process and compare pixel by pixel using different methods for obtain a faster , quicker and reliable results, obviously these results depend of the machine use to process[1] this due to the huge computational power that these algorithms, functions and routines requires, these are the most popular techniques used for solve this modern problem are :

❖ Eigenface[1]
❖ Linear Discriminate Analysis[1]
❖ Elastic Bunch Graph Matching fisherface[1]
❖ Hidden Markov model[1]
❖ Neuronal motivated dynamic link matching[1]

facial recognition algorithms identify faces by extracting landmarks, or features, from an image of the subject's face[3].

Intel's open-source computer-vision library can greatly simplify computer-vision programming. It includes advanced capabilities - face detection, face tracking, face recognition, Kalman filtering, and a variety of artificial-intelligence (AI) methods - in ready-to-use form[1].

In addition, it provides many basic computer-vision algorithms via its lower-level APIs. For example, an algorithm

may analyze the relative position, size, and/or shape of the eyes, nose, cheekbones, and jaw. Face Detection where a photo is searched to find a face, then the image is processed to crop and extract the person's face for easier recognition. These features are then used to search for other images with matching features. Other algorithms normalize a gallery of face images and then compress the face data, only saving the data in the image that is useful for face detection.

A probe image is then compared with the face data. One of the earliest successful systems is based on template matching techniques applied to a set of salient facial features, providing a sort of compressed face representation.

Recognition algorithms can be divided into two main approaches:

❖ geometric, which looks at distinguishing features,
❖ Photometric, which is a statistical approach that distal an image into values and comparing the values with templates to eliminate variances.

A general statement of the face recognition problem (in computer vision) can be formulated as follows: given still or video images of a scene, identify or verify one or more persons in the scene using a stored database of faces.

Face Detection Has two stages:

## II. FACE DETECTION

First, Face Detection where a image is searched to find a face, then the image is processed to crop, greyscale& extract the person's face for easier recognition[1]



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### III. FACE FETCH

Second, Face Fetch where that detected and processed face is compared to a database of known faces, to decide who that person is[1].

**CXCORE** namespace contains basic data type definitions, linear algebra and statistics methods, the persistence functions and the error handlers. Somewhat oddly, the graphics functions for drawing on images are located here as well[1].

**CV** namespace contains image processing and camera calibration methods. The computational geometry functions are also located here[3].

**CVAUX** namespace is described in OpenCV's documentation as containing obsolete and experimental code. However, the simplest interfaces for face recognition are in this module. The code behind them is specialized for face recognition, and they're widely used for that purpose[3].

**ML** namespace contains machine-learning interfaces[3].

**HighGUI** namespace contains the basic I/O interfaces and multi-platform windowing capabilities[3].

**CVCAM** namespace contains interfaces for video access through DirectX on 32-bit Windows platforms[3].

### IV. EMGU CV

An .net wrapper class / cross platform for It is extremely important to apply various image pre-processing techniques to standardize the images that you supply to a face recognition[1] system to the Intel OpenCV[3] image processing library. Allowing OpenCV functions to be called from .NET compatible languages such as C#, VB, VC++, IronPython etc. The wrapper can be compiled in Mono and run on Linux / Mac OS X[1].

Light and camera angel are the most face recognition algorithms[1] are way too extremely sensitive to lighting conditions, face should also be in a very consistent position within the images (such as the eyes being in the same pixel coordinates) [1], consistent size, rotation angle, hair and makeup, emotion (smiling, angry, etc) [3], position of lights (to the left or above, etc).

In my own words **EmguCV** is an awesome Wrapper, this let make very interesting things and tasks of computer vision, this library set let do an unlimited amount of wonderful projects in this field, **EmguCV** have many functions that let us work with CPU and GPU increases the performance dramatically with the latest mentioned.

This Awesome SW project let work and do:

- ❖ Optical Character Recognition(OCR)
- ❖ Face Detection
- ❖ Pedestrian Detection
- ❖ Kinect projects
- ❖ 3D reconstruction
- ❖ SURF feature detector ...between many others interesting tasks

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**Experiments and Analysis**

When image quality is taken into consideration, there is a plethora of factors that apparent in a person's skin into a mathematical space Tests have shown that with the addition of skin texture analysis, performance in recognizing faces can increase 20 to 25 percent[3]. It is typically used in security systems and can be compared to other biometrics such as fingerprint or eye iris recognition systems influence the system's accuracy[3]
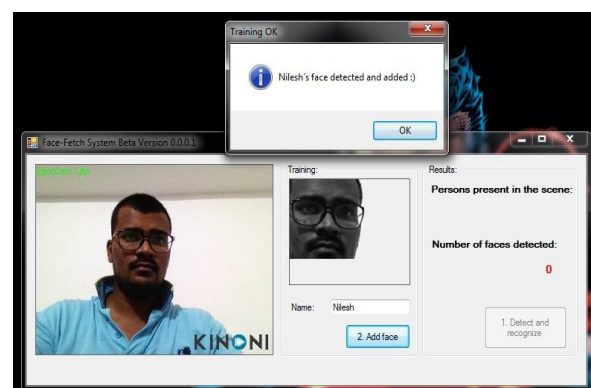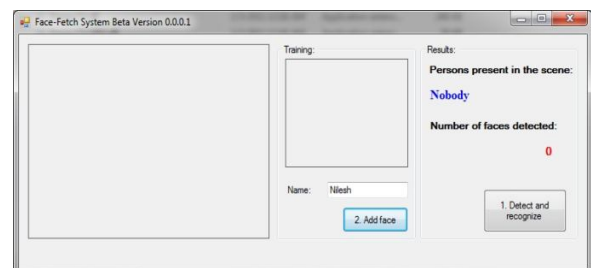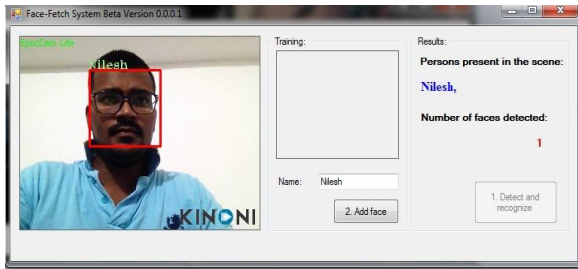
## V. CONCLUSION

To improve the recognition performance, there are MANY things that can be improved here, some of them being fairly easy to implement. For example, you could add color processing, edge detection, etc.

Face recognition is relatively easy to do in real-time if you are training on someone and then instantly trying to recognize them after, since it will be the same camera, and background will be the same.

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