3D-Face Detection & Recognition for Video Surveillances using open-CV: A Research Approach

Amit Kushwaha
Research Scholar,
Department of EIE, SLIET, Longowal (PB),
India

Dr. Ashwani K. Aggarwal
Assistant Professor,
Department of EIE, SLIET, Longowal (PB),
India

***Abstract*—An approach for automatic face detection and recognition on video streams from surveillance cameras in public or commercial places is supposes to discuss in this paper. In many circumstances it is necessary to track an object in motion and classifying it as a Human or Non-Human entity, which would help in subsequent to detect the face of particular person and recognize him. For e.g. in exhibits, commercial malls, and public places in buildings. Here is a plan to design a Prototype to work with cameras for the 3D-face detection and recognition system based on Open CV. This system can be used for security purpose to record the visitor face as well as to detect and recognize him. A program is proposed to develop using Open CV for this purpose. This paper presents a research proposal of 3D-face detection and recognition of a particular one from crowd.**

Keywords*— *Face Detection; Face Recognition; Open-CV

I. INTRODUCTION

Automated Video Surveillance addresses real-time observation of people and vehicles within a busy environment leading to a description of their actions and interactions [1]. Technical issues include moving object detection and tracking, object classification, human motion analysis, and provide an easier human-machine interaction routine when user authentication is needed through face detection and recognition [2]. Automatic face recognition has received a great deal of attention and emerged as an active research area especially over the last 20 years [3]. The major purpose of face recognition is to identify the humans from data acquired from their faces, as humans do. A good recognition system has to be fully automatic and robust enough for real life conditions such as illumination, rotations, expressions and occlusions [4]. Since 2002, face detection can be performed fairly easily and reliably with Intel's open source framework called Open-CV [5]. This framework has an in-built Face Detector that works in roughly 90-95% of clear photos of a person looking forward at the camera. However, detecting a person's face when that person is viewed from an angle is usually harder, sometimes requiring 3D Head Pose Estimation. Also, lack of proper brightness of an image can greatly increase the difficulty of detecting a face, or increased contrast in shadows on the face, or maybe the picture is blurry, or the person is wearing glasses, etc. [2].

II. BACKGROUNG AND REVIEW OF PAST WORK

2D image has been the most popular and commonly used image for the purpose of face recognition but it cannot handle the change of illumination, facial expression and changing in pose. Recently with new technology and using 3D scanners, 3D face recognition has attracted a lot of researches because it is a more reliable system and able to face facial expression and illumination problem. A review of (3D) face recognition researches is as follows:

Most of the 3D approaches for face recognition rely on both the depth and color information extracted from the face [6]. The work in [7] represented a survey on 2D and 3D face recognition. The research work in [8] represented a new attempt to face recognition based on 3D point clouds by constructing 3D eigenfaces. In [9], a detailed comparison between the existing approaches of 3D face recognition is given. Lee and Milios [10] create an extended Gaussian image for each convex region in the image. Some of the existing 3D face recognition systems, except the deformations, are from some form of known gesture.

III. PROBLEM DEFINITION AND PROPOSED METHODOLOGY

This paper proposes a modeling technique for 3D face detection & face recognition using a Human Detection for Surveillance (HDS) System. The proposed method is illustrated by a block diagram representation in Figure given below in Fig.1.

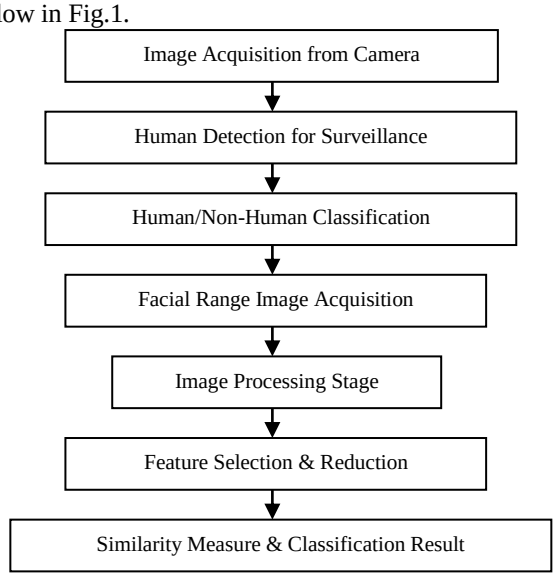

Fig.1: Block diagram representation of methodology

Before any video or image processing can commence an image must be captured by a camera and converted into a manageable entity. This is the process known as *image acquisition*. The image acquisition process consists of three steps; *energy* reflected from the object of interest, an *optical system* which focuses the energy and finally a *sensor* which measures the amount of energy. The field of computer vision is concerned with problems that involve interfacing computers with their surrounding environment through visual means. One such problem, object recognition, involves detecting the presence of a known object in an image, given some knowledge about what that object should look like. As humans, we take this ability for granted, as our brains are extraordinarily proficient at both learning new objects and recognizing them later. However, in computer vision, this same problem has proven to be one of the most difficult and computationally intensive of the field.

Face recognition is a very challenging problem and up to date, there is no technique that provides a robust solution to all situations and different applications that face recognition may encounter. The 3D structure of the human face intuitively provides high discriminatory information and is less sensitive to variations in environmental conditions like illumination or view-point. For this reason, recent techniques have been proposed employing range images, i.e. 3D data in order to overcome the main challenges of 2D face recognition: Pose and illumination [11]. Detecting faces in images is a key step in numerous computer vision applications, such as face recognition or facial expression analysis. Automatic face detection is a difficult task because of the large face intra-class variability which is due to the important influence of the environmental conditions on the face appearance [12].

A. Tool- Open-CV

In this section the tool and methodology to implement and evaluate face detection and tracking using Open-CV are detailed. Open-CV (Open Source Computer Vision Library) is a library of programming functions mainly aimed at real time computer vision, developed by Intel and now supported by Willow Garage [Lu et al., 1999]. It is free for use under the open source BSD license. The library is cross-platform. It focuses mainly on real-time image processing. If the library finds Intel's Integrated Performance Primitives on the system [Open Source Computer Vision Library Reference Manual-intel; Gary Bradski & Adrian Kaehler O‟Reilly, 2008], it will use these proprietary optimized routines to accelerate it. The library was originally written in C and this C interface makes Open-CV portable to some specific platforms such as digital signal processors [13].

B. Why Open-CV

MATLAB also can do Image Processing, then why Open-CV? Advantages of Open-CV over MATLAB stated below.

- ***Speed:*** Mat-lab is built on Java, and Java is built upon C. So when a Mat-lab program runs, computer is busy trying to interpret all that MATLAB code. Then it turns it into Java, and then finally executes the code. Open-CV, on the other hand, is basically a library of functions written in C/C++ which directly provide machine language code to the computer to get executed. So ultimately you get more image processing done for your computers processing cycles, and not more interpreting. As a result of this, programs written in Open-CV run much faster than similar programs written in MATLAB.
- ***Resources needed:*** Due to the high level nature of Mat-lab, it uses a lot of your systems resources. Mat-lab code requires over a gig of RAM to run through video. In comparison, typical Open-CV programs only require ~70mb of RAM to run in real-time.
- ***Cost:*** List price for the base (no toolboxes) MATLAB (commercial, single user License) is around USD 2150. Open-CV (BSD license) is free.

IV. CONCLUSION

A prototype of video surveillances system for automatic face detection and recognition is proposes to implement. Method proposes in this paper will detect and recognize human face after segregate the human from the images by using open-CV, if possible.

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