Human Face Identification Using Robot

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***Abstract*— In this paper we mainly discuss on automating procedure for finding lost humans in a critical situation where human interference is not possible. This is done by using an autonomous robot. The system consist of four wheel robot which can be wirelessly controlled from computer or laptop. Camera will be mounted on the top of the robot, which will continuously fetch Frames. HAAR algorithm proposed by Paul Viola and Michel Jones, which is being use for face detection and recognition. In contrast, Face recognition using SDK enables highly accurate recognition from a frame or video. Thus Image Processing will take place using FaceSDK.**

Index Terms*— *Camera, Face Detection, FaceSDK, Frames, Image processing, Robot.

I. INTRODUCTION

Our project basically focuses on identifying human faces in various situations such as humans lost in interior parts of forest, border areas, trekking areas etc. with the help robot which is capable of rotating 360^{o} as well as the camera mounted on the robot will move up and down.

The frames and the videos will be processed by Image Processing algorithms. Let us see what basically image processing is: An image may be defined as a two-dimensional function, f (x, y), where x and y are spatial coordinates and the amplitude of f at any pair of coordinates (x, y) is called the intensity or gray level of the image at that point. When x, y and gray level of 'f 'are all finite, discrete quantities, the image is then digital image. The processing of digital images by means of a digital computer is called digital image processing. Digital image is composed of a finite number of elements, each of which has a particular value and location, called as pixels. The different stages for image processing are low-level, mid-level and higher-level processing.[6].

Numerous face detection methods have been developed in past years. Paul Viola and Michel Jones has introduced Face Detection method based on HAAR like features[1].Aim of the face detection method is to identify and locate all faces regardless of their positions, scale, orientation, lighting condition and expression[5].

Human faces are objects particularly hard to model because of their significant variety in colour and texture and there are no constraints on the background. The value of a two-rectangle feature is the difference between the sum of the Pixels within two rectangular regions. The regions have the same size and shape and are horizontally or vertically adjacent.

In contrast, FaceSDK is a high-performance, multi-platform face identification and facial feature recognition solution. FaceSDK is a perfect way to empower Web and desktop applications of face detection for user authentication, automatic face recognition, and identification. It is compatible with 32 and 64-bit environments. FaceSDK is easy to integrate with new or existing projects, enabling developers to create a wide variety of applications. FaceSDK will plot and process facial coordinates based on eyes,eye corners, eye brows, mouth, nose, nose tip [3].

II. LITERATURE REVIEW AND RELATED WORK

Many researchers have introduced Face detection methods but for achievement of fast and efficient image processing for extraction of human faces. The author Jock Barreto, Paulo Menezest and Jorge Diad proposed the different techniques to construct a framework for robust and rapid people learning, tracking and recognition in a human-robot interaction environment. This paper presents an approach for face recognition which can be very useful for human-robot interaction systems. The Face detection system works as a preprocessing stage to the Face recognition system [1].

Recently Viola et al. have proposed a multi-stage classification procedure that reduces the processing time substantially while achieving almost the same accuracy as compared to a much slower and more complex single stage classifier. This paper extends their rapid object detection framework in two important ways: Firstly, their basic and over-complete set of Haar-like feature is extended by an efficient set of 45" rotated features, which add additional domain-knowledge to the leaning framework and which is otherwise hard to learn. These novel features can be computed rapidly at all scales in constant time. Authors Rainer Lienhart and JochenMaydt proposed an novel and fast to compute set of rotated HAAR-like features as well as a novel post optimization procedure for boosted classifiers. It was shown that the overall performance could be improved by about 23.8% of which 10% could be contributed to the rotated features and 12.5% to the stage post-optimization scheme [2].

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The author K.T.Talele and Sunil Kadamhas proposed two main face detection approaches: Image based methods and Geometrical based methods which focuses on a detector that processes images very quickly, while achieving high detection rates. This detection is based on a boosting algorithm called AdaBoost and simple HAAR based features. The proposed system can be used for real-time application[5].
HAAR algorithm uses a set of weak classifiers, constructed by thresholding of one Haar-like feature. Due to large number of weak classifiers, they can be ranked and organized into cascade.[8]

Face biometric techniques can be used for both authentication and identification applications. The author Jackie Abbazio, Sasha Perez, Denise Silva, Robert Tesoriero, Frederic Penna, and Robert Zack proposed these applications which have a critical role in national and economic security. This study researched several face recognition software and tested FaceSDK[3].

III. PROPOSED WORK

The basic structure includes a Robot and the Computer that are interconnected to each other by the Transmitter and the Receiver. The transmitter of the system will give the Transmit Front command and the receiver of robot will receive. This in turn is forwarded to the MDC i.e. the Motor Driver Circuit. The robot will start capturing frames and find human faces. As soon as the robot captures the frames, it will be forwarded to the system. The further process on that image will be done by the system.

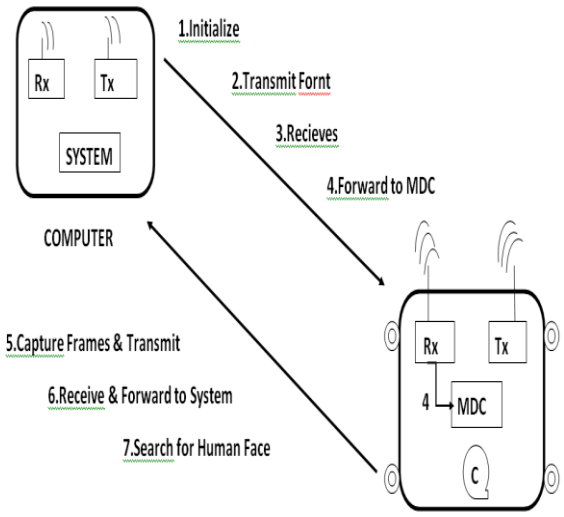

Fig 1 : Working of Robot & Computer

The following Fig. shows the working and detection of the face using the HAAR Algorithm. In the 1st part of the figure the face is categorized into rectangular sections, based on the lighter and darker regions of the skin. In the 2nd part the points are plotted on the graph and various HAAR Features are applied on it.

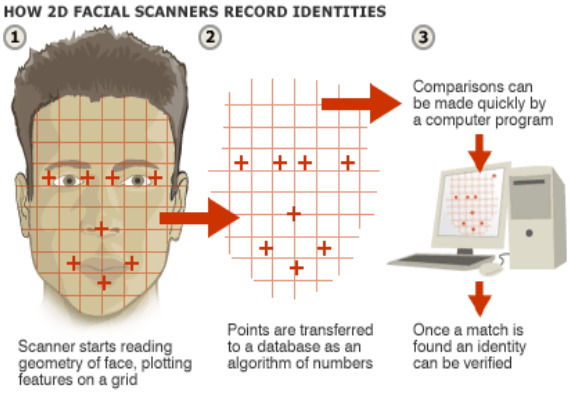

Fig: 2 Face Identification Using HAAR algorithm & System Verification

In the 3rd part of the fig 1. if the detected points plotted on the graph, matched with the geometry of the human face then it represents that a human face is detected.

Hardware includes one Robot made up of two motors at rear and one caster wheel in front. Robot is controlled wirelessly from the Base station. The camera which is mounted on top of the robot will be able to rotate 360° at once that will continuously capture frames.

IV. CONCLUSION

This system presents an approach to find Lost Humans in certain situations where human interaction in not possible, by reducing human efforts physically. For this system we are using Robot which is wirelessly controlled having a camera mounted on it which is capable of moving 360^0 which continuously captures frames for finding human faces.

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