Spying Drone with Face Detection System

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Abstract: *Face detection is the process of identifying one or more people in images or videos by analyzing and comparing patterns. Algorithms for face detection typically extract facial features and identifying them in the given video or image. In addition to this process we add the tool of spying drone, which is used to monitor the activities at a next level. Face detection is typically used in security systems. Besides that, it is also used in human computer interaction. In order to develop this project eigen faces method is used for training and testing faces. It has received significant attention up to the point that some face recognition conferences have emerged. A general statement of the problem can be formulated as follows, given still or video images of a scene, one or more persons in the scene can be identified using a stored database of faces. The solution of the problem involves face detection, feature extraction from the face regions and recognition. To develop this project we used the Eigen faces method.*

I. Introduction

Face detection is typically used in security systems. Besides that, it is alsoused in human computer interaction. In order to develop this project eigenfacesmethod is used for training and testing faces. It has received significant attention upto the point that some face detection conferences have emerged. A generalstatement of the problem can be formulated as follows, given still or video images ofa scene, one or more persons in the scene can be identified using a stored database offaces. The solution of the problem involves face detection, feature extractionfrom the face regions and detection. To develop this project we used the eigenfacesmethod.

A set of eigenfaces can be generated by performing aMathematical process called principal component analysis (PCA) on a large set ofimages depicting different human faces. The key procedure in PCA is based onKarhumen-Loeve transformation. If the image elements are considered to be randomvariables, the image may be seen as a sample of a stochastic process. The focus ofthe research is to find the accuracy of eigenfaces method in face detection.

II. Design

2.1 Spying drone:

It is the chopper, which is integrated with a 16F877A microcontroller used for controlling the whole process undergoing the drone. This drone consists of the brushless DC motors, which are lightweight and posses high RPM comparatively to normal motors which makes drone to get high easily. In additionally, now we are adding the wireless camera to the drone that transmits the live video. Receiver receives the live video and AV to USB converter converts the received video to system-required format.
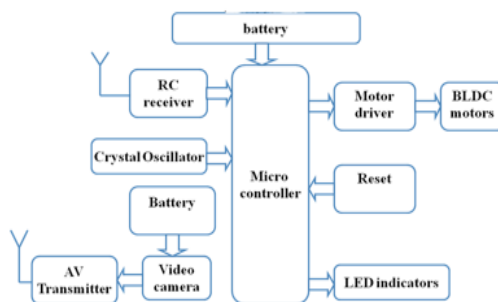

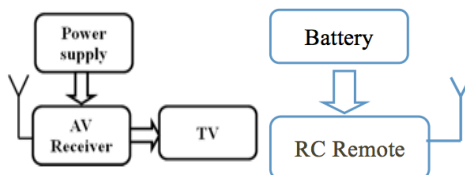Fig. 2.1: Transceiver section of spying drone

Fig. 2.2: AV Receiver   Fig. 2.3: RC Remote

2.2 Specifications:

2.2.1Wireless camera:

Wireless security cameras are closed-circuit television (CCTV) cameras that transmit a video and audio signal to a wireless receiver through a radio band. However, some wireless security cameras are battery-powered, making the cameras truly wireless from top to bottom.

In an open field (with line of sight), a typical wireless camera has a range between 250 to 450 feet. In a closed environment such as an interior of a house the wireless camera range is between 100 to 150 feet. The signal range varies depending on the type of building materials and/or objects the wireless signal must pass through.

Most digital wireless cameras support one or both of the following resolutions: QVGA and VGA.
QVGA produces video at up to 25-30 FPS at 320x240 resolution.
VGA produces video at up to 10-12 FPS at 640x480 resolution.

2.2.2. AV Transmitter/Receiver:

The transmitter and the receiver are used in the same channel in a pair and can be used in the modes of point-to-multipoint or multipoint-to-multipoint. Compatible with DVD, DVR, CCD camera, IPTV, satellite set-top box, digital TV set-top box and other AV output devices.

Transmitting unit:
Frequency Output: 1.2Ghz
Transmission Signal: Audio, Video
Linear Transmission Distance: 50-100m
Voltage: DC+9V
Current: 300mA
Power Dissipation: 640Mw

Receiving unit
Receiving Frequency: 1.2Ghz
Receiving Signal: Audio, Video
Voltage: DC+12V
Current: 500mA

2.3 Algorithm:

In mathematical terms, the objective is to find the principal components of the distribution of faces, or the eigenvectors of the covariance matrix of the set of face images. These eigenvectors can be thought of as a set of features which together characterize the variation between face images. Each image location contributes more or less to each eigenvector, so that we can display the eigenvector as a sort of ghostly face called an Eigen face
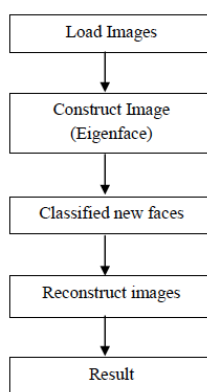

Fig. 2.4: Outline of a typical face detection system

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There are three main functional blocks, whose responsibilities are given below

a) The acquisition module:

This is the entry point of the face detection process. It is the module wherethe face image under consideration is presented to the system. Another words, theuser is asked to present a face image to the face detection system in this module.

b) The pre-processing module:

In this module, by means of early vision techniques, face images arenormalized and if desired, they are enhanced to improve the detection performanceof the system.

c) The feature extraction module:

After performing some pre-processing (if necessary), the normalized faceimage is presented to the feature extraction module inorder to find the key featuresthat are going to be used for classification. Another words, this module is responsiblefor composing a feature vector that is well enough to represent the face image. The proposed face detection system passes through three main phasesduring a face detection process. Three major functional units are involved in thesephases and they are depicted in Figure 3.2.
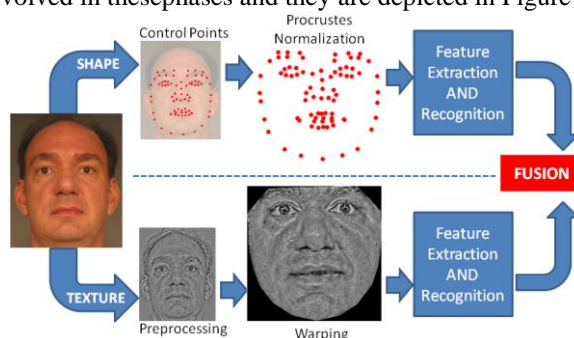

Fig. 2.5: Functional block diagram of the proposed face detection system

After constructing the weight vectors of face,now the system is ready to perform the detection process.User initiates the detection process by choosing a face image. Based on theuser request and the acquired image size, pre-processing steps are applied tonormalize this acquired image to face library specifications (if necessary). Once theimage is normalized, its weight vector is constructed with the help of the eigenfacesthat were already stored during the training phase.

After obtaining the weight vector, it is compared with the weight vector ofevery face library member within a user defined "threshold". If there exists at leastone face library member that is similar to the acquired image within that thresholdthen, the face image is classified as "known". Otherwise, a miss has occurred and theface image is classified as "unknown". After being classified as unknown, this newface image can be added to the face library with its corresponding weight vector forlater use.

III.   Results

This project is successfully drawn on the basis of security surveillance consists of a spying drone with a wireless camera which gives us the visual output with the face of the living thing detected in it.
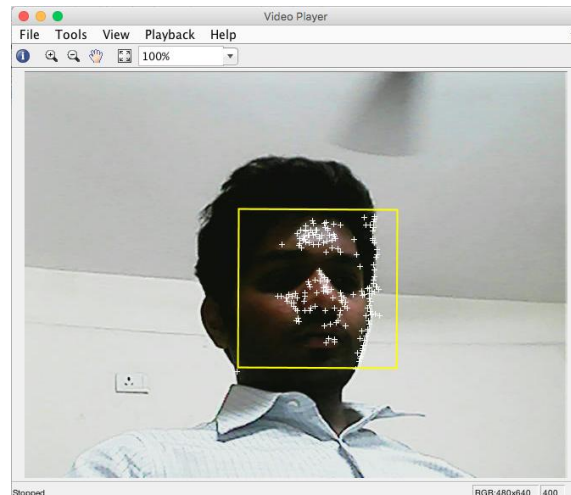

Fig. 3.1: Spying drone with camera

Fig. 3.2: Output at MATLAB video player

IV.   Conclusion

Integrating features of all the hardware components used have been developed in it. Presence of every module has been reasoned out and placed carefully, thus contributing to the best working of the unit.

Secondly, using highly advanced IC's with the help of growing technology, the project has been successfully implemented. Thus the project has been successfully designed and tested. The Microcontroller used in the project is programmed using Embedded 'C' language. Also, we can use a camera for live video image transmission.

4.1 Future Scope:

Our project "SPYING DRONE WITH FACE DETECTION" is mainly intended to control the robot with a wireless camera using a wireless RC remote, wireless technology.

It can be extended to the recognition technology and used as a real time security purpose.

This project finds its major applications while we are monitoring larger areas like Crop monitoring, banking, Cold storage etc. This project assures us with more reliable and confident security system.

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