A Review Article on ARM9 Based Real Time Face Recognition Attendance System

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Abstract—**Face recognition is not so new yet not so old technologies going on these days. Face recognition is basically used for the security purpose but here in this thesis it's been used for the application. An ARM9 based embedded Linux system is going to be used in this report. A fast working micro controller like S3C2440 is used as the controller. Here the main purpose of this is to make a low cost, portable, less power consuming and more reliable system that can recognize the face of human and detect it correctly. For the detection of the face GPIO camera is used and its been stored in the NAND Flash and to digitalized it Haar-like transforms are used. The captured images are going to match with the available database and then if its verified then a GSM module will send it to the server and the attendance will be taken. If the captured image is not verify with the data base then it will generate the message invalid image.**

Index Terms—ARM9; GPIO Camera; NAND Flash; S3C2440.

I. INTRODUCTION

In this era of science and technology security plays a vital role in day today life. Security is the basic requirement for all the people starting from common people to VIP and VVIPs. These days human face recognition is most widely used technology and for also the core issue of security. The current security systems are using biometric recognition. Here in this system we are going to make such system that will take the pictures of human and it will match with the data base available and then that will be transferred to the server as our goal is to take attendance of the present students in the class.

In current days either in schools or in collages teachers are taking attendance manually that means teachers are calling for roll numbers of the students and then students who are present they call upon their numbers and teachers put their present, but here in this system an embedded microcontroller based system is placed at the entrance of the class and camera is attached with that system so that camera will take the picture of the student coming into the class and match that picture with that available database, if its match then it will send the present of their student to the server via GSM model. This is one of the easy ways of taking attendance and to keep the work easy for tutors. Here in this system there will not be any chance of cheating like students do in manually system. In manually systems students speak present on their friend's number although they are not present, but in this system all the data already being stored in memory and attendance will be taken if and only if picture of the student is recognize and match. So this system is more reliable compared to current system.

II. SYSTEM HARDWARE

Heart of the system is ARM9 processor. It is S3C2440 processor. Hardware features are described below. The CPU works on 400MHz and it can work maximum on 533MHz. NAND and NOR Flash for memory storage Also LCD – 4 wire touch screen interface, up to 1024*768 pixels. Many features are available for Interface and Resources. The oscillator frequency is 12MHz. RTC of the board is internally available. Dimension is 100*100(mm). It can support three different types of OS, Linux, Android, WinCE 5 and 6.[3]

III. LITERATURE SURVEY

The following papers are useful for the study of face recognition.

(a) Real Time Device for Face Recognition System

Here in this paper the authors have made the real time, portable, low cost face recognition system with the help of ARM Microcontroller. They have named the system as RPIPD-v1, i.e., Real Time Portable Image Processing Device Version 1. This system is made up of hardware and software to get the accurate results. This is a standalone system.

Here they have concentrated on two basic areas of the system i.e. Face Recognition and Face Detection. As the result the accuracy of the system is about 60% in recognizing the known and unknown faces. For getting the better results, it needs individual faces with proper lighting and the surrounding conditions. Low cost is another factor so that the system is used at many places to get the better results for the perfect situational results.

Here authors have developed a standalone portable real time face recognition system which takes the images from the camera attached with the processor and makes a platform necessary for image processing as well as the face recognition. Their approach was to make a biologically implementable and is concern with preliminary finding the psychology of the face recognition.

For the face detection here they have used Matlab. Face detection was done in Matlab using 4916 face images and about 150000 non face images which were randomly cropped from non-face images. Images were scaled to 24*24 pixels. Existence of human face and its position is checked out in this stage. More than one face can be detected as the result in this detection technique. For the face recognition they have used two portions. They are training with training images and recognition on the test images. For detecting the faces here they are using algorithms from the paper Eigen faces for Recognition developed by Matthew Turk and Alex Pentland.

(b) Real-time Face Recognition for Smart Home q Applications:

In this paper with the use of software and hardware authors have implemented a system for face recognition for consumer or embedded application. This is an embedded interconnected home environment that enables intelligent servicing by the identification of the user automatically.

Here in the paper they have used colour based face detection. Because it can be ineffective with respect to skin colour also with the objects occur in the background. This system works in a home environment to give intelligent services like detecting the faces. The system is made up from four different processing steps: face detection from live video, facial feature extraction, face normalization and the last is recognition.

For the facial feature extraction they have used four different stages:

1. Local Attribute Matching: based on the haar feature extraction each feature point is searched along a trace composed of eight radial lines.
2. Global shape Regulation: using PCA algorithms global shape is updated and regulated.
3. Face normalization: using affine transformation, wrapping an input face with varying size, scale and position to a standard frame. The correspondences between the extracted image and the front view average face, we can estimate six parameters. Based on these parameters warping is preformed to obtain a normalized face.
4. Face recognition: this normalized face is applied to image classifier. Then compared with the database and match the face.

By using these techniques 94% of the accuracy is being achieved on variable data base. It takes 0.1s -0.2s to process one video.

(c) Face Recognition System based on ARM9:

Here in this paper the authors have used the ARM9 processor. Face detection system uses the latest technologies, less power consumptive, very small size and fast working micro controller (S3C2440).

Here the system uses USB camera to take the images. Captured images are stored in the NAND Flash of the processor. Here in this paper they have made a system on a security purpose to identify the particular criminal based on the data connected to the port of the processor.

System based on ARM9 processor and PCA algorithms for the face detection. For image acquisition system uses common USB camera, operating system is Linux, ARM S3C2440. Based on hardware, embedded Linux system is made and then drivers are developed. After that face recognition system is developed on the operating system. It is a low cost and small face recognition system.

In this system, they have included five different parts. They are as below:

1. Input image from camera
2. Face detection
3. Pre-processing
4. Feature extraction
5. Feature matching

In this paper they have used Haar feature for object recognition. A Haar-like feature considers adjacent rectangular regions at a specific location in a detection window, sums up the pixel intensities in each region and calculates the difference between these sums. This difference is then used to categorize subsections of an image. Now to understand this let us take an example. Consider we have a data base of human faces. Now as we know all the portion of the human face is not similar i.e. the portion near eyes is darker than the portion of cheeks. So here by using the Haar-like features is set of two adjacent regions (rectangles), one is above the eyes and another is near the cheeks. Now these two rectangles are acts like the bounding box to the target object.

Now to describe an object with sufficient accuracy, a large number of Haar-like features are necessary. Because of the use of integral images, a Haar like Features of any size can be calculated and in time constant.[8]

The basic idea of the PCA algorithm is: the image vector by KL transforms from high dimensional transform to low dimensional transform. The low dimensional vector space is liner vector space i.e. subspace, and the resulting projection coefficients as the recognition of feature vectors.

IV. SUMMARY AND FUTURE WORK PLAN

This thesis report represents an ARM9 based embedded Linux system that will capture the images from GPIO camera and then it will be applied for the image processing for Haar-like transforms. Processor will going to match this captured image with the available database and verifies it. After verification that data will be send to the GSM module to make the attendance of the present students in the class. Thesis work is to study the regarding papers and to implement a low cost and reliable embedded compact system that will work very effectively.

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