Face Detection E-Attendance System

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Abstract:

The issue of taking attendance each and every period by the teacher is very time consuming and tiring as well. Therefore we intend to design an application for Android Smart Phones which helps in capturing the image of all the students in the class and then marks the attendance accordingly to their respective faces if present. The image processing will internally be done by the application so as to detect the faces of the students by computing the various features of the face. By introducing this application we intend to reduce the pressure of teachers taking the attendance and saving time as well. The probability that there would be wrong attendance marked for students would also be reduced to a larger extent as the application completely depends on the face detection of that particular student only. This paper deals with an application that uses face detection and recognition to mark the attendance of the student. Local Binary Pattern Histogram algorithm is used in this approach.

Keywords: Face Detection, Face Recognition, Android, Local Binary Pattern Histogram, LPBH, Attendance, Image Capturing and Processing.

1. INTRODUCTION

A. MOBILE OPERATING SYSTEM

“Android”, a word that has changed the meaning of mobile phones and has made this device the most popular one to use. Android is a mobile phone operating system developed by Google, the pioneer of mobile computing and communication. What makes android so special is it provides a very convenient hardware for developers so that their ideas are realized in less time. What makes this operating system so easy to use is that it is written in basic computer languages such as C,C++ and Java. Android was one of the first operating systems to introduce an interface based on direct manipulation or what can simply be called as a touch screen module. It also has the largest installed base of operating systems throughout the world. The open source feature of this operating system makes it more likely for developers to conduct their applications extensively on this platform; facts say that 40% of full time professional developers work on this platform, which is more than iOS at 32%.

Android is also popular due to its readymade, low cost and high customizability feature among the technology companies for manufacturing their high tech devices. It has also enabled developers to work on their community driven projects due to the open source code. The smart phone wars between technology companies have made sure to target the operating system due to its success for patent litigation. As there are a vast number of developers that work on this platform, bugs or glitches are sooner reported and rectified and the republished to the regular user. As known, it is the most frequently updated operating system providing nightmare for developers and stable versions for the general users. Most of the android devices are designed in such a way that their power consumption is low when compared to the desktops where there is continuous source of power. It is also the first operating system to bring in many new hardware components, thus extensive variation in hardware of these devices gives the developers an opportunity to tailor the operating system individually.

Features due to which android is chosen when compared to other mobile phone operating system are ease of notifications, social integration, system wide copy and paste functionalities, audio, graphical and input enhancements for game developers and finally support for multiple cameras.

When compared to other leading operating system providers, the camera has the most notable features to mention such as the ability to capture RAW or unprocessed images, manual exposure and focus, very high light sensitivity (ISO) , wide option of
image saving formats such as bitmap and thermal images and lastly the crispness of the image even after zooming it by 200% yields a much superior quality image than the other operating systems. All in all android has become a part of our daily life, without which surviving is quite endangered.

B. FACE DETECTION

If we see from past few decades there has been a drastic change in technology, we could see many advances in technology as a part of this advancement the technology has made itself available to allow verification of individual identity[11][17]. This type of technology is based on the field called biometrics. Face recognition is one of the biometric methods that posses the merits of high unambiguousness and low invasiveness. This also plays a major role in surveillance systems as it docent need the objects liaison[1][8][16].

In order to recognize the face precisely the designers most commonly use the locations of both eyes for assistance[14][15]. For a face to be recognized correctly many parameters have to be taken into consideration such as:

1. As the face picture is taken in normal external environment, so the environment may not be same all the time.
2. The camera distortion and noise[6].
3. Facial expression of the person whose face is being recognized.
4. Face beautification.
5. Hairstyle of the person.

Considering all this effects the designers have designed a few algorithms which have succeeded in recognizing the face precisely for a maximum extent. They are namely Eigen faces, Fisher faces, Laplacian faces, neural network approach and many more[7].

For the face to be recognized it should first be detected, so for face detection there are four steps daily followed commonly in all algorithms as shown in Figure 1[5][6].

Step1: Localize the face region that means selecting those parts of the image were the face may be present.
Step2: Normalize the detected region so that the alignments of various facial features are in proper location.
Step3: Extract various facial features like nose, mouth, eyes etc
Step4: Verify whether the anticipated parts are actually carried out a face or not. This is done by comparing the acquired pats with the default human faces. After the face is detected then the detected face is recognized [2][3][4][18].

Fig. 1. Face recognition working flowchart

The face recognition is divided into 2 types:

1. Geometric approach or feature based approach
   In this method first of all the disturbances are removed from the image such as camera distortion, camera noise, illumination effect etc, and then extract all the distinctive features of face such as nose, eyes etc. Now compute geometric relationship among the facial points, so by doing this it reduces the facial image to a vector of only geometric features[13][12]. Standard statistical pattern recognition techniques are used to match faces by measurements. In this our main aim is to find information about the facial features or to find the local significant geometries of the face that correspond to the local features of face[10].

2. Holistic based face recognition
   In this we use global information instead of local face feature information. Here the entire picture is represented with a small key value which is derived from pixel information of the image[12] as shown in figure 2.

Fig. 2. general face detection procedure

2. ATTENDENCE

The attendance of an organization can be monitored in many ways. This will vary from organization to
organization, attendance sheet may be used some, online methods may be used by some and fingerprint recognition is being used by most of the institutes, which is highly reliable. Each have their own pros and cons. Nowadays everything processed by technology, over the last few years technology has vastly improved causing it to be used in many organizations. The simplest way an organization can monitor attendance is by having a signature in a sheet which at times can be very convenient and very quick, but however this can easily get lost and is pretty outdated.

3. PRESENT ATTENDENCE SYSTEMS

A. Manual System

Manual systems rely on heavily on calling out each of the student’s name individually and marking them against their names in their registers and then collectively entering them into the attendance database manually. It is done by highly efficient people meticulously adding up paper cards on which time have been stamped onto by using the time stamping machine. These machines have been used since a century and are still being used by many organizations as a much less expensive alternative to time and attendance applications.

B. Automated Systems

Automated time and attendance systems use :-

- Electronic tags
- Barcode badges
- Magnetic Stripe Cards
- Biometrics (vein reader, hand geometry, fingerprint, or facial)
- Touch Screens

Students to identify themselves will have to touch or swipe and record their attendance throughout the day. The recorded information is then automatically transferred to the institute server. Some-times these systems require an operator to physically transfer the data from the electronic system to the computer sing a memory device.

4. DISADVANTAGES OF PRESENT ATTENDENCE SYSTEMS

The present system deal with a lot of disadvantages such as:

- Data cannot be precisely relied upon
- Duplication of data
- Possibility of faulty attendance
- Parameters for sensing may change over a period of time
- Possibility of tapering the system

A. RELATIVELY ROBUST SMARTPHONE ATTENDENCE SYSTEM

The proposed application deals with a much reliable and precise method of attendance. When compared to the present systems, this application is less time consuming and also doesn’t require heavy manual labour. It is also highly reliable as there is no possibility of the teacher being cheated with faulty attendance. Since the application deals with face detection and recognition there are less chances of the features of the face changing over a period of time used in the algorithms to detect the face. This application also overcomes the manual effort taken in pooling the data as it is collectively stored directly into the servers.

5. ABOUT APPLICATION

The teacher has to first login with his/her credentials and then mention the period and the class of which the attendance should be taken. The teacher then points the mobile phone camera to capture the class photo, the application would be designed in such a way that once the image is captured the application detects all the faces present in image and then matches them accordingly to the images of the students present in the database and then marks the attendance respectively. The database will have the images of all the students stored on a prior basis. The attendance is then transferred to the college server if necessary to mark the final attendance before the end of the day. The algorithm recognizes the face that is done by comparing few parameters in which the algorithm is trained in. If the face is recognized then it marks attendance to the person whose face has been recognized as shown in figure 3.

Fig.3: Working of face recognition
It uses OpenCV for face detection algorithm and JavaCV to access the face recognition algorithm in OpenCV. This application uses LBPH (Local Binary Pattern Histogram) algorithm for processing the image in face recognition. In this algorithm every image is independently analyzed and then each image is separately characterized in the dataset locally, when a new and unknown image is given to the algorithm it again compares this with all the other images in dataset.

6. FUTURE SCOPE

The application can be further extended to other platforms present in the present market. This factor also depends on the adaptability of the OpenCV platforms for the iOS and Windows Phone operating systems. Another major change log can be brought in the application as to where it is used and can be extended to various companies and industries to maintain the attendance of their employees where the teacher can be replaced by the project head/manager. Another proposal can also be made so as to use it in the tablets which can be stationary and can automatically detect the person who stands in front of it. Furthermore is possible we can implement the same system in CC cameras where it is not even needed to maintain a device and the camera automatically detects the person and the records the presence and is stored in a remote database which can be accessed at anytime from anywhere.

7. CONCLUSION

This application deals with one of the most robust and secure technologies, that is Face Detection and Face Recognition. The chances of losing the data or faulty attendance being marked is highly reduced. The application is also handy to use and will be of a great help to the teachers as it saves time and reduces the manual effort that it is presently put into it. The intervention of a third person is also removed to maintain these databases and collectively sum up the attendance.

REFERENCES


