Effective Mechanism for Advancement of Monitoring Process of Educational Sectors of Underdeveloped Countries – A Study Based on Educational Sector of Pakistan

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Abstract - Educational sector of underdeveloped countries needs revival to promote the culture, education, research and development and to progress. Continuous measures are being taken to improve the overall quality of education. This research is based on a survey conducted on the educational sector of Pakistan. One of the important aspects to deliver quality education in urban and rural areas includes monitoring of a defined mechanism. Stakeholders of any educational system include Students, Teachers and Management that are interlinked and involved to deliver the best services. One of the key factors includes the dedication of teachers and students towards education that can be analyzed by the patterns of their attitude towards respective classes and courses. This research paper proposes an automated attendance mechanism that will be efficient enough to capture and update records timely on a centralized server.It proposes a real-time distributed system design for the collection of data on a regular basis that will help the education department to monitor all the institutions remotely by effective analytical reports.

Key words–education sector, distributed system, image processing, automated tool.

I. Introduction

Authentication and identification have become major issues in today's digital world. Face detection plays a significant role in authentication and identification. The proposed system is basically a smart face recognition system which will be used for marking the attendance of students in class automatically. Later it will be modified and embedded with different features.

Public and private sector schools and colleges in Pakistan are having high enrolments on papers but the reality is somewhat different especially in case of public sector institutions. Recent reports of accountability bureau claims that there are many schools that are on paper but they exist physically. Schools that are listed and verified are not been attended by students regularly because of lack of interest from teachers. Delays in the start of scheduled class, cancellation without any reason and lack of punctuality of staff for the facilities are the factors found in the survey of around 58 public sector schools in rural areas of province Sindh. As per the reports many of the teachers that are employed by provincial government do not report to their schools and colleges and continue to withdraw their regular salaries. All the records are kept manually that are easily changed on regular basis with the help of supporting staff. All this is possible because there is no automated system to monitor their presence in due time, the classes and students as well.

Smart Class Attendance System will revive the current mechanism of attendance from manual to automation that will lead towards transparency and will make each stakeholder accountable on their part. This will also help to compile the records for performance evaluation of teachers for promotion and other benefits based on their performance.

II. Literature Review

A. *Role of ICT in Educational System*

ICT is currently mainly used in management of educational institutions for the purpose of better communication, resource and general administration (Fredriksson et al., 2009).

Most of the countries today are ensuring that their educational systems are updated frequently to allow equal access opportunity to everyone and ensure that all educational institutions possess basic ICT skills. ICT is being used as a mind tool that includes dynamic modeling, knowledge construction, information interpretation, collaboration and conversation (Kirschner& Davis, 2003).

ICT is now acting as a means of facilitation for various types of online conferencing and through introduction of virtual support groups. The administrative use of ICT involves enrolment,

registration, assessment, record keeping and communication. (Flecknoe, 2002)

Use of ICT in education involves the use of tools such as data capturing, multimedia software for simulation, publishing and presenting tools, digital recording equipment and computer project technology (Osborne & Hennessy, 2003).

B. *Role of ICT in Learning*

ICT is now being usedas a technical support system for establishing new teaching and learning methods but for it to be effective it needs to study the physical, psychological and physiological factors and how they influence workers' performance. (Zandvliet& Fraser, 2004)

ICT can be used to establish strong relationships among universities, colleges and schools in order to develop technology rich learning environment. (Maignan et al., 2003)

ICT plays a vital role in creating rich innovative learning environments that are ultimately helping in constructing both virtual and real communities. It has introduced various ways of knowledge generation, sharing and reconstruction. This paper emphasizes on the creation of a learning environment that focuses on communal construction of knowledge. (Leask&Younie, 2001)

ICT is being used in distance learning programs by students with the help of a learning management system. (Jamtsho&Bullen, 2007)

ICT integration in learning environments requires the presence of all necessary components that involve hardware, software, technical support, proper training of personnel, accessibility to resources and most importantly sufficient amount of time. (Bingimlas, 2009)

ICT is helping us to present and publish information at affordable prices that can be accessed by anyone anywhere with internet-technology. (Holmes et al., 2001)

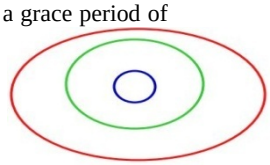
C. *Role of ICT in Developing Countries*

ICT is helping developing countries to bridge the gap between government offices and their citizens. ICT implementation on government level requires it to be reliable, flexible, available, integrated and responsive. The benefits it will gain from it involve improved efficiency, improved access to information, transparency, efficient communication, more storage and real time processing. (Gichoya, 2005)

Developing countries who want to compete globally cannot ignore to use ICT in their education system. Here the major responsibility is on the policy makers in education that include school principals, education supervisors, regional education directors and district-level or state-level educational administrators and the incorporation of computer systems, World Wide Web, internet, software, networks and communication devices. (Jhurree, 2005)

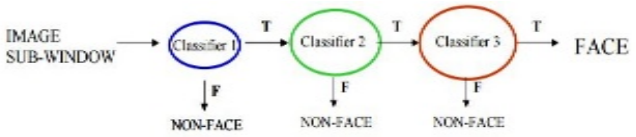
III. METHODOLOGY

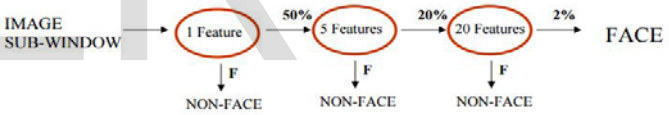
In order to design an efficient system that would satisfy the requirements relating to marking of attendance, generating customized reports and collecting real time data on a centralized server, digital cameras are to be installed in the defined vicinity. A certain height and angle is to be determined after physical inspection of each room for mounting the camera. Each institution has its defined rooms for classes and labs along with a standard schedule for each batch of students. Schedule contains all the details of courses(titles), rooms(room number), start time of class, duration for the whole semester. Plan of institute will be loaded in the local server that will allow some grace time to the capturing of image for example, a class is scheduled to be start at 9:00am, a grace period of 3-5 minutes can be set after which the mounted camera automatically captures a couple of shots of the class room.



Images that are captured will be stored in local server on which a set routine will be called as each new file is stored. That image will be processed using Viola Jones Algorithm, one of the most appropriate algorithms for image processing.

"Viola–Jones object detection framework is the first object detection framework to provide competitive object detection rates in real-time proposed in 2001 by Paul Violand Michael Jones.Although it can be trained to detect a variety of object classes, it was motivated primarily by the problem of face detection"**.** The problem to be solved is detection of faces in an image. A human can do this easily, but a computer needs precise instructions and has certain constraints. To make task manageable, Viola–Jones requires full view frontal upright faces. Thus in order to be detected, the entire face must point towards the camera and should not be tilted to either side, hence a camera should be mounted to a certain height and calculated angle. While it seems these constraints could lessen the algorithm's utility somewhat, because the detection step is most often followed by a recognition step, in practice these limits on pose are quite acceptable.





Viola–Jones algorithm has four stages:

1. Feature Selection
2. Creating an Integral Image
3. Adaboost Training
4. Cascading Classifiers

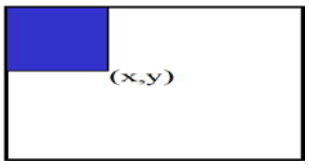
1. Feature Selection

• For each round of boosting:
– Evaluate each rectangle filter on each example
– Sort examples by filter values
– Select best threshold for each filter (min Z)
– Select best filter/threshold (= Feature)
– Reweight examples
• M filters, T thresholds, N examples, L learning time

– O(MT L(MTN)) Naïve Wrapper Method
– O(MN) Adaboost feature selector

2. Creating Integral Image

The integral image computes a value at each pixel (x,y) that is the sum of the pixel values above and to the left of (x,y), inclusive. This can quickly be computed in one pass through the image.



3. Adaboost Training

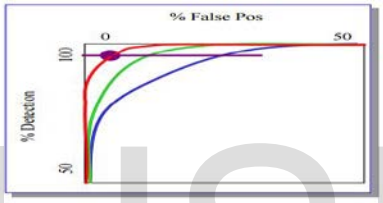
Super-Efficient Feature Selector

- Features = Weak Classifiers
- Each round selects the optimal feature given:
  – Previous selected features
  – Exponential Loss

3.1 Cascading Classifiers:

Building Fast Classifiers

Given a nested set of classifier hypothesis classes



Computational Risk Minimization

Cascaded Classifiers

- A 1 feature classifier achieves 100% detection rate and about 50% false positive rate.
- A 5 feature classifier achieves 100% detection rate and 40% false positive rate (20% cumulative)
  – using data from previous stage.
- A 20 feature classifier achieve 100% detection rate with 10% false positive rate (2% cumulative)

4. Output of Face Detector on Test Images

IV. LIMITATIONS

Color illustrations and photographs are accepted but we ask that you check all

- **Image quality:** Image quality affects how well facial-recognition algorithms work. The image quality of scanning video is quite low compared with that of a digital camera.
- **Image size:** Face detection algorithm do not recognize the captured face whose relative size is different from the size of enrolled image. An already small size image coupled with a target distant from the camera means that the detected face is only 100 to 200 pixels on a side. Further, to scan an image for varying face sizes is a processor-intensive activity. Most algorithms allow specification of a face-size range to help eliminate false positives on detection and speed up image processing.
- **Face angle:** The relative angle of the target's face influences the recognition score profoundly. When a face is enrolled in the recognition software, multiple angles are used (profile, frontal and 45-degree are common). Anything less than a frontal view affects the algorithm's capability to generate a template for the face.
- **Processing and storage:** Even though high-definition video is in low resolution when compared with image of digital camera but still occupies significant amounts of disk space. Processing every frame of video is an enormous undertaking so only a fraction (10% - 25%) is actually run through a recognition system. To minimize total processing time agencies can use clusters of computers. However, adding computers involves considerable data transfer over a network which can be bound by input-output restrictions, limiting the processing speed. Face recognition can't tell the difference between identical (twins). Many systems are less effective if facial expressions vary. Face recognition does not work well included poor lighting, sunglasses, long hair or other objects partially covering the subject's face (women who wears hijab) and find difficulties in processing low resolution images.

V. CONCLUSION

By the implementation of this proposed system, efficiency adaptability, sense of responsibility, and ultimately overall progress of the institutions can be monitored. Initially, it may take time for deployment, but once it is implemented it would definitely benefit all the stakeholders. Limitations as discussed can be minimized by further working on the integration and improvement of algorithm.

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