Architecture Of Intelligent Process Controlling Model Through Image Mining

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Abstract—In this paper, research potentials and challenges raised through visual data mining and image mining are presented. Various views of visual data mining and a new vision of visual data mining and its applications are discussed. A case study of an application of visual data and image mining for improving quality processes of an educational organization is presented. Various research challenges raised by such image mining applications are described.

Index Terms— Knowledge acquisition, Visual Data mining, Data Mining, Image Mining, Real time data mining, Architectural framework, Process Controller.

I. INTRODUCTION

An image is equal to thousands of words. It is possible to present complex data in a predefined format of an image. For Example, Software engineering domain uses UML which represents its models in the form of a set of diagrams. These UML diagrams has particular schema and defines a set of rules for designing. These UML Models holds lot of information with semantic meaning. A software developer can get required information along with complex logic of system from these UML diagrams.

Similarly, most of the images represent lot of data without following a particular pattern or rule. Extracting information and patterns from the data available in an image or a set of images can be referred as Image mining. A satellite Image holds lot of information in an unprocessed form. Many researchers are using Data Mining Algorithms for extract information and knowledge from satellite images [4].

A Human Expert gains knowledge from the images captured through his vision applying natural data mining algorithms running in his mind known as human intelligence. This enables a human expert to control set of quality processes of any domain of his expertise. A robot can mimic exactly like a human expert if it is charged with powerful Image mining algorithms through an intelligent software framework.

This paper presents model application framework using Visual Data mining and image mining for improving quality of processes of an organization through visual aids and intelligent software model. A case study of controlling educational processes through visual data and image mining is discussed in this paper.

II. VISUAL DATA MINING VS VISUAL DATA

The term Visual Data mining is defined differently depending on its usage at deferent application. The Data Mining defined visual data mining as a tool to represent graphical data for taking decisions. It is used to represent complex data sets or patterns in a graphical form for taking decisions. Though it proves that a graph or an image can be used to generate knowledge from complex data sets, it is limiting the word only to the extent of generating set of mathematical graphs. This paper uses the word for extracting information and knowledge from real time images generated through visual aids for taking decisions.

Visual data plays a major role in knowledge extraction. Educational experts suggest visual tools (Visual Aids) as better process for knowledge acquisition and better communication even for a human expert. The word Visual data mining should be redefined for better use as *set of algorithms models which extract data from images collected using visual aids for acquiring required knowledge for taking decisions*. The term visual aid refers to human eye, a Video or digital Camera or a satellite. A human Expert extracts Knowledge for taking decisions through his sight applying natural Visual data and image mining algorithms functioning in this mind.

Applying such concepts enables a computer based system to take decisions through extracting knowledge from images collected from digital device. The final objective of such models is to charge the robots with powerful knowledge acquisition algorithms to mimic like a human expert collecting data from visual devices (multimedia devices).

III. A CASE STUDY OF INTELLIGENT PROCESS CONTROLLER EDUCATIONAL ORGANIZATION

A. E-College System

The E-college Product is a Web based Software Model which automates the processes of a huge educational organization. General objective of any educational environment is to control the educational processes to produce the best professionals to the society. Several methodologies are available to improve the educational process with the help of Information Technology. E-College is a Computer based system which implements processes of a Huge Educational organization for improving the quality of the educational system.

B. Architectural of intelligent process control model for ECollege

The major challenge of educational process is to monitor the academic processes. For example consider the process of monitoring the attendance of the students in the class rooms. This will be managed with attendance registers. All the registers data can be made available over internet either adding the data from the registers or by automatically collecting from finger-prints of the students from the class rooms. This will not provide authenticated information for the following questions:

1. Whether all students are present throughout the class?
2. When the class started? What will be the strength of the class at the beginning and at the end?
3. Any malpractice took place in giving the attendance?

The solutions for all the questions will be by appointing an agent or an academic controller who will be observing the classes on line. This can be done even by keeping the digital cameras in the class and observing them. Such process has the following disadvantages:

1. The data is not persisted?
2. Very difficult for a human controller to monitor if the number of classes are large and the class schedules (or time tables) are complex.

The solutions for such processes are addressed by a simple intelligent software model. This model controls the classes with the visual aids. The computer module can manage complex class schedules and huge data. In the computer modules can collect visual pictures from required classes and extract data and make them persistent. This enable the module to evaluate the regularity of the class room lectures.

This model is replacing a *Dean Academics* who monitors the class rooms functioning with Software Module capable of collecting real time data from the class rooms using simple digital cameras and a software model.

IV. CLASS ROOM MONITOR ARCHITECTURE

Architecture of the Class *Room Monitor* is presented in the following Figure 1.

In this model class rooms are equipped with digital cameras. The class room database consists of information related to class room sessions. The visual data collector will collect the information in visual form with the help of digital cameras based on class room schedule databases. This will extract required information from visual data and builds suitable data base with collected visuals. Typical data mining algorithms are applied for building Knowledgebase. The knowledge base is used to extract required information for decision making.

Such systems can be used to measure regularity of the class room lectures, regularity of students attending the class and regularity of the faculty. This system works like an *automated real time software dean academics* for monitoring the class room lectures. Similar models can be developed for several such applications for monitoring

the processes of organizations for improving the performance.

Figure 1: Architecture of Classroom monitoring system
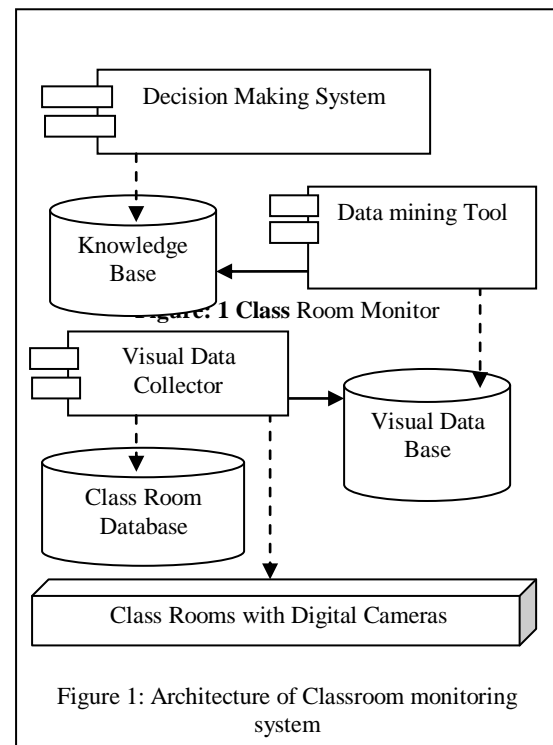
Picture are collected depending on class schedules and prescribed frequencies. For example if a class start at 9am and duration is one hour we can set system such that it collect pictures at 9.00 9.15 and 9.30 and 945 and 10.00 and 10.15. This will enable expert providing the following answers.

1. When the class started? How many students at the beginning of the class?
2. When all students are present in class?
3. When the class ended? How many students are present at the end of class?
4. Whether the class ended at time or not?

Digital devices can be configures to take pictures depending on time or on events as per the need of the system. This logic can be extended to other multimedia devices such as audio or video devices.

Such systems need software facilities to update changes in the timetables at run time which enable to change the class room or to change teacher, in order to make the visual devices act accordingly.

V. IMAGE MINING REQUIREMENTS

This model identifies and raises requirements from image mining which enforse the human expert to interfear for automatic decition making. In this model a human expert is needed to identify the number of students in the class room from the picture collected and stored in database. Image mining algorithom which collect number of students in a class from the picture makes the software model totally automated. An alogorithm to

recorgnize a student from a picture with total confidence will enable the software to generate automated attendence register with a simple picture collected.[1,2,3,5,7]

V. Other Applications

We can find several applications which are useful for rural development. Farmers who involve in cultivation need advice on their crops at frequent intervals of time. Similar software model which collects images as per the requirement can be used for advising the farmers. Like medical image mining algorithms which recognize medical problems if algorithms are generated for finding problems from villages can be benefited through these models. [8] At present similar software models are available but not fully automated. Fully automated models decrease human expert time and provide fast decisions which are required for providing immediate solutions for the problem. This will enable to use such applications even for *Disaster Management.*

Several similar applications based on image mining are in use. For example *Traffic Control system* of several contrives take pictures of vehicles which violate the traffic rule. They have the intelligence of recognizing the number automatically from the picture and collect the details of the owner and vehicle from online database. Such systems have the capability of automatically recording the defaulters. [6]

Similar other application is for the payment of the bills from the scanned hard copy of the bill. The image mining algorithm can recognize the validity of the bill along with bill number, customer details and amount payment details. The percentage of the accuracy of the information collected from these image mining algorithms changes with risk rate of the applications.

Conclusions

This paper identifies the need to develop the intelligent software models for improving the organizational processes through data mining techniques. It also indentifies the need in the domain of image mining which supports such processes for total automation. The paper identified the use of the multimedia devices and data mining algorithms to extract information through them to enable software models to mimic like human experts through total automation of the software. This paper identified the need for redefining the visual data mining from 'providing visual tools to human expert for taking decisions' to "extracting information from visuals" for total automation.

Acknowledgment

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