Fully Automated Attendance Record System using Template Matching Technique

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Abstract-- This research paper “Fully Automated Attendance Record System using Template Matching Technique” focuses on the need to design a system that will automatically arrange the record and calculate the average attendance of each student. Manual attendance record system is not efficient and requires time to arrange record and to calculate the average attendance of each individual student. The Attendance Record System is intended to replace the manual model of attendance record keeping. The paper describes an efficient image processing algorithm that reads the scanned hard copy accurately and further calculates the absence or presence accordingly. In Image processing, noise is present in scanned images. This noise must be removed from scanned images. The Paper also describes a noise removal method that will remove noise efficiently from scanned images.

Index Term-- Median Filter, Region based segmentation, template matching, pattern recognition, convolution

1. INTRODUCTION

Attendances are maintained in every school, college and university. A proper record needs to be maintained by respective teachers. Manual attendance record system is not efficient and requires time to arrange record and to calculate the average attendance of each individual student. So there is a need to design a system that will automatically arrange the record and calculate the average attendance of each student. The proposed Attendance Record System is intended to replace the manual model. The system contains attendance records in electronic files containing details of absence or presence of a specific student enrolment during a semester. This project will try to organize the current university attendance record system that will be much quicker and will save time of instructors.

The Attendance Record System will allow the instructors to maintain a record of attendance of students in their respective classes on a paper. System will automatically update the attendance on the server of the respective student on the university server as well as soon as the attendance sheet is scanned. The goal is to provide a professor with an easy, time saving solution to attendance record maintenance and statistics. An attendance record for each and every student is needed for each and every lecture and must be submitted after the lecture.

Attendance record system includes the scanning of hard copy of attendance sheet that will involve the techniques of digital image processing. Digital image processing performs image processing on digital images through the use of various different computer algorithms. Various algorithms are available for this purpose. Through digital image processing, many complex algorithms can be applied which results in better removal of noise and hence better image quality. Digital image processing is the only useful technology for classification, feature extraction, pattern recognition etc. Further Image comparison or image matching and further image segmentation will be helpful in sorting out the attendance of students individually. Image segmentation results in the division of a digital image into segments. Segmentation is performed in order to gain an image that is much clear and can be easily analyzed. Image segmentation results into a set of images that make up a whole image. Practical applications of image segmentation include face recognition, fingerprint recognition, medical imaging etc. Attendance sheet template is shown in fig. 1.

Fig. 1.
For image matching or image segmentation, we will implement an algorithm that will efficiently calculate the presence or absence of individual students. Fig. 1 is the attendance sheet given to the teachers for taking attendance. The teacher is required to fill the given roll number by placing a tick mark on a roll number in case that particular student is present while leaving the roll number blank in order to mark a student as absent. The implemented algorithm will automatically detect the presence and absence of each student. The attendance sheet will be marked as shown in fig. 2.

If there is no mark present for a particular roll number, then the algorithm will not detect that particular roll number as present and mark it as absent which is saved immediately.

2.2 Case 2

2.3 Case 3

2.4 Case 4

If a teacher accidently places a mark on a roll number other than a tick mark, then that roll no is not marked as present. The algorithm will not detect that particular roll number as present and it will be automatically considered as absent and is saved immediately.

2.5 Case 5

If a teacher cuts or overwrites an entry for a particular roll number, then that roll number will not be marked as present. The algorithm will not consider overwriting or cutting and the roll number will be automatically marked as absent and is saved immediately.
2.6 Case 6

![Attendance Sheet Table]

If a teacher accidentally makes duplicate entry for a particular roll number, then that roll number will not be marked as present. The algorithm will not consider any duplicate entry and the roll number will be automatically detected as absent and is saved immediately.

3. ATTENDANCE TAKING RULES

Teacher must follow some rules while marking attendance on the attendance sheet. These rules are as follow:

- The teacher must mark the roll number correctly i.e. in the given allocated space in order to mark the student as present.
- The tick mark must be proper.
- The teacher must not cut or overwrite an entry once made.
- The teacher must not make duplicate entry.
- The teacher must not place any mark if a particular roll number is absent in order to mark the student as absent.

4. METHOD’S DESCRIPTION

4.1 Basic Approach

The basic method used in the application is based on an image processing technique. Template matching is one of the major image processing techniques. Template matching is a technique in digital image processing that finds smaller parts of an image which match a template image. The techniques of Template matching compare portions or segments of images against each other. Sample image may be used to recognize similar objects in source image. Templates are most often used to identify printed characters, numbers and other simple objects.

The basic method of template matching uses a convolution mask that is tailored to a particular feature of the search image, which the user wants to detect. This template matching technique can be performed easily on grey scale images. At points where the structure of the image matches exactly the mask structure, the convolution output will be highest i.e. the locations where large image values get multiplied by large mask values.

4.2 Main Method

First of all, teacher marks the attendance of respective students against their roll numbers. He places a tick mark for present and no mark for absent. The teacher must be very careful while marking for present or absent. After this, the sheet is scanned which is then read by the system. The scanned sheet is then compared with the templates that have been saved in the system.

The implemented algorithm will detect the presence or absence of a particular student. After the sheet is scanned, the algorithm will check each roll number against the template that has been saved already. The templates are simple roll numbers with no mark on them. If in the scanned sheet, no mark is present on a particular roll number then it is exactly the same as the template saved. The scanned sheet will look like as in fig. 9.
Individual attendances are matched by matching of their respective templates against the scanned attendance sheet shown as

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**Template**  **Scanned Image**

**Case 1: Present Case**
If a particular scanned roll number is not the same as the template saved, i.e. a tick mark is placed on the roll number, then that roll number is considered to be present. The algorithm detects the changes that have been made to a roll number and then after comparing it with the template saved, marks that roll number as present. The roll numbers that are considered as present are saved immediately. The information is then passed on to a text file which keeps a record of the all the present students.

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**Template**  **Scanned Sheet**

**Case 2: Absent Case**
If a particular scanned roll number is the exactly the same as the template saved, then that roll number is considered to be absent as no mark of presence is present on the roll number. In this case, the roll numbers are saved and the information is then passed on to a text file.

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**Template**  **Scanned Sheet**

**4.3 Noise Removal Method**
Noise results in loss of vital information from scanned images. Therefore it must be removed efficiently while retaining the original information. There are many noise removal methods such as Gaussian low pass filter, morphing filter, Butterworth low pass filter, ideal low pass filter, Median filter etc. The most common and capable method of noise removal is the median filter which is discussed below.

**4.3.1 Median Filter**
Median Filter is one of the most efficient methods of noise removal. The scanned images contain many different kinds of noise of which the salt and pepper noise is the most common. In order to remove noise from the image, median filter is applied at the scanned image. Through median filtering, the noise is removed by replacing the window center value. This value is replaced by the center neighborhood’s median value. Median filter removes noise more efficiently than other filters. The results of median filter are shown in fig. 4.

**5. IMPLEMENTATION**

**5.1 Algorithm Implementation**
The algorithm described previously is implemented. The following fig.s i.e. fig. 4, fig. 5 and fig. 6 describes the working of applied template matching algorithm. These flow control charts are shown below.

Fig. 9. Original Image

Fig. 10. Median Filter

Fig. 11.
5.2 Pseudo Code
Scan original attendance sheet and marked attendance sheet from the scanner. Get and Read the original attendance sheet and marked attendance sheet of scanned image.
Apply noise removal algorithm through median filtering.

//Load all templates of roll numbers
Read all the templates of each roll number.

Median_Filter()
1} //Apply Noise Removal algorithm that is implemented through median filtering
1}

Template_Match ( )
{2
//Get the x and y coordinates using CvPoint
//Get the minimum and maximum location using minloc, maxloc
//Get the properties of original attendance sheet
//Get the properties of the template to be matched
//Draw rectangle on the matched template
//Display the matched image on screen
2}

File ( )
{3
//Write the matched roll number to a text file which shows the presence of respective student
3}

6. CONCLUSION
In this paper, we introduced an automatic image processing based attendance record system and described its working and features. An efficient algorithm is introduced that calculates the presence or absence of respective students from scanned attendance sheet. Different cases are illustrated in the paper. The technique of template matching that is used in the application is focused in detail. Further, a noise removing filter is discussed to get better results from noisy images.

REFERENCES