

# Image Processing Based OMR Sheet Scanning

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**Abstract-** This paper aims to develop Image processing based Optical Mark Recognition sheet scanning system. Today we find that lot of competitive exams are been conducted as entrance exams. These exams consists of MCQs. The students have to fill the right box or circle for the appropriate answer to the respective questions. During the inspection or examining phase normally a stencil is provided to the examiner to determine the right answer to the questions. This is a manual process and a lot of errors can occur in the manual process such as counting mistake and many more. To avoid this mistakes OMR system is used. In this system OMR answer sheet will be scanned and the scanned image of the answer sheet will be given as input to the software system. Using Image processing we will find the answers marked to each of the 50 questions by finding the region of interest and applying template matching algorithm. Summation of the marks & displaying of total marks will be also implemented. The implementation is done using C#.net and the image processing would be done in Open CV.

**Keywords-** OMR, OPEN CV, Recognition, Scanner.

## I. INTRODUCTION

OMR technology has changed much in recent years. Now a day in schools, colleges and classes we use OMR technology. Exams are conducted using OMR answer sheet checking system because by using this technology the conduction of exam is getting much easier, powerful, and cheap. In this system answer sheet layout is created by using sheet design depending upon our requirements. The role of scanner is just to scan the filled sheet and so any flatbed or ADF (Automatic Document Feeder) Scanner is used to Scan the sheet. Basically designed software is to check the answer sheet and display the results. Firstly the OMR answer sheet will be scanned and the scanned image of the answer sheet will be given as input to the software system. Using Image processing we will find the answers marked to each of the 50 questions by finding the region of interest. Summation of the marks & displaying of total marks will be also implemented.

The proposed system is designed in such a manner that it is easy to use; no special training is required to operate the system and is the most cost effective method when the number of answer sheets to be evaluated is very large, and the need is regular.

This system also used for other applications also by making small changes in form design and software code. The proposed system can be implemented by using camera instead of scanner by adjusting values of Rmin and Rmax. Besides the achievements in terms of accuracy and reliability of the proposed system, In Case of using scanner another advantage of this approach is that non-transoptic answer sheet paper with lower cost can be used. After capturing image it will be given as input to the software system and applying image processing like image segmentation, image pre-processing, feature extraction and decision rule on the image and determine the result.

## II. PROPOSED METHODOLOGY

### A. REVIEW OF LITERATURE

This paper is actually an application that we are developing which enables implementation of OMR using an ordinary scanner. It provides tools to the user to design an OMR sheet based on the layout they want. The design of the sheet will be stored as image file format. Then user can take as many print outs as required, distribute it among others from whom information is desired, and get the filled sheets scanned. The scanned image files will then be provided as input to the software, processing will be done, value of filled fields will be extracted and then the data will be manipulated as instructed by the user. The implementation is done using Java[1].

The main objective of this paper is to develop a system which facilitates the OMR answer sheet evaluation technique which must be feasible and efficient. The objective is to eliminate the use of dedicated hardware which in turns very costly, So the evaluation of OMR answer sheet could be done by the simple scanned image of that sheet using simple scanner [2].

The most common use of OMR is to process student responses to a multiple choice exam, or responses to a questionnaire or feedback form after which the questions are provided on paper, and students mark their responses onto special pre-printed forms. Basically, the main task is to detect the presence and absence of dark marks and extract the information depending upon these marks from an image. There are number of softwares and hardwares in present market that are professionally used to detect such images. But however, here the aim is to develop a suitable software that would detect marks and hence prepare their results according to the needs[3].

One of the most important usages of OMR is checking multiple choices question exam students choose the answer by filling square choice on a printed paper. Then after scanning, these papers will be checked by special software automatically. This article is written based on morphology and rejection error algorithm which is included: scanning, preprocess, steps, basic identify, checked steps, and conclusion of different tests[4].

In this paper, a low-cost OMR (LCOMR) technique is presented. Besides implementing all the functions of the traditional OMR, LCOMR supports plain sheets (70 gsm or less) and low printing quality sheets. which include the image scan, tilt correction, scanning error correction, regional deformation correction and mark recognition, are presented[5].

Lopresti et al explained the process of optical mark recognition with reference to Remark Office OMR 3.0, made by Principia Products. Also he reported that, for years people who do statistical analysis have been designing questionnaires, and getting them filled out by respondents or interviewers, and then somehow wrestling the data into a computer. With the first computers, much of the data was input by creating decks of punched cards. While this process allowed one to create those necessary computer files, it was subject to input error and thus had to be verified. At the very same time also it allows multiple-choice forms to be read.[6]

Kia mentioned that Optical Mark Recognition (OMR) is used for standardization testing as well as course enrollment and attendance in education[7].

Dillman studied the impact of OMR forms on which it responded it to be relevant issue. One possible disadvantage with OMR surveys is that they may suppress response rates. OMR surveys are often combined with other cost-cutting measures (e.g., no follow up), so their low response rates may simply be an artifact of other choices about survey administration. Generally OMR forms have one standard ink color that provides limited visual appeal

creating a disincentive for their response. Moreover these forms are also more tedious to fill out. Rather than simply reading through the survey and checking off or circling responses, the respondent must carefully fill in a circle or “bubble” for each question answer[8]

Image-based OMR studies by Chinnasarn et al. presented PC-type microcomputer and image scanner. The system operation could be distinguished into two modes: learning mode and recognition mode. Data extraction from each of the following can be performed based on the horizontal and vertical projections. For the purpose of checking answer, the number of black pixels in each answer block is counted, and the difference between those numbers in the input and its corresponding model is used as decision criterion[9]

Pegasus Corporation presented a Software Development Kit for OMR recognition from document images. Recent works include software along with specified scanner for specific design of Form for OMR purpose. Tao and Toan presented some difficult problems of OMR such as the correcting position of form with pattern. Hussmann S. et al, 2005 proposed a LCHS using Field Programmable Gate Array (FPGA), but had constraints and critics on the input of the forms [10].

### B. SYSTEM ALGORITHM

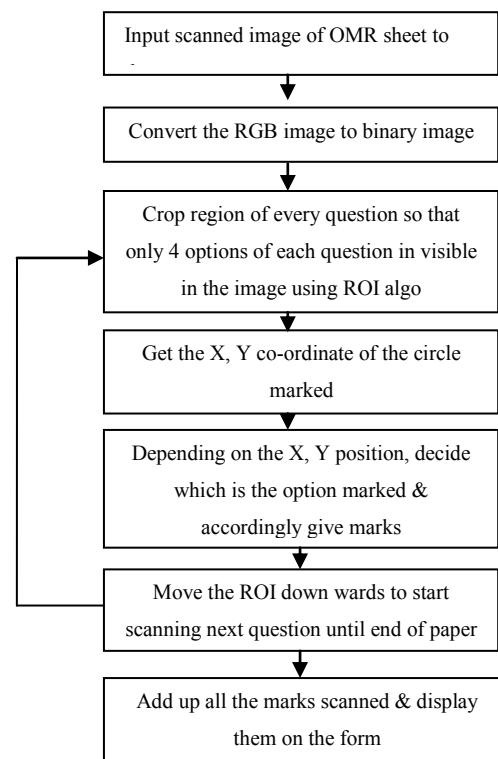


Fig.1. Proposed System

The success of speech recognition system needs combination of various techniques and algorithms, each of which performs a specific task for achieving the main goal of the system. Thus the combination of related algorithms improves the accuracy or the recognition rate of such applications. Fig. 1 shows the methodology of system.

The algorithmic steps of OMR sheet scanning system are as follows:

1. Start
2. Import Image
3. Convert the image from RGB to Grayscale image
4. Applying threshold values convert the gray image to binary image
5. Get the co-ordinates of the two red squares
6. Applying the equation  $y = mx + c$  get the slope of the line
7. Accordingly rotate the image to make it perfectly vertical i.e. zero degree rotation
8. Cut the sheet into seat number, section one and section two sections
9. Scan each row of the seat number for identifying each number of the seat number
10. Using the moments in x & y direction and the spatial moments, calculate the x and y co-ordinates
11. Map the found co-ordinates for finding the respective marked seat number
12. Scan each row of the first section for identifying answer marked for each section
13. Using the moments in x & y direction and the spatial moments, calculate the x and y co-ordinates

#### IV. REFERENCES

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14. Map the found co-ordinates for finding the respective marked answer
15. Follow the same steps to identify the marked answers for section two
16. Compare the stored scanned answers in the array with actual answers in the database
17. Depending on the range of marks defined, declare the class awarded to the student.
18. Stop.

#### III. CONCLUSION

Ultimately any technology introduced should serve the purpose of well being of common community. Optical mark recognition (OMR) is a data capture technology used for automated data entry into a computer system. It is gaining wide acceptance in educational institutes for computer aided assessment. The two methods used for OMR are using dedicated scanner and using image. The problems associated with first method are it is costly and customization of forms is difficult.

The second method of OMR i.e OMR from image is simple to design and implement, requires less hardware and forms can be customized by users. For computer aided assessment it is best suited because the form design can be customized by user. The system is developed to meet the following goals: The system is used for computer aided assessment of class tests. The system is designed and implemented with minimum cost.

The system is designed with easy user interface

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