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OMR SHEET EVALUATION SYSTEM USING IMAGE PROCESSING

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Abstract—This paper presents an automated Optical Mark Recognition (OMR) Sheet Evaluation System designed to improve accuracy, efficiency, and transparency in large-scale examinations. The system integrates image preprocessing, contour-based bubble detection, answer validation, and automated scoring. Experimental validation demonstrates reliable performance under varying scanning conditions. Maintaining accuracy and efficiency in large-scale academic examinations is a major challenge when OMR sheets are evaluated manually. Manual checking consumes significant time and is prone to human errors. This paper presents an automated OMR Sheet Evaluation System that integrates image processing techniques for accurate bubble detection, response recognition, and result generation. The system performs preprocessing, contour-based bubble extraction, answer key comparison, and automated scoring. Experimental evaluation demonstrates improved accuracy, reduced processing time, and enhanced transparency. The proposed solution is scalable, adaptable to multiple OMR formats, and suitable for educational institutions conducting objective-type examinations.

Index Terms— OMR, Image Processing, Bubble Detection, Automated Evaluation, Computer Vision

I. INTRODUCTION

Optical Mark Recognition sheets are widely used in academic and competitive examinations. Manual checking methods are time-consuming and prone to calculation errors. The proposed system automates scanning, detection, scoring, and result reporting.

II. LITERATURE SURVEY

Early OMR systems relied on dedicated hardware scanners and predefined templates for bubble detection. Although accurate under controlled conditions, these systems lacked flexibility and adaptability to varied sheet designs.

Recent approaches utilize image processing libraries such as OpenCV to perform contour detection, adaptive thresholding, and pixel intensity analysis. These methods allow OMR evaluation using scanned images; however, challenges remain in handling noise, skew, faint markings, and multiple responses.

The proposed system improves upon existing methods by implementing structured preprocessing and modular scoring mechanisms to enhance robustness and accuracy.

III. EXISTING SYSTEM

Existing OMR evaluation systems suffer from limitations such as strict template dependency, limited tolerance to noise, manual region configuration, and difficulty in detecting partially filled or ambiguous bubbles. These constraints reduce scalability and increase administrative effort

IV. PROPOSED SYSTEM

The proposed system introduces an automated, modular OMR evaluation framework capable of processing scanned sheets efficiently. The major features include:

- Image preprocessing with grayscale conversion and thresholding
- Contour-based bubble detection
- Pixel density analysis for mark identification
- Automated scoring using predefined answer keys
- Result generation with performance statistics

V. SYSTEM DESIGN

The system follows a multi-stage architecture consisting of preprocessing, bubble detection, evaluation, and result reporting modules.

A. Image Acquisition and Preprocessing

Scanned OMR sheets are converted to grayscale and processed using thresholding and noise reduction techniques. Skew correction ensures proper alignment of answer regions**.**

B. Bubble Detection Module

Contour detection algorithms identify bubble regions. Pixel intensity thresholds determine whether a bubble is filled or unfilled.

C. Scoring Engine

Detected responses are compared with a stored answer key. Correct and incorrect responses are computed, and marks are assigned accordingly.

D. Result Reporting

The system generates individual score reports and summary statistics including average marks, highest score, and class performance analysis**.**

VI. METHODOLOGY

The development follows a structured pipeline: requirement analysis, system design, implementation of preprocessing algorithms, bubble detection, scoring logic, and validation testing. Batch processing ensures scalability for large datasets.

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VII. RESULTS AND DISCUSSION

The system achieved high detection accuracy under varied lighting and scanning conditions. Processing time was significantly reduced compared to manual evaluation methods. Automated evaluation ensured consistency and minimized human bias.

VIII. USER INTERFACE AND IMPLEMENTATION

Fig. 1. Admin Login Interface of OMR Scanner System

The login page provides secure authentication for administrators before accessing system functionality.

Fig. 2. Dashboard Overview with Performance Metrics

The dashboard displays total scanned sheets, average marks, pending reviews, and quick access features.

Fig. 3. Upload Sheets and Answer Key Module
Administrators upload answer keys and student OMR sheets in supported formats for processing.

Fig. 4. Marking Scheme Configuration Panel
The marking scheme configuration allows enabling negative marking and setting scoring rules.

Fig. 5. Scan Execution Module
The scanning interface processes uploaded sheets and supports demo execution mode.

Fig. 6. Results Summary and Class Statistics
The results page shows rankings, marks, percentages, and class-level statistics.

Fig. 7. Individual Student Performance Report
The student report provides detailed statistics including correct, wrong, and unattempted answers.

Fig. 8. Question Summary Visualization
The question summary section categorizes answers using visual indicators for clarity.

Fig. 9. Complete Answer Sheet Evaluation View
The complete answer sheet view presents question-wise comparison between selected and correct answers.

IX. CONCLUSION

The OMR Sheet Evaluation System provides a reliable, scalable, and efficient solution for automated examination grading. By integrating image processing techniques, the system reduces human error and administrative workload. Future enhancements may include machine learning-based bubble recognition, mobile scanning support, and cloud-based deployment for large-scale examinations.

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