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OMR Sheet Evaluation using Image Processing

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Abstract: *Optical Mark Recognition (OMR) technology has revolutionized the grading and assessment processes in educational institutions, surveys, and various other fields. OMR sheets, designed with predefined bubbles or checkboxes, are scanned and processed to extract relevant data. This paper presents a comprehensive review of the methodologies and advancements in OMR sheet evaluation using image processing techniques.*

The review begins with an overview of traditional OMR systems and their limitations, such as susceptibility to errors due to variations in scanning quality, paper orientation, and noise interference. Subsequently, it delves into the evolution of image processing algorithms tailored for OMR sheet evaluation.

Several key components of OMR sheet evaluation are discussed, including image pre-processing techniques for enhancing readability, segmentation methods for isolating individual marks, feature extraction algorithms for capturing relevant data, and classification techniques for accurate identification of marked responses.

The review highlights recent trends and innovations in OMR sheet evaluation, such as the integration of machine learning and deep learning algorithms for improved accuracy and robustness. Additionally, it addresses challenges such as handling skewed or distorted images, multi-page OMR sheets, and real-time processing requirements.

Furthermore, the paper discusses benchmark datasets and evaluation metrics commonly used to assess the performance of OMR systems. It also examines practical considerations such as scalability, cost-effectiveness, and usability in diverse settings..

Keywords: Optical Mark Recognition (OMR), Deep Learning, Image Acquisition, Pre-processing Techniques

I. INTRODUCTION

Optical Mark Recognition (OMR) has emerged as a cornerstone technology in automating the evaluation of assessments, surveys, and forms. By leveraging image processing techniques, OMR systems can accurately and efficiently interpret marked responses on standardized sheets, revolutionizing the grading process in educational institutions, market research, and beyond. This introduction provides an overview of OMR sheet evaluation using image processing, highlighting its significance, challenges, and recent advancements.

In traditional evaluation methods, manually grading paper-based assessments is time-consuming, error-prone, and resource-intensive. OMR technology addresses these challenges by automating the data capture and analysis process. OMR sheets, typically printed with bubbles or checkboxes corresponding to answer options, are scanned using specialized hardware or conventional office scanners.

Image processing algorithms then analyze the scanned images to detect and interpret marked responses. This process involves several critical steps, including image pre-processing to enhance readability, segmentation to isolate individual marks, feature extraction to capture relevant data, and classification to determine the selected responses.

One of the primary advantages of OMR sheet evaluation using image processing is its scalability and consistency. Whether processing hundreds or thousands of sheets, OMR systems can deliver rapid and accurate results, reducing the burden on educators and administrators.

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However, despite its numerous benefits, OMR sheet evaluation presents several challenges. Variations in scanning quality, paper orientation, noise interference, and handwriting styles can introduce errors and affect the accuracy of the evaluation. Additionally, the processing of skewed or distorted images, multi-page forms, and real-time requirements pose further challenges to OMR systems.

To address these challenges, researchers and practitioners have continuously explored novel image processing techniques and algorithms. Recent advancements in machine learning, deep learning, and computer vision have enabled significant improvements in the accuracy and robustness of OMR systems. By leveraging these advancements, OMR systems can adapt to diverse environments and handle complex scenarios with greater efficiency.

In summary, OMR sheet evaluation using image processing represents a transformative approach to streamline assessment processes and enhance accuracy and efficiency. This paper explores the methodologies, challenges, and recent advancements in OMR technology, providing insights into its applications across various domains and its potential to revolutionize the way assessments are conducted and evaluated.

II. PROPOSED WORK

A. Creation of database

For the creation of a database for OMR sheet evaluation using image processing, a reference or database image is essential. This image serves as a template containing all correct answers and is typically obtained from an institutional site. The processes performed on this database image include RGB to Grey conversion, padding, edge detection, median filtering, and complementing of the image. These operations prepare the database image for comparison with other input test images. The resulting processed image serves as a standardized reference for evaluating and comparing responses from different test sheets.

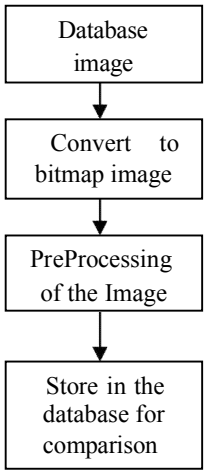

Fig2.1:Creation of database

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B. Processes perform on an input image

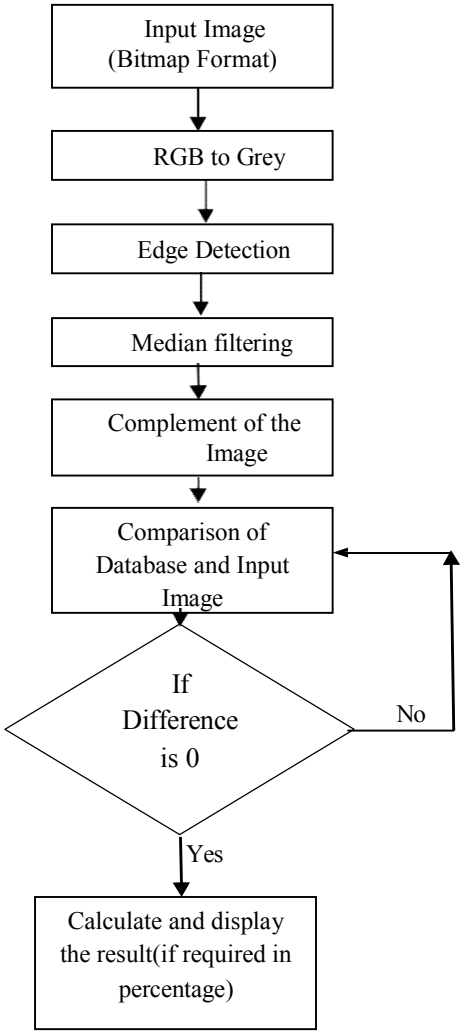

Fig 2.2: Flowchart for input image processes

In the process of OMR sheet evaluation using image processing, several steps are applied to both the database image (representing correct answers) and the input image (student's answer sheet). The input image, typically containing various colours, undergoes RGB to grey conversion to standardize it. Padding with arrays of ones and zeros is applied to facilitate edge detection and median filtering for noise reduction. The grayscale image is then complemented to convert it into a binary black-and-white format, aiding in comparison with the database image. Differences between the complemented database and input images are analysed: a zero difference indicates matching answers, which increments a counter for accurate evaluation. Each pixel's intensity is examined, and if it exceeds a threshold of 150, it's considered a marked answer; otherwise, it's treated as unmarked. These processes culminate in the generation of a resultant image, enabling the calculation of results or grades based on the detected markings.

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C. Block Diagram of the System

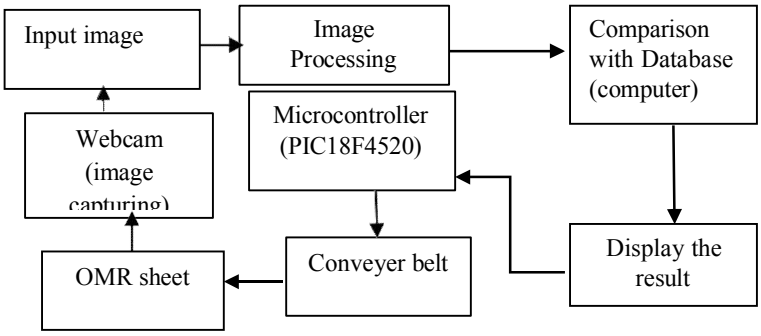

Fig 2.3: Block Diagram of OMR sheet evaluation system

In the automated OMR sheet evaluation system, the process begins with placing the OMR answer sheet on a conveyor belt, which is controlled by a microcontroller. When the sheet reaches the desired position under the webcam, sensors accurately trigger the webcam to capture a snapshot of the sheet. This snapshot serves as the input image for further processing. The input image undergoes the described processes, including RGB to gray conversion, padding, edge detection, median filtering, and complementation, to prepare it for comparison with the database image containing correct answers. The system then compares the processed input image with the database image, analyzing differences to determine the student's responses. This automated process streamlines OMR sheet evaluation, ensuring accuracy and efficiency in grading assessments.

III. RESULTS AND ANALYSIS

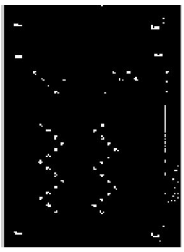

Fig.3.1 Input Image

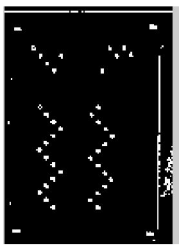

Fig.3.2 GreyImage

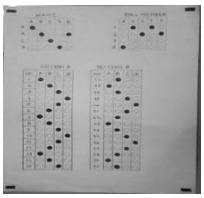

Fig.3.3 Edge Detection Image

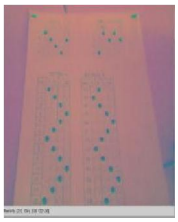

Fig.3.4 Median Filtered Image

.Figure 3.1 represents the input image, which could be either from the database (containing correct answers) or from a student's response sheet. This image is initially converted into grayscale, as depicted in Figure 3.2. Subsequently, the grayscale image undergoes edge detection processing, resulting in Figure 3.3, where edges and boundaries are emphasized. Following edge detection, a median filter is applied to the image, as shown in Figure 3.4. This filtering process enhances the image and helps to make it more distinct and unique, facilitating subsequent analysis and comparison tasks in the OMR sheet evaluation system.

IV. PERFORMANCE EVALUATION

This framework has an exactness of 88% and can effectively distinguish the checked circles or bubbles within the OMR (Optical Check Acknowledgment) and can effortlessly be supplanted as a starting evaluating apparatus for instruction

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purposes and numerous more. The time had taken by the proposed framework is approximately 60 seconds max, which implies ready to spare on time and the taken a toll to invest in an overwhelming OMR sheet filtering machines. The as it was disadvantage of the framework might be the tilt within the sheet whereas putting on the transport belt which can afterward be rectified.

V. CONCLUSION

These systems proposed can be used to supply a proficient way to assess the answers sheets of different exams conducted over the globe. It, too, gives a cheap strategy of the client who does not need to contribute parcel of capital in an overwhelming apparatus. Time is being the foremost significant figure of each human life this framework has made a point to spare it. The demonstrated time for the framework to assess the paper is 60 seconds max. The calculation checks for the blunders and gives the marks have gotten by the candidate. Basic strategies of getting the picture, changing over it into gray scale, getting the intensity of each bubble, calculating it, and expanding its number have been included. This framework proposed features a wide scope in future and can be of incredible offer assistance when tackled for the purposes of study, participation, and numerous others.

VI. ACKNOWLEDGMENT

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REFERENCES

[1]. Sanguansat, P. (2015). "Progressions in Vigorous and Temperate Optical Check Acknowledgment for Mechanized Information Passage." IEEE Exchanges on Mechanization Science and Building, 9(1), 62-66.

[2]. Nguyen, T. D., Manh, Q. H., Minh, P. B., Thanh, L. N., & Hoang, T. M. (2011). "Improvement of an Proficient and Dependable Camera-based Multiple-Choice Test Evaluating Framework." Procedures of the IEEE Universal Conference on Progressed Innovations for Communications.

[3]. Hasan, R. H., & Abdul Kareem, E. I. (2015). "Improved Picture Handling Procedures for Optical Stamp Perusing Frameworks based on Adjust Multi-Connect Design (MMCA)." Universal Diary of Cutting edge Patterns in Designing and Investigate, 2(7).

[4]. Sattayakawee, N. (2013). "Imaginative Test Scoring Procedures for Non-Optical Network Reply Sheets Utilizing Projection Profile Strategy." Worldwide Diary of Data and Instruction Innovation, 3(2).

[5]. AL-Marakeby, A. (2013). "Utilization of Multi-Core Processors for Camera-based Optical Stamp Acknowledgment Frameworks." Worldwide Diary of Computer Applications, 68(13).

[6]. Rakesh, S., Atal, K., & Arora, A. (2013). "Advancement of a Budget-friendly Optical Stamp Peruser." Worldwide Diary of Computer Science and Manufactured Insights, June.

[7]. Tiwari, S., &Sahu, S. (2014). "Location of OMR Sheet Altering utilizing Scrambled QR Codes: A Novel Approach." Procedures of the 2014 IEEE Worldwide Conference on Computational Insights and Computing Research