



## ENHANCING E-ASSESSMENT WITH IMAGE PROCESSING FOR EXAM EVALUATION

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### Abstract

There has been a steady increase in the usage of multiple choice questions (MCQs) to evaluate an individual's knowledge. Both human grading and OMR technology are options for these tests. Having an OMR machine in real-time under all conditions is challenging, and manual correction is costly in terms of time and inaccuracy. Our proposed solution addressed these shortcomings by using a digital image processing method to correct OMR sheet responses. Our purpose is to use Open Source Computer Vision Library (Open CV) to process and rectify the responses. Python is the best language for using this strategy because of the Open CV library.

**Index Terms:** - Open Source Computer Vision Library

### 1 Introduction

The need for digitalized paper-based information storage is rising in the modern world. This problem also affects education, even though it doesn't always get enough attention. However, many aspects of education can be made much simpler, easier, faster, more enjoyable, and (partially) automatable by making effective use of modern technology. The need for digitalized paper-based information storage is rising in the modern world. This problem also affects education, even though it doesn't always get enough attention. However, many aspects of education can be made much simpler, easier, faster, more enjoyable, and (partially) automatable by making effective use of modern technology. For the majority of its subjects, the majority of educational institutions still employ traditional teaching and assessment techniques. Even while it has garnered considerable attention in the past, education digitization has only just started to gain traction. Computer-based evaluation techniques also exist, albeit they are not the main feature of e-learning platforms. Therefore, for subjects that demand this kind of evaluation, traditional examination models are typically used. As this is the main topic of this post, we will now discuss the paper-based examination procedure. The word "e-assessment" refers to electronic assessment since exam papers that students fill out after the exam are marked using software. Respondents to multiple choice questions (MCQs)



are asked to choose only the correct answers from a list of possibilities. MCQs are one sort of objective evaluation. The most typical uses of the multiple choice format are in elections, market research, and educational exams, when a respondent must choose between a large number of candidates, parties, or policies. In this work, we employ image processing in an extremely straightforward way to do MCQ correction. It attempts to alleviate a great deal of the obstacles to multi-choice assessment rectification. Here, we're using array format to edit a user-uploaded response sheet that was photocopied. Obtaining the answer and image that the user has shaded is the basic idea. The OpenCV library for Python is available for image processing. The best outcomes are obtained when we combine Python with the Django framework. A programming function package particularly designed for real-time computer vision is called Open CV. The topics that follow are arranged to help explain how to use this tactic.

## 2. Literature survey

Classifications of related systems The primary classification is based on the main functionalities of the given system as follows:

1. Computer-based examination and assessment systems
2. Computer-based assessment systems

It is trivial that the former set of systems provides a broader answer and even appears to be better and easier to complete the entire process this way, but it is not in every instance for certain, and in most cases it is not even worth it. Though it indicates that the majority of relevant work in the preceding ten years has discussed these types of systems, since these should be the true future of computer-based education.

Nowadays, the examination element of these systems is too pointless, and it can only fully replicate the way of its paper-based version in rare circumstances (e.g., multiple-choice tests). For example, in the United States, they sought to put these systems in every school and make them mandatory. Both of the previously mentioned system categories can be seen from a different perspective because they are both assessment systems with so-called evaluation intelligence. as stated by the evaluation intelligence The following is the classification:

- Manual evaluation, in which the answers are evaluated manually by human resources.
- Semi-automatic evaluation, in which the system evaluates the majority of the solutions automatically while the teacher evaluates a smaller portion of them.
- Automatic evaluation, the system can evaluate all responses automatically.

Computer-based examination and assessment systems:

As previously stated, the majority of the linked work is of this type of problem-solving method, however just one of these is emphasised below. The explanation and summary of the the highlighted system is shown below. The eMax system, developed at Obuda University's John von Neumann Faculty of Informatics, enables quasiautomatic evaluation for short text answer questions and particular mathematical assignments. The text can be any input from a keyboard, but there is a specified syntax for the math jobs that must be followed to achieve the optimum efficiency of the evaluation algorithms. Because of this limitation, many students were unable to adjust to the system's ways, and the system only proved effective in a few circumstances, resulting in the software's envisioned capabilities not being realised. Today, the system is still used, although not in the same way.

**Computer-based assessment system:**



There are several works in this category of assessment systems as well, but not all of them are completed or just tackle a specific problem in this manner. As previously stated, only one of these is highlighted below, although there is no personal link to it this time. It is simply one of the best ones discovered during the inquiry.

The title of the article that will be discussed already shows its approach: "Blended e-assessment: Migrating traditional exams to the digital world." It assures the reader of the purpose of the work; it is nearly identical to mine. It makes a compelling case for the use and significance of such software, and even displays the completed software, as well as a summary of several years of experience with the system based on the experiences of students and teachers. It also includes certain significant solutions in the software itself, which largely serve to make it more user-friendly, but as a result, some of my early concerns about such software were confirmed.

### **3 Implementation Study**

The Multiple Choice Question Pattern is most commonly used to analyse the relevant details. Currently, optical mark recognition (OMR) is most commonly employed to answer multiple-choice questions. OMR sheets, on the other hand, are rectified by specialised machines to correct the answers. Handling the data manually will be cumbersome, and the accuracy will be called into doubt. To be excellent, the physical job required more effort, time, and concentration. The current system has a number of drawbacks.

#### **Proposed Methodology**

The suggested system takes a digital image of the answer sheet in the specified pattern and uploads it to the specified system. To correct the response, digital image processing is employed to retrieve the answer sheet and read the image. This strategy avoids both machine and human dependency to a large extent. This solution maximises efficiency by combining the Django framework with Python to perform image processing. The open CV library, which is available to access the image to receive it as a matrix and make that highly effective to deal with rectifying replies in the image, has had the most influence.

#### **Advantages:**

- The suggested system is machine agnostic. People management is both simple and effective. It is also less expensive because no specific machines are required, and the resources required are minimal. As a result, interacting with photos makes it incredibly simple to gain access.

**1. ARCHITECTURE DIAGRAM**

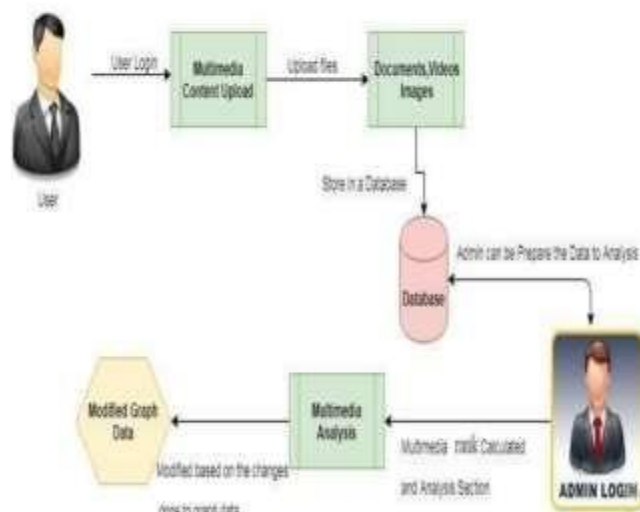


Figure 1: System Architecture

**4. Methodology**

The System Design Document describes the system requirements, operating environment, system and subsystem architecture, files and database design, input formats, output layouts, human-machine interfaces, detailed design, processing logic, and external interfaces.

This application has four modules which are listed in the following.

1. Student Management
2. Exam Assessment
3. Result Details
4. Graph Analysis

In this project there are four modules to achieve our expected result. These are the major functionalities of the project. The registration and login process are important to access the project for both users. There are two users’ admin (Teacher) and user (Student).

**1.Student Management**

The students are not directly registered. Faculty is uploading the bulk details of students with details of name, student id, class and so on. Students will receive manually student id from faculty manually. With the username and student id as password, student can authenticate to access the details. The details can be modified by students not by faculty at the same time student cannot modify their student id which given to them.

**2. Evaluation using Image Processing**

The Faculty will upload the students' answer sheets as photos. Those photos can be evaluated with the help of Digital Image Processing technique. It can be achieved with the help of python’s opencv library. The matrix form is created with the answer key to identify and give the result as per the photos.

**3. Result Analysis**

The results from the above module are handled by some math functions to put those values into calculations. Get the total marks accomplished by students and average of the student can be calculated by the auto functionalities and displayed to users.

**4. Graph Analysis**



The graph analysis is done by the values taken from the result analysis part and it can be analyzed by the graphical representations. Such as a pie chart, pyramid chart and funnel chart here in this project.

## 5 Results and Evolution Metrics



**Fig1:** In above screen enter username as 'faculty' and password as 'faculty' to login after login will get below screen



**Fig2:** After faculty login will get above screen



**Fig3:** In above screen click on 'Upload MCQ Paper' and enter student name and upload question images



**Fig4** In above screen click 'ok' button to upload image



**Fig5:** In above screen selected one image now click open to process that image



**Fig6:** In the above graph we can see marks obtained by each student. Similarly students can see their marks by entering their name. See below screen



**Fig7:** In above screen click on 'Student View Marks' button to get below dialog box

## 6 Conclusion

The E-Assessment software system that is included is in alpha, meaning that the previously envisaged features have been developed to a certain extent and are operational. One desktop application included with the package lets users create exam sheets, view and edit the database, add images, and fix tests. The structure that is now being built offers a good glimpse of how the full system will be assembled. The software can only be used offline for the time being. Students have already completed more than a hundred exam papers expressly for the purpose of evaluating the system's functionality. The system's image processing component yielded satisfactory results, seemingly processing even enormous amounts of photos quickly enough. Without a doubt, the E-Exams software system has enormous potential for expansion in the future. By seizing this opportunity, it might be rather influential once it is finished and distributed. major role in the education revolution's digitalization in the



future. Rectification of multiple-choice questions (MCQs) is a major assessment approach in use today. The MCQ Test format is very difficult since it uses a special method for giving and correcting tests. The Django Framework and image processing are used in the suggested method to address and resolve the problem. These two tactics proved useful in addressing MCQ Test Correction problems.

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