

## OMR Sheet Scanner using Image Processing in Android

*Seema Shivapur<sup>1</sup>, Husna Tabassum<sup>2</sup>, Najmusherh J<sup>3</sup>, Deepak N R<sup>4\*</sup>*

*<sup>1,2,3</sup>Assistant Professor, <sup>4</sup>Professor*

*Department of CSE, HKBKCE, Bangalore, India.*

*\*Corresponding Author*

*e-mail Id:-deepaknrgowda@gmail.com*

### ABSTRACT

*Optical imprint acknowledgment is the method involved with distinguishing presence or nonattendance of an imprint in a foreordained position. OMR is currently utilized as an info gadget for information section. Examining OMR sheets is normally done by a scanner. This project aims to overcome the use of scanners to scan OMR sheets by using a smartphone to capture the image of the sheet and send it to the server which will process the image and find the marked zones compare values, then check with input key and show the total. The data is then stored in the MongoDB. This project will utilize the availability of smartphones with almost everyone to make this process simpler by dividing the task into smaller tasks among the assigned faculty. Further with smartphones coming with better cameras we can get very accurate results than before. Also the project is implemented in flutter using dart so the app can be used for iOS also. The app is lightweight as the processing is done in the back-end. The project is an innovation on how to use new technological advancements in an innovative way to solve problems at their simplest level thereby reducing overall complexity of the system. The results are stored in JSON format.*

**Keywords:-**OMR, Flutter, Dart, MongoDB, Python, Image processing, Python Flask, Android Studio, JSON, PIL, Opencv.

### INTRODUCTION

OMR is technology which helps in capturing human marked data from document forms. Nowadays OMR sheets are used in common entrance exams , feedback forms , aptitude tests, and also in many other competitive examinations. Since innovation in these in terms of scanners has reached a saturation we need to go in different directions in order to innovate and make this better and efficient.

Almost everyone has access to smartphones and these are being used to scan documents creating pdf files etc. Because of one major innovation that being its camera. Smartphones are coming with better and more powerful cameras as camera sensors are improving and are being made smaller and better.

Hence we can make use of this progress and get better high quality images from this image sensor which almost everyone has in their pocket. Using its power and high definition pictures now we can try and replace scanners with them to scan OMR sheets. As with future innovations we can get more accurate results.

The internet is faster and its availability is wide which makes it easier to capture and send these images to the back-end for efficient image processing rather than have them processed in the smartphone itself. By using smartphone we come across another issue that is which one to make it for android or ios. We can solve this problem with new innovative development software's which allow us to make apps for both android and ios flutter being one of them. These make it easier for

developers and reduce their burden as they now have no need to make apps differently for android and ios. Using all these technological and software advancements we can make the OMR sheet scanner using smartphones a reality.

The app will make use of the camera of smartphone send the image by means of a http connection to the back-end and make use of rich image processing libraries provided in python such as python image processing, opencv to process them accurately and store the result in a MongoDB. These new tools make one thing clear that now is the right time to try these new changes. The need and room for innovation in this area is vast and is often overlooked.

### **EXISTING SYSTEM**

The current system makes use of scanners which are present at a facility to which the OMR sheets are transported to. The OMR sheets are collected from students separated according to any criteria if present and then sealed in envelopes. These envelopes are then transported to a facility where the scanners are present. These scanners are connected to systems. The sheets from the envelopes are then fed into these scanners which take them one by one and scan each sheet individually.

The scanned sheets are processed by the system and marks found are detected and the options corresponding to those marks are found. These options are then checked with the key input and result is tabulated. The results are then uploaded either by a person or a software. These are also stored on databases for student access. The time required to transport these sheets and then upload the results is a lot and sometimes these sheets can get misplaced causing big problems to students. There is also the need of trained people to operate these scanners and to upload the results properly. Also there is huge maintenance

costs which also come with using these scanners. Scanners may get damaged which will cause a delay. Scanners require a facility where they will be housed. These facilities must be maintained well. Also these scanners are expensive. If any result needs to be reevaluated it becomes inefficient to use a scanner for few copies. The scanners in case of exams scheduled twice in a year the rest of the time remain unused, Requiring maintenance even when not operational.

### **METHODOLOGY**

#### **Proposed System**

The system comprises of a smartphone in which an app is installed which will be used to capture the image of the OMR sheet. After capturing the image we can crop the image further increasing the accuracy. After cropping the image by clicking or tapping on the tick mark sign the image is sent to the back-end in the form of bytes.

The image is then received by the python flask server in the form of bytes in JSON format. The bytes data is extracted from the JSON packet and then the image is redrawn and saved on local disk till use. The image is then processed and the result is calculated. The result is then stored on to MongoDB. Before storing the roll number is checked to see if the sheet was already scanned.

#### **Implementation**

The front-end is made using flutter IDE in android studio. The app is written dart programming language. The image captured and cropped is converted into bytes then added to JSON variable. The JSON variable is then sent via HTTP POST method to the back-end.

The JSON data is converted into a python variable and then the image is drawn. After drawing the image is rotated and then stored onto the local machine in PNG

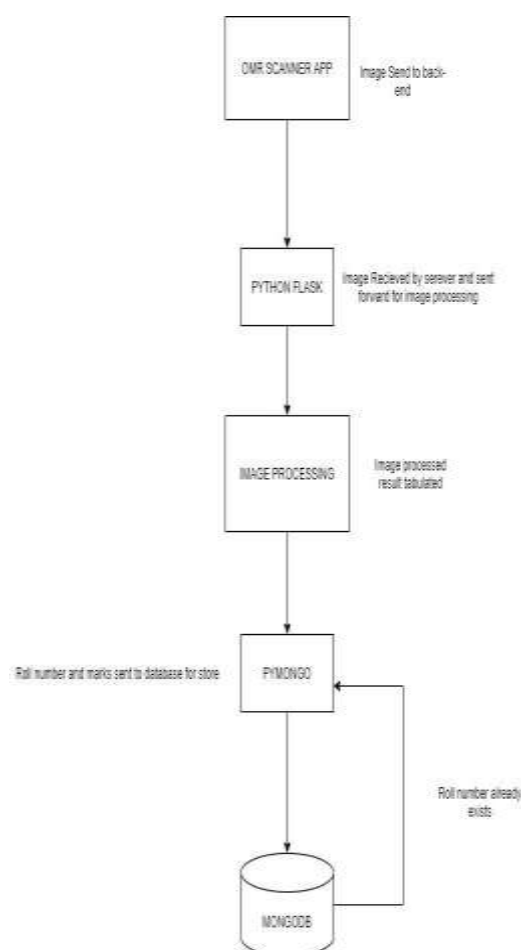
format.

The image is loaded and converted to greyscale. After this Gaussian Blur is applied and then image canny function. Then the contours of the image are found. Different boxes in the image are placed as variables in an array in increasing order of size.

The first being the roll number box the next being the options 1 to 10 box and then the options 11 to 30 box. The boxes are each processed as individual images. The different sizes of boxes make it easier to process the image.

Perspective transform is applied on the image box, then wrap perspective is applied according to predefined width of the image. After applying these functions to each of the boxes a new image is obtained for each individual box. These images are converted to greyscale then threshold function is applied on them with thresh binary inv set as 1.

Then each box undergoes splitting into smaller boxes and placed in an array. These individual boxes pixels are calculated and compared with a threshold to see if the option is marked or not.

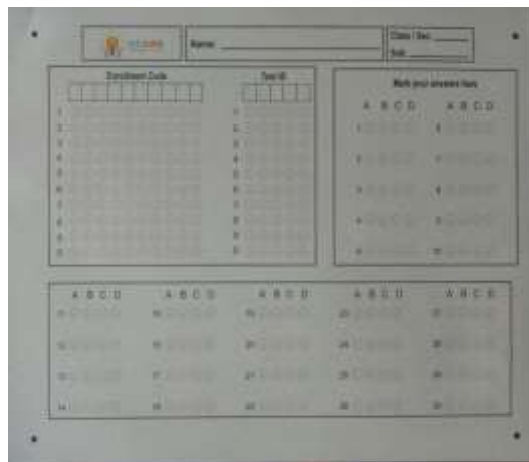


**Fig.1:-Flow Diagram**

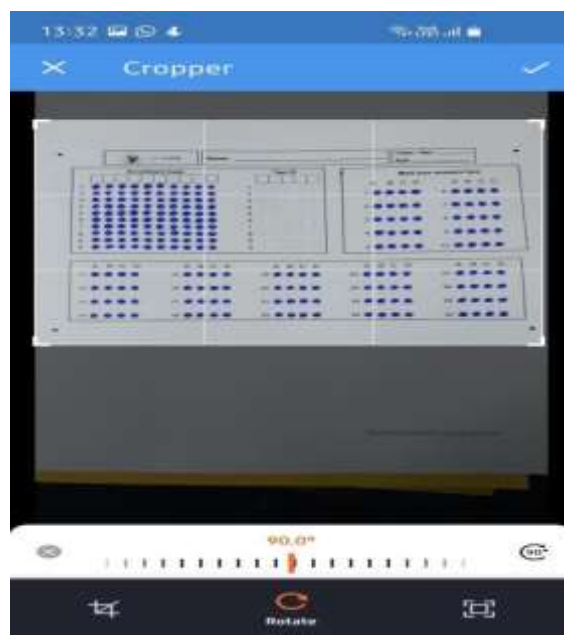
The worth and roll number is then changed over to JSON Then assuming that choice is chosen then it is set in a python list.

Subsequent to finding for all choices the rundown is contrasted and the vital qualities and result is determined.

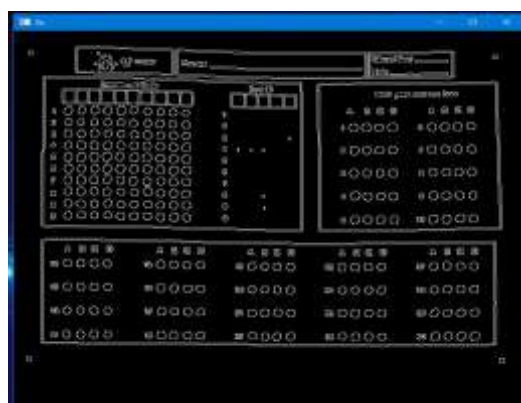
## EVALUATION AND RESULTS



*Fig.2:-OMR Sheet used sample*



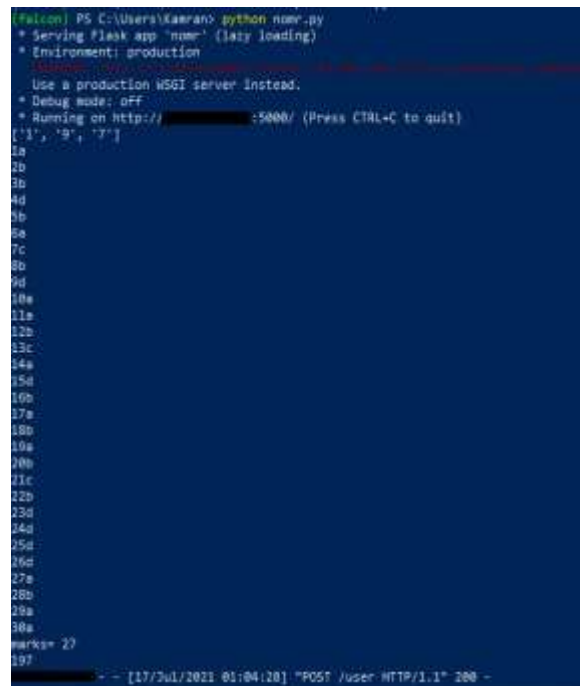
*Fig.3:-Image capture and cropping from app*



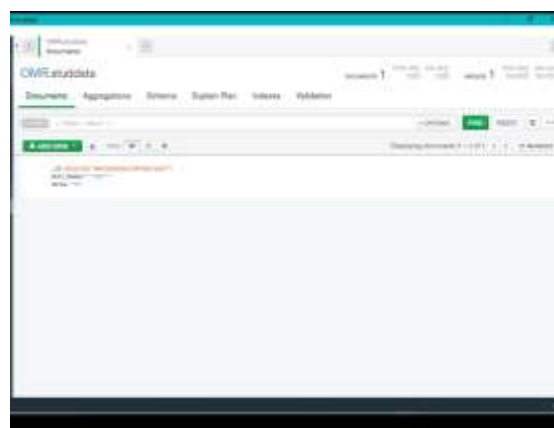
*Fig.4:-Roll Number image inversion*



*Fig.5:-Mapping all options 1-10*



*Fig.6:-Image Processing Results*



*Fig.7:-Results Stored in MongoDB*

The accuracy is increased by mapping each individual marks and not just traversing some pattern. Although time consuming it gives accurate results in some lighting changes.

But if the change is too much we encounter errors. The points are detected using a if else so that if two or more bubbles of the same option are marked priority is given only to the first that is 'a' and remaining are discarded.

By mapping the points individually we can set pixel density lower so it can accurately detect marked bubbles. The type of sheet used here has boxes of different sizes which makes it easier to map options based on box size else if they were of same size the option order of mapping would be wrong therefore the end result would be wrong. The roll number is also stored in a list which is then converted to a string and displayed. After all this is done the result is then stored onto the MongoDB.

There is code written to check if the roll number is stored before in order to remove redundancy. This allows the user not to worry about redundancy when scanning as the code takes care of it. The use of image cropper increased the accuracy by a huge margin as the surrounding unwanted parts of the image was removed. It is very important to have good lighting and capturing the image at a proper angle to prevent inaccurate results. If the lighting is proper along with capture angle we get accurate results almost 99% of the time. By mapping each bubble we remove the issue of bubble mark from the other bubble.

## CONCLUSION

The system being used here is still in its budding state, this can be further enhanced by adding flash while capturing image of sheet which would mean almost accurate results in all forms of

environments. The advantage of using this system is that it reduces the burden on a single person or machine and divides the task among several individuals who will also not find it very difficult to operate this. The result is not shown to the user to maintain confidentiality. In case of any errors only the admin can discard the sheet. Redundancy is removed.

The process of mapping the entire sheet is tiresome but once done it gives accurate results. Further the maintenance cost of scanner system to scan the sheets is removed, only the cost of server and its maintenance will be there. No need for year round maintenance of servers. No requirement to buy expensive scanner systems. Now any small college or university or school can easily create OMR tests and do them at a nice frequency without having to worry about cost. Allow everyone to conduct OMR tests and universities can be given a standard OMR sheet software at a lower cost with cost varying with customization. By using this OMR scanners sheets are not limited to a certain class of universities but rather any school or college or university can make use of this and reduce the burden on the faculty. The entire system of transporting the sheets and maintaining their safety prevention of tampering could be achieved by using the system shown. Everyone possess a smartphone nowadays meaning the app can be used by the faculty quite easily. The need for training to use an equipment is removed since everyone knows how to capture an image.

The requirement of having a facility for keeping scanner system is removed. The need for transportation is removed. The ease of results automatically getting uploaded on the database is also one of its advantages. No faculty will have to worry about what is going on in the software but rather just capture the image.



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