Optimizing the Limitations of On-Screen Marking System

Under

Ministry Of HRD

At

Smart India Hackathon 2017 Grand Finale

Tech-Matrix

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- **Aim:**

The aim of our project is to optimize the existing OSM system and making it effective through AI technique.

- **Summary:**

The Show Stopper of this project is “Barcode Technology & AI”. Using this technology we are going to fetch the exact sequence of the questions attempted by the student. Not only this, we are also going to replace the conventional OMR system with the barcodes for the student’s details that are acquired for the conduction
of examination. Using this technology, we will have following merits.

1. Barcodes are more secure.
2. Student details will be safer than before.
3. Reduced cost incurred.
4. Smart Evaluation of answer book.

Once the barcodes will be decoded it will be easy to fetch the sequence of questions attempted by the students. Then the marking scheme will get arrange in the sequence fetched by the software.

Thus, the current OSM system will be now optimized for checking the answer sheet electronically, as well as the marking scheme generated for the evaluator will be in order same as attempted by the students.

Also, integrating AI technology with our software we are working to provide smart evaluation for the answer books. This would be done by decoding the scanned copies, extracting the content followed by its mapping with the sample answer. After head evaluator’s consent the final mark sheet will be generated.

- **Introduction:**

The whole process begins with students appearing for examination .The students will now, be allotted with the barcode containing their barcode containing their detail required by the examination board. They just need to stick that barcode on the answer sheet. After completion of the exam, they will be provided with the set of barcode stickers encoded with question numbers. The students will have to stick those stickers in the order they have attempted the questions in answer sheet. In case, the student makes mistake in sticking the barcode, then the invigilator would be provided with the set of stickers which will be distributed to students to overwrite the incorrect one. Then these copies would be sent to nodal centers where the scanned images of these copies will be evaluated and marks will be awarded. This would be same process as that of OSM system. The whole process will be monitored by the head evaluator for its effective implementation. Also, there will be a choice between the assessment of answer sheet through evaluator or smart evaluation through Artificial Intelligence.

- **Objectives:**

The objectives of our project are as follows –

1. To sequence the marking scheme as per the order of questions as attempted by the student.
2. To build up a secure environment by replacing OMR system by Barcodes system for storing students information.
3. To provide an additional facility for smart evaluation using Artificial Intelligence.
4. To minimize the chances of any inaccuracy confronted while assessment.
5. To design a monitoring system for the in-charge to check the evaluation process.
6. To give an efficient and easy evaluation environment to evaluators.

- **Status:**

The software that we have prepared uses scanned images as input. These scanned images are then processed and then barcodes are fetched. These barcodes are then decoded for getting the sequence of the questions as attempted by the students. This sequence is stored as a string in database and at the time of evaluation by the evaluator. **The marking scheme gets arranged in the exact sequence in which student attempts the questions,** which reduces the manual work for the evaluator, thereby reducing error possibility. We have created the interfaces for head evaluator and evaluator separately.
The head evaluator has an access to every answer copy and also has the right to send the copies for the re-evaluation. We have also prepared an interface for the evaluator where he can check the copies using the reference through Sample answers. The evaluator will assess the answer sheet as per the sample answer and will allot the marks per question simultaneously.
The fields in the marking scheme as well as the sample answers will get arranged in the order in which student has attempted the questions. Every field has been validated such that evaluator can't enter negative or more marks then the maximum marks allotted to the question and none of the fields should be left empty.
Now we are working a step forward to make our application work online. We are also working for the smart evaluation i.e. the evaluation through Artificial Intelligence which will not require any evaluator for assessing the copies. Using artificial intelligence we are going to convert the scanned images into text files and these text files will be assessed using the sample answers as reference by the software.

- **Novelty:**

1. **Barcodes-** As barcodes, are integrated to store more data in less space as well as they can't be manipulated, thus maintaining the security of the whole process.
2. **Artificial Intelligence-** For assessing smartly and allotting the marks as per the marking scheme, reducing the probability for any misinterpretation.
3. **No Additional hardware required-** Using Zxing API, we have reduced the cost of barcode scanning hardware by building a program which decodes the barcodes from image.

- **Work Plan:**

The first thing we ought to do is to make the whole application online using J2EE as platform, an update to our previous approach. Along with this we are providing separate environment for evaluator who will be assessing the answer sheets and head evaluator who will be monitoring the whole process.
Then we are planning to make use of artificial intelligence. To implement AI the first goal will be to achieve handwriting recognition for assessment of answer book through it. Once the image is decoded, by handwriting recognition API we will fetch the content of image into text. After it we will extract the sentences in that text and will cross check it through Google Natural Language API for any fault if it is there in the answer. Once the original text written by the student answer and sample answer is mapped, marks allotment will have to be automated based upon certain criteria.

Moreover, the technique will have to be implemented in such a way which will ascertain no redundancies in the answers written by student. In case of any deliberately foisted repetitions of points in the answer, the student will be awarded marks only for the first occurrence of the answer, thereby rejecting the later occurrence of the same point.
In the last month, gradually, our product will be analyzed and tested remarking any bugs to be removed and testing the software for glitches, if at all existing, in the software.
This is how we are planning to automate the evaluation process using Artificial Intelligence.

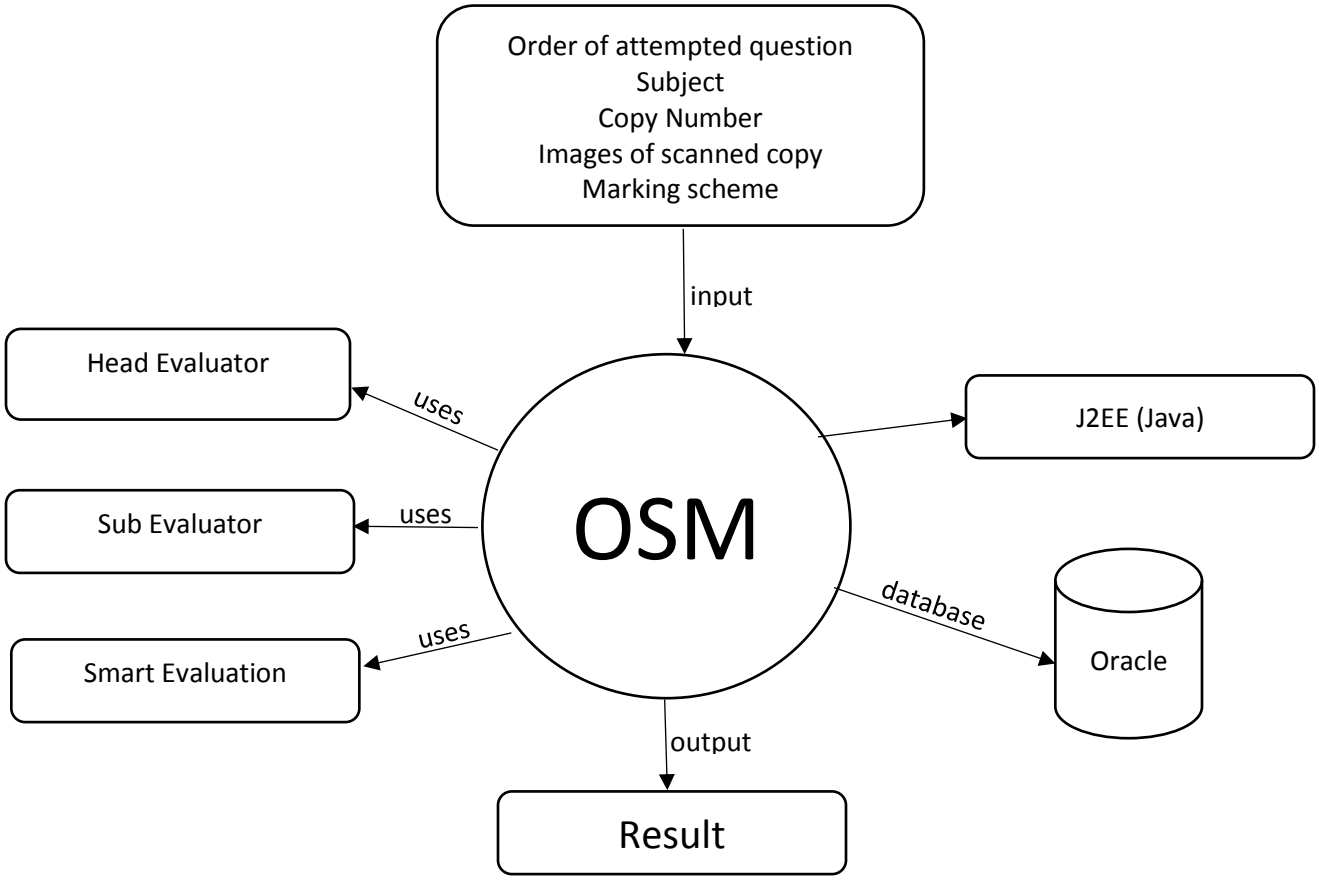
- **Open Source Technology Stack to be used**

We made use of NetBeans IDE 8.2, Oracle Database 11g Express Edition and SQL developer which are all open source softwares for implementation of our product.
API used- Zxing API, Google Vision API, and Google Natural Language API.

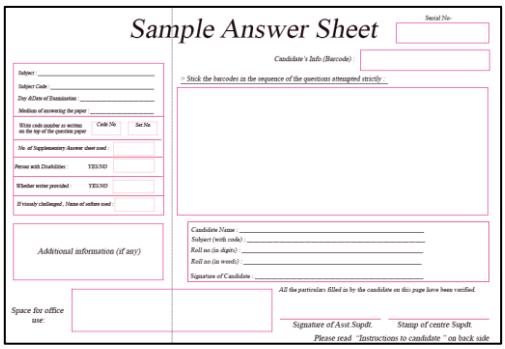
- **Any technologies that you used during SIH2017 that you wish to change/ alter? Why?**

Last attempt to our implementation focused on sheer working model of the product we intended to deliver. An adjunct to our project has been appended in order to extend the project scope online. With reference to which we will be using J2EE instead of core java that we used earlier and we also are on our way to implement AI in order to improve the efficiency of the overall product which can also be stated as an addition to the product.

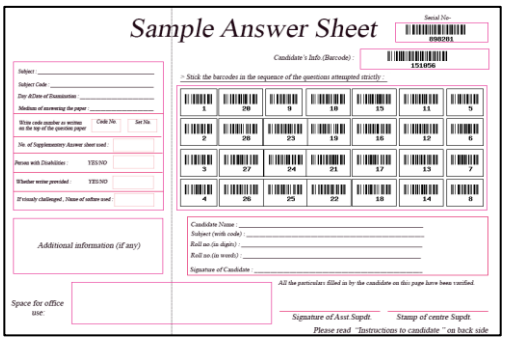
- **Architecture Block Schematic**



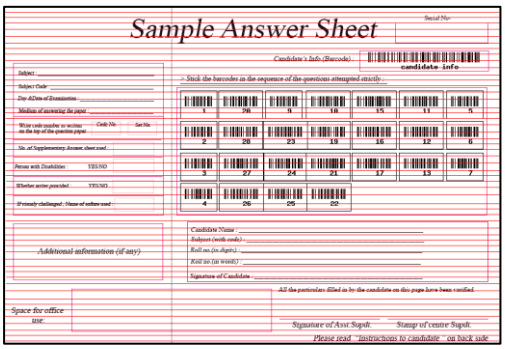
- **Flow Chart depicting the working of our Software**



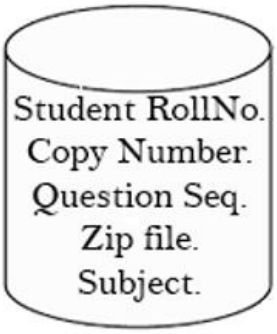
Blank Sample Answer Sheet



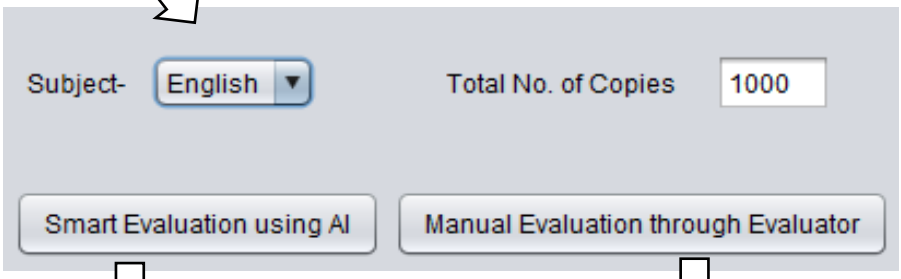
Barcode Sticked by Students



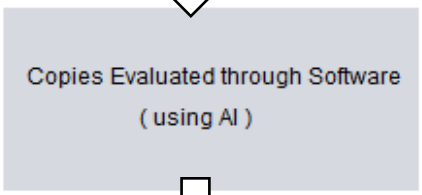
Scanning of Answer Sheet

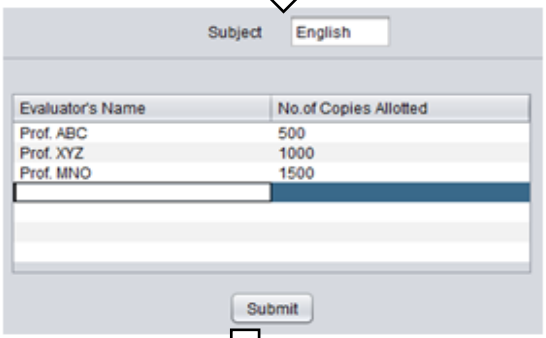


Databas

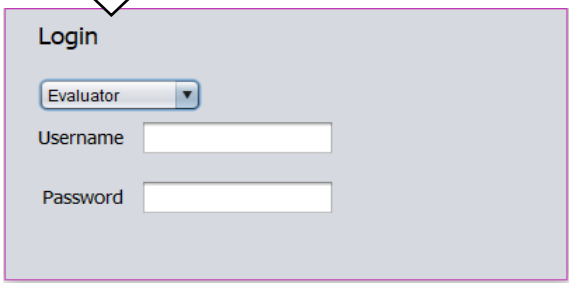


There will be a given choice whether the Evaluation is to be conducted using AI or by Evaluator





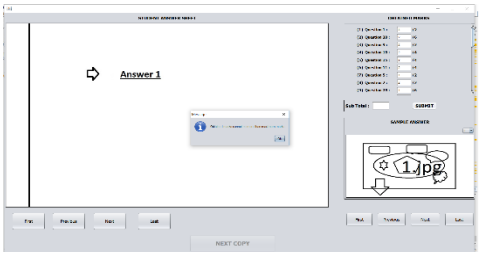
Distribution of Answer Sheets between the Evaluators

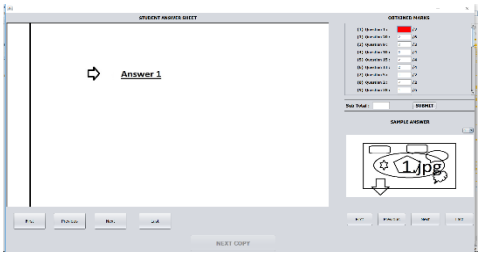


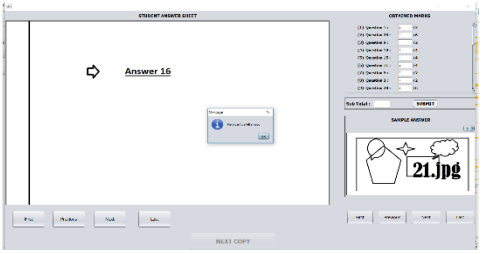
Login Window for Evaluator/Head Evaluator

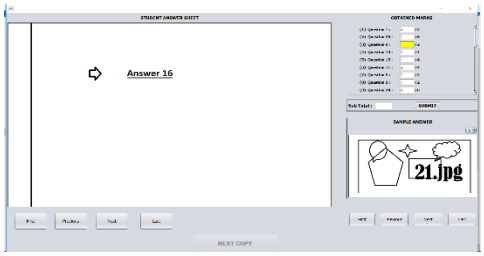
Evaluator's logged in Window

Evaluation

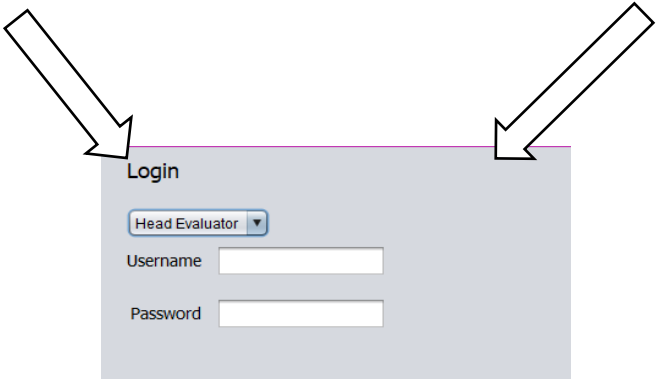




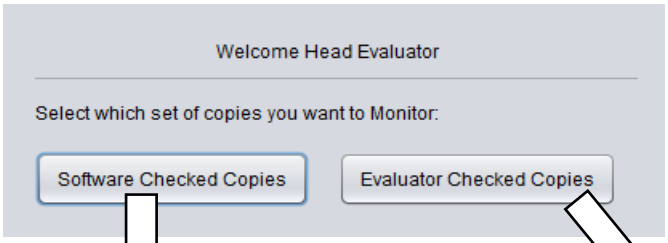




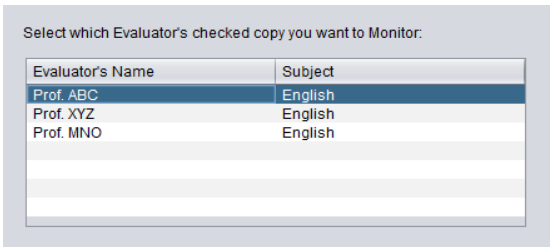
Various validation to prevent manual mistakes



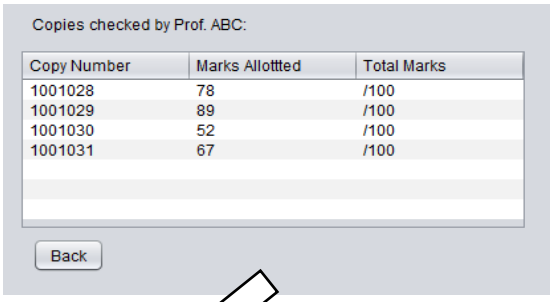
Head Evaluator's Login



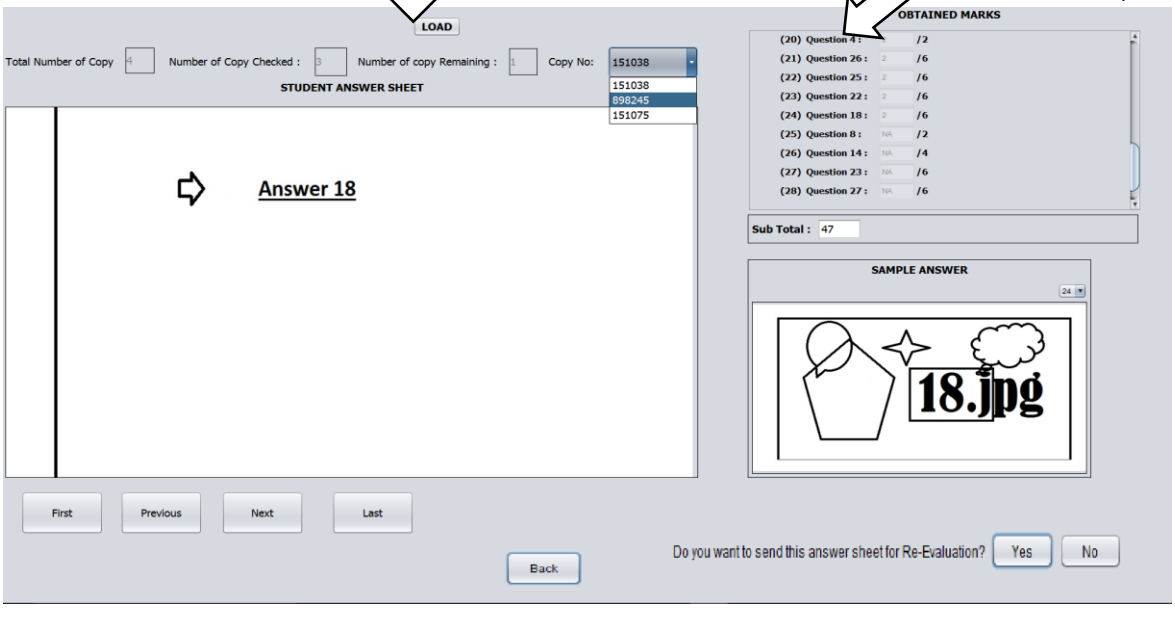
Choice whether the answer sheet he has to review is accessed by software or by Evaluator



Details of Evaluator's



Details of checked answer sheet by evaluator



Head Evaluator's review window to review checked answer sheets

- **Time line and responsibility of participating team**

	Particulars		Time (months)					
#	**Tasks**	**Team Member's Name**	**1st Month**	**2nd Month**	**3rd Month**	**4th Month**	**5th Month**	**6th Month**
1	Feasibility Test For Modules and exploring new Requirements	Mahip Modh						
2	Prototype designing and Detail designing.	Mradul gupta						
3	Development and implementation of Modules.	Burhanuddin Saify						
4	Development and implementation of Modules.	Neeraj Vyas						
5	Development and implementation of Modules.	Priya Parwani						
6	Testing glitches and bugs.	Jatin Telang						

- **Comprehensive budget**

Budget requirements (total as well as individual institutions/laboratory along with monthly break-up covering manpower, travel, contingencies, overheads, others (if any) and equipment for the 6 months project duration)

(***Rs. in thousands***)

Head of Expenditure	**1st Month**	**2nd Month**	**3rd Month**	**4th Month**	**5th Month**	**6th Month**	**Total**
	Recurring						
Travel	2320*6	2320*6	2320*6	2320*6	2320*6	2320*6	13920*6=Rs.83,520
Contingencies	1000	1000	1000	1000	1000	1000	6000
Other research expenditure (e.g. Outsourcing)							
	Non-recurring						
Equipment and accessories							
Licensing cost (for using proprietary technology, if any)							
Total							Rs.89,520

**** In addition to this, team members will be paid a stipend by the concerned ministry/ department during the period of the project.*

Note:

1. **The estimated amount in the travel section of the above table is the Fare of 3 tier AC from Indore to Delhi.**
2. **The Fare listed is for two way travel.**
3. **We have listed the amount considering that all the 6 team member will travel to Delhi every month.**
4. **Thus the amount that will be needed is only to travel from Indore to Delhi, that too according to your schedule. Hence The Traveling amount may vary.**
5. **Refrence link of the estimated fare-**

- http://www.indianrail.gov.in/cgi_bin/inet_frenq_cgi.cgi
- http://www.indianrail.gov.in/cgi_bin/inet_frenq_cgi.cgi
- https://railways.makemytrip.com/railways/railListing?trackingId=9EYM6DRI3U1496132465759&checkTrainRoute=true&date=5%2F31%2F2017&returnDate=5%2F31%2F2017&srcStn=INDB&srcCity=&destStn=DEE&destCity=&trip=oneWay&classCode=3A&FD=false&FC=false&__checkbox_FD=true&__checkbox_FC=true&affiliateId=&channelId=
- https://railways.makemytrip.com/railways/railListing?trackingId=9EYM6DRI3U1496132465759&checkTrainRoute=true&date=5%2F31%2F2017&returnDate=5%2F31%2F2017&srcStn=DEE&srcCity=&destStn=INDB&destCity=&trip=oneWay&classCode=3A&FD=false&FC=false&__checkbox_FD=true&__checkbox_FC=true&affiliateId=&channelId=

- **References:**

1. **Google Vision API-** https://developers.google.com/api-client-library/java/apis/vision/v1
2. **Google Natural Language API-** https://developers.google.com/api-client-library/java/apis/language/v1
3. **Zxing Master API**- https://github.com/zxing/zxing