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Design Project Report

on

Live Detection and Evaluation of a Document

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Abstract- Examination has been part of every educational system as well as non-educational organizations. Most of the competitive examinations are conducted online for years. Nowadays in the era of the COVID-19 pandemic schools, institutes, universities are also encouraged towards taking online examinations. An online examination can be conducted in both manners, objective as well as subjective. The developed system over here will be helpful for the evaluation of the subjective part examination. Here, the document/answer sheet will be scanned at the time of writing the answers. Both webcam, as well as phone camera, can be used. The evaluation is done on the basis of the keywords that the answer must include in it.

I. INTRODUCTION

When the examination is taken in the objective mode only, it is easy to do an evaluation as the answers are installed in the application/on the machines; therefore the application will check it and show the grades/marks according to those stored answers. But when it comes to the subjective mode, an evaluator is supposed to check the checked copies manually (i.e by reading all the copies) and then provide the marks. Hence, this system will help an evaluator in such a way that the scanned document will be evaluated in the system on the basis of the keywords evaluator has added. Therefore, we can say that instead of manual it will be done automatically by the system.

The developed system here will also be helpful for the students writing the examination. It is a time consuming process when a student writes first and then scan it and makes a pdf document of it. This system will scan the document/answer sheet when students are writing the answer and after completion, it will be sent to the Evaluator. Therefore, a student can get more time to write.

However, for our project we mainly focused on live detection and evaluation of a document/ an answer sheet as well as the accuracy of detections of handwritten letters.

In one it can be said that the proposed system is a system that seeks to implement an application which will be able to evaluate the subjective answer to a question in the live manner.

II. LITERATURE SURVEY

The handwritten digit recognition problem becomes one of the most famous problems in machine learning and computer vision applications. Many machine learning techniques have been employed to solve the handwritten digit recognition problem.

OCR is used for **handwriting recognition tasks** to extract information. A lot of work is going on in this field.The very recent and interesting application is made by the company Microsoft. Microsoft has come up with an awesome Mathematical Application that takes as input a handwritten mathematical equation and generates the solution along with a step-by-step explanation of the working.

Python-Tesseract which is also referred to as Pytesseract plays an important role here , for the handwritten character recognition. Python-tesseract is an optical character recognition (OCR)[1] tool for python. That is, it will recognize and “read” the text embedded in images. Python-tesseract is a wrapper for Google’s Tesseract OCR-Engine.

.By implementing the referred research paper, we learnt that it’s no secret that Tesseract is not perfect. It performs poorly when the image has a lot of noise or when the font of the language is one on which Tesseract OCR is not trained. Other conditions like brightness or skewness of text will also affect the performance of Tesseract.We have tried to overcome the mentioned challenges and get the best level of accuracy here.

III. THE PRESENT INVESTIGATION

We successfully overcome the challenges mentioned above for accuracy in our system. The components require to implement the system :

- openCV
- Pytesseract
- Phone Camera/Webcam(iVcam)
- Tkinter

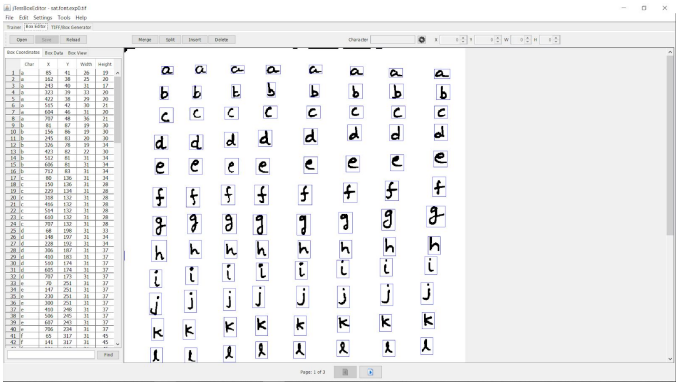
Steps to train the data : [2]

Tool used : Jtessbox Editor

S-1 : collect different samples and merge those samples.

S-2 : Insert .tif file into Jtessbox editor with name sat.font.exp0(here sat represents language name and font represents font name).

S-3 : Prepare box file and correct box file for training. Correction can be done by adding or deleting or adjusting the boxes.



S-4 : Create .txt file for font configuration.

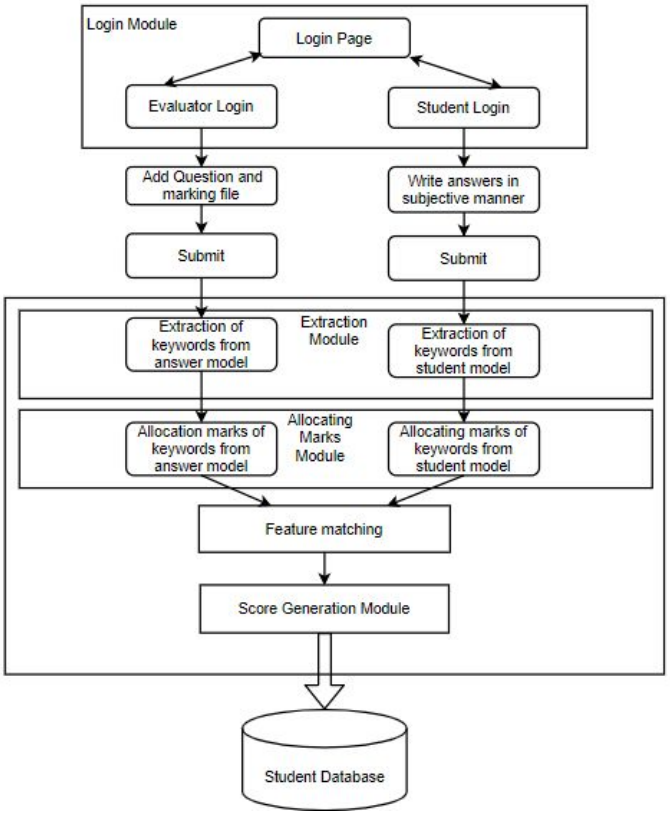
S-5: Run training commands in the terminal.

S-6 : sat.traindata will be the final trained file.

As the real time video is feed to the system, we are finding ROI(region of interest) with the help of openCV mask, capture the video and it will be passed frame by frame. Pre-processing is done on each frame. Various methods have been used to pre-process the frame.Pre-processed frame will be then passes to Tesseract with English language and more two trained data which we have trained on our own /handwriting. Later on, the

recognized image text will go into spellingChecker and text processing to improve accuracy.

Architectural Diagram :



Modules of Proposed Project : [3]

The system comprises four modules and they are Login module.Information extraction module. Allocating marks module and Score Generation module.

Login Module :

The login module authenticates both the student as well as the evaluator. Once the authentication is done, the student and Evaluator can perform their individual activities.

- ❖ Student Login :

The student is allowed to answer all the questions given by the evaluator.

- ❖ Evaluator Login :

An evaluator can add questions(questions.txt) and can also add keywords(keywords.xlsx). The file that contains Keywords is password protected, thus only an evaluator has access to open that file.

Information Extraction Module :

Information extraction module is a module where the process of extracting the keywords from the standard answer and the student submitted answer would take place. Along with the keywords[4] submitted by the student will also be extracted. The keywords that get repeated very often in a document is given less importance. But the keywords which occur rarely in a document will have great importance.

Allocating Marks Module :

The keywords of the model answer can be written in any letter(Lower case or Upper Case) while storing in the database.These keywords are extracted by our system and stored in a multidimensional array.There will be a proper number of marks allocated to each keyword. Now these words are checked in the student's answer.Now the keywords extracted by the system from the evaluator's answer are checked with the array of the student's answer one by one.

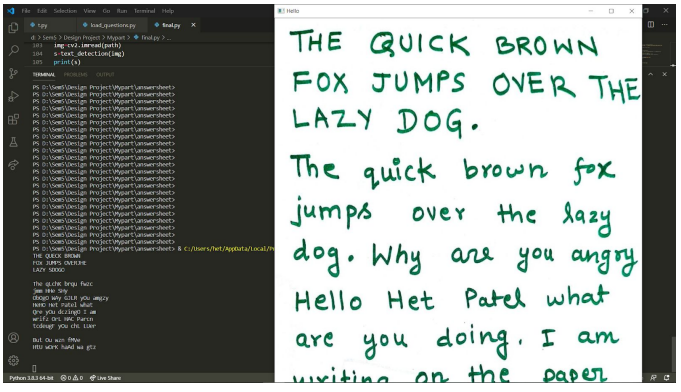
Score Generation Module :

The total marks will be the sum of all the marks obtained from,individual, sections. If the students write complete different answers with no keywords matching,then Zero mark will be allocated.

IV. Results and Discussions

We are successfully able to recognise text from live video frame with a very good amount of accuracy. We have used Tesseract, an open source library specially made for text recognition. The main challenge for us was the accuracy as we have to recognise the handwritten papers. Tesseract is mainly suitable for the images with the printed texts .
At the time of testing/running the system we found that the accuracy of handwritten letters recognition mostly depends upon the quality of image as well as lighting coming on the paper. Therefore to overcome this we tried preprocessing. what we done for preprocessing is :

- Resize image
- Remove Noise(Denoise)
- Segmentation
- Morphology(Smoothing edges)



1.Results before Preprocessing(i.e without accuracy)

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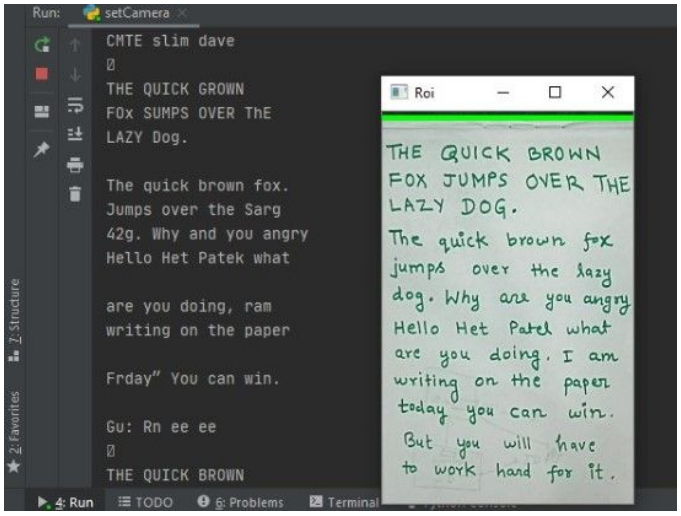
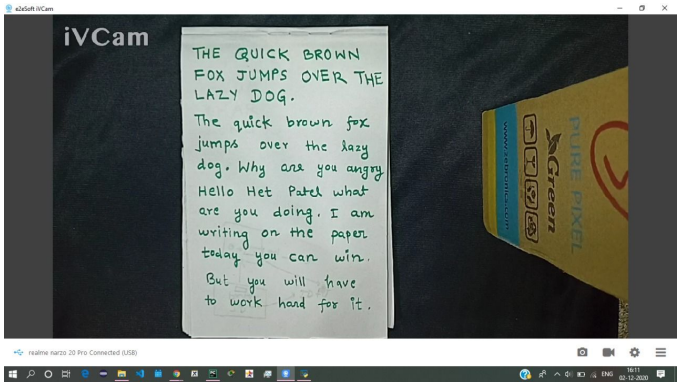


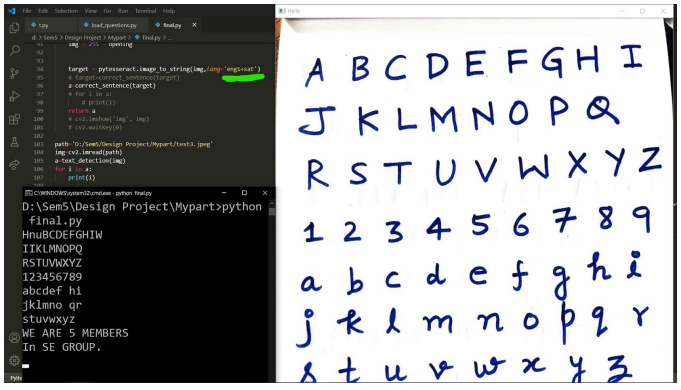
2. Results after Preprocessing(i.e with accuracy)



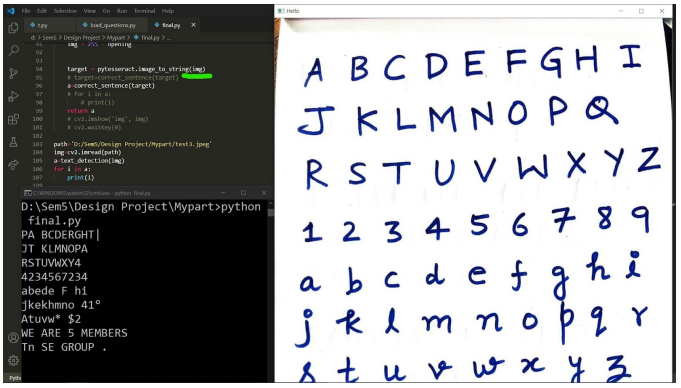
3. Quality of video using iVcam

Handwriting on which data is being trained :

After training of handwritten dataset of a particular person, we can also achieve better accuracy than the Tesseract.
Image below shows the result comparison between sat.traindata, eng1.traindata and eng.traindata (default language for tesseract OCR) for the handwriting of a particular person .



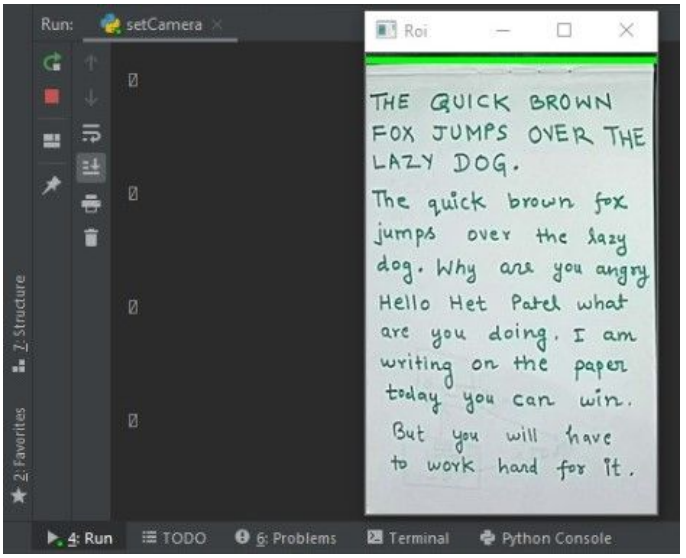
4. accuracy with eng1 + sat



5. Accuracy with eng only

Failed attempts :
To achieve such a level of accuracy, we have passed through some failed attempts also. These failed attempts showed us the correct path towards a proper result.

Below shown image is one of the results of our failed attempt during Preprocessing.This code for Preprocessing was taking too much time to recognise the characters from the live video frame.



6. Failed attempt at the time of Preprocessing

Here, eng1.traindata was trained for small alphabets, but when it was applied to a mixture of small and capital alphabets, it performed poorly. The result is shown below.

7. Result by using eng1.traindata only

V. Conclusions and future work

Examinations play a very important role in in colleges,universities and various other educational institutes Many educational institutes have their examinations conducted online,But these exams only contains multiple choice questions which are providing to be very efficient in testing the student's aptitude,on the other hand fail to measure the conceptual knowledge a student or learner must possess. Therefore subjective answers must be included in online examinations. The proposed system evaluates the answer based on the keywords. By comparing the standard answer and the student's answer marks is obtained if the student utilizes all the keywords mentioned in the standard answer. Hence the said system could be of great utility to an evaluator as well as the students.

As for right now we have achieved the satisfactory level of accuracy. We further have planned to expand this project for other languages also. That is if a student is writing in English then that will be translated into hindi or any other language.For this machine translation will play an important role. Not only this the system will also be able to detect the graphs and mathematical equations also.

Acknowledgment

We are thankful to IIIT Vadodara for providing the computational and infrastructure facilities.

We would also like to thank our mentor Dr. Ashish Phophalia for providing us guidance in the correct direction, also providing us knowledge in the new field.

References

[1] R. Smith, "An overview of Tesseract OCR engine", Ninth International Conference on Document Analysis and Recognition (ICDAR), pp. 629-633, 2007.

[2] Badla, Sahil, "IMPROVING THE EFFICIENCY OF TESSERACT OCR ENGINE" (2014). Master's Projects. 420

[3] Sheeba Praveen,“An Approach to Evaluate subjective Questions for Online Examination System” published in International Journal Of Innovative research in Computers and communication Engineering Vol 2,Issue 11,November 2014

[4] Dharma Reddy Tetali, Dr. Kiran Kumar G and Lakshmi Ramana, “A Python Tool For Evaluation of Subjective Answers (APTESA)”. International Journal of Mechanical Engineering and Technology, 8(7), 2017, pp. 247–255.