

# Optical Character Recognition

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**Abstract-** Optically, reading of the text from an image is made easier through the use of OCR. However, we can able to use the feature of OCR to solve some of the mathematically written expressions also. As we know by doing some coding Computer system is also made to solve mathematical problems that we give as input to it. Handwritten Mathematical expression Solver helps to find the solution of handwritten or documented expressions on a computer system. The system automatically translates scanned images of handwritten, typewritten or printed mathematical expression into a machine-encoded expression. This automatic translation of the text of image into machine-encoded text is processed by optical character recognition (OCR). OCR is an optical or mechanical conversion of typed, handwritten or printed text into machine-encoded text. After the conversion, the machine-encoded text is again converted into expression which is going to get solved by the system and finally the result of the mathematical expression is going get generated as an output on the system screen.

## INTRODUCTION

The Optical Character Recognition (OCR) is used for reading text from the images. It can be used to read handwritten, Typewritten or any printed text from an image. Here, we are going to use these features in solving some of the mathematical expressions written on paper. By taking the images of that as an input to our system and computationally solve the expression to get the result.

Steps involved in Implementation of the program:

- 1 Reading of an image.
- 2 Conversion of the image into a grayscale.
- 3 Recognition of text.
- 4 Evaluation of expression.
- 5 Display result.

In 1st step reading of the image from the location where it is stored is done. In 2nd step conversion of

an image into grayscale and removing of noise from it is done, so that black colored text can be easily read by the OCR. In step 3 with the help of OCR Expression is recognize in the form of string. From which expression is evaluated and solved which is done in the 4th step. And finally, the result is displayed in the final step.

## PURPOSED MODEL

We have used python programing and their libraries for the Implementation of the project.

Various python libraries used:

- 1 OpenCV:-OpenCV is one of the libraries of python used for processing of the image.
- 2 NumPy:-This python library is used for converting the image into a NumPy array.
- 3 Pytesseract:-A library of python which connects with OCR to read a string from an image.
- 4 Tkinter:-This library is for creating a GUI effect.

## IMPLEMENTATION

```
#read image with opencv
img=cv2.imread(img_path)

#convert to gray
gray=cv2.cvtColor(img,cv2.COLOR_BGR2GRAY)

#apply dilation and erosion to remove some noise
kernel=np.ones((3,3),np.uint8)
gray=cv2.dilate(gray,kernel,iterations=1)
gray=cv2.erode(gray,kernel,iterations=2)

#write image after removed noise
cv2.imwrite(src_path+"removed_noise.png",gray)

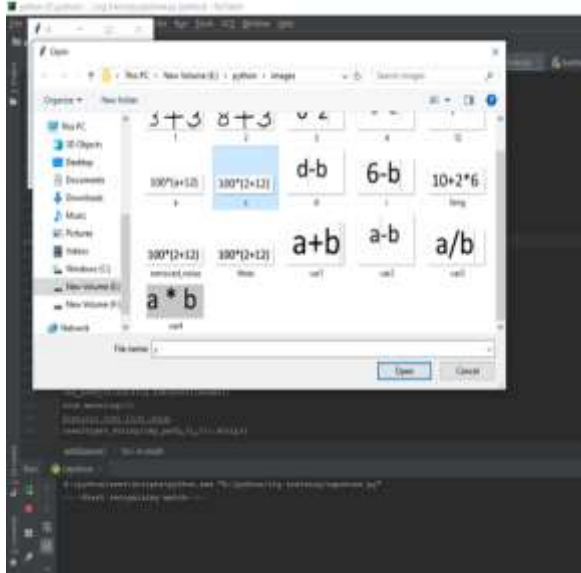
#apply threshold to get image with only black and white
gray=cv2.threshold(gray,127,255,cv2.THRESH_BINARY)

#write the image after apply opencv
cv2.imwrite(src_path+"thres.png",gray)

#recognise text with pytesseract for python
result=pytesseract.image_to_string(Image.open(src_path+"thres.png"))
```

The complete program is written in python. We have used it's some of its libraries also. In coding we have followed the implementation steps. From taking images from the location, conversion of it into grayscale, reading of expression to displaying of the result.

### RESULT



The result shows the output of the evaluate expression, here we have the image 'c' which contain expression  $100*(2+12)$ . and then the result is evaluated which is 1400.

### CONCLUSION

- 1 The graphical user interface is used in the selection of different types of expressions.
- 2 OCR used to read text from the image.
- 3 Able to solve Small, large and variable type mathematical expression.

### REFENCES

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