e-Yantra Robotics Competition Plus

(eYRC+ Pilot)

eYRCPlus-PS2#3150

Team leader name	**Ruchika Kachhwaha**
College	**Shri Ramdeobaba College of Engineering**
e-mail	**rkushwaha975@gmail.com**
Date	**16-11-15**

Image Processing (8)

Write down the answers to the following questions.

1. What is the resolution (size) of the test image assigned in the task?
2. What is the use of thresholding an image?

1. 747 * 900
2. Thresholding is used to convert a colored or grayscale image to binary so that a pixel is either black or white as it is easier to process a binary image.

Explain the algorithm used to perform the task given in practice_test folder.

<

Answer format: Bulleted form

I have solved this task using two methods, both of them are explained below

Method 1

Method 1 is further divided into three sections:

Section 1. Training the model

- A training image is loaded, converted into grayscale and then into binary
- All its contours are detected
- Filter is applied on contours in term of area and perimeter to prevent false detection and so that only number are selected

- Now iterate over the list of contours, crop only the contour by using bounded rectangle and show the bounded rectangle on original image
- Resize this contour to fit 20 * 20 pixels dimension
- At this point the user have to press the number which the image corresponds to so that that contour shape can be associated with that number
- Now reshape the cropped contour matrix to 1 * 400 matrix and convert it to float32 type
- Save the data in an two dimensional array
- Convert the ascii value of key pressed to actual number pressed and save the response to a matrix also convert it to float32 data type
- Move on to next contour in the list and repeat the procedure till last contour is detected
- Save data of contour to a file and responses to separate file

Section 2: Training the model

- Load both data and response file saved previously and train the K nearest neighbor model using this data

Section 3: Detecting number

- Load the image, convert it to grayscale and finally binary
- Initially few constants are set like X and Y co-ordinate of the first cell, dimensions of cell number of rows and columns in matrix 1 and matrix 2
- Now iterate over initially via column in row 1, then column in row 2 and so on till the cell exist.
- Pass this cell to a function which recognize contour in the cell, reshape it again and match it with the data initially saved to match it to its nearest neighbor using knn model
- Once a digit is recognized, append it to the list of numbers and pass on the next cell to the function for its digit to be recognized
- Once all cell have been recognized, move on to second matrix and do the same with few modifications mentioned below
- Once a cell have been sent to the function for its digit to be recognized, detect all contour and apply filter, then calculate the centroid and then sort the list according to X co-ordinate of centroid and iterate over the list, detect the number in the cell and combine all digits detected
- Then calculate the cell number based on row and column from which the cell have been cropped
- Append both cell number and complete number detected to the list
- Return the list
- Then pass the whole image to a function to draw all the contours detected and then show the image

Method 2:

For method 2, first two section remain the same, third section is as mentioned below

Section 3: Detecting the digits

- Load the image and convert it grayscale and finally binary
- Crop the left matrix, detect all contours, apply the filter to prevent false detection
- Calculate the x and y co-ordinate of the centroid and make a new list containing centroid co-ordinates and contour
- Sort this list based on this co-ordinate according to cell number calculated using rows and column approximation of cell centroid
- Now detect digits and reassign the list with only the digit and delete the centroid co-ordinates
- Crop the right matrix, detect all contours redo the steps like calculating centroid appending to a list and so.
- Append two digits at a time, now iterate over the rows and columns, approximately fit the centroid if it lies nearby and calculate the cell number
- Append final number and cell number to the list
- Display the list and draw all the contours In the image

Software used (7)

Write down the answers to the following questions.

1. Write a function in python to open a color image and convert the image into grayscale. You are required to write a function *color_grayscale(filename,g)* which takes two arguments:
    a. filename: a color image (Test color image is in folder "Task1_Practice/test_images". Pick first image to perform the experiment.)
    b. g: an integer

Output of program should be a grayscale image if g = 1 and a color image otherwise.

```
def color_grayscale(filename,g):
      '''
      filename-- input color image stored as file(Test color image is in
      folder
     "Task1_Practice/test_images". Pick first image to perform the
      experiment.)
      g -- int 0 or 1
      returns img-- grayscale of input image if g=1 else color image
      '''
      #add your code here
```

```
if(g == 1):
      img = cv2.imread("Task1_Practice/test_images"+filename,0)
      '''if g == 1 read image in grayscale using 0 as a flag for imread
      class in cv2'''
else:
      img = cv2.imread("Task1_Practice/test_images"+filename)
      '''else read image in color using no flag for imread class in
      cv2'''

return(img)
```