[Volume 2 issue 12 December 2014]
Page No.766-773 ISSN :2320-7167

INTERNATIONAL JOURNAL OF MATHEMATICS AND COMPUTER RESEARCH

A New Approach for Mobile Image Recognition

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ABSTRACT

Cell phones are the perfect way to stay connected with others and provide the user with a sense of security. In the event of emergency, having a cell phone can allow help to reach you quickly and could possibly save lives. However, the importance of cell phones goes a way beyond personal safety. Modern cell phones are capable of internet accesses, sending and receiving photos and files, and some cell phones are equipped with GPS (Geographic Position System) technology, allowing for use in most locations around the world and allowing the cell phone to be found or the user located in the event of loss or emergency.

This research aims to develop an algorithm for image recognition and that by recognizing the numbers in the image. It is possible to send the car plate photo which contains the car number to the computer centre. By using the proposed algorithm, it is possible to read the number and then send the correct number to the main database to extract all the information concerns the owner of the car.

Keywords: Cell phone, Photo, Algorithm, Image, and recognition.

1. Introduction

Cell phones have become a necessity for many people throughout the world. The ability to keep in touch with family, business associates, and access to email are only a few of the reasons for the increasing importance of cell phones. Today's technically advanced cell phones are capable of not only receiving and placing phone calls, but storing data, taking pictures, and can even be used as walkie talkies, to name just a few of the available options.

For the traffic police it is much easier to shoot a photo then to remember the car plate number especially in case of the accident or in case the driver done something wrong and run away. It is simple to send the photo to the main computer to recognize the car number.

2. The Proposed Algorithms:

To recognize the car plate numbers, three algorithms have been proposed the first one is to divide the image into sub images; the second is to recognize the vertical and horizontal lines and a third algorithm for recognizing the numbers on each sub image in the car plate.

2.1 Algorithm1: Segmentation of the Image.

This algorithm will divide the car plate image into sub images as follows:

1. Scan the image from left to right to find white pixels consecutive columns.
2. Whenever we found such columns, we cut the image to create a sub image.
3. Repeat step 1 and 2 until we reach the end of the original image.
4. The first sub image will be ignored because it contains the name of the country which is always in the left side of the image.
5. The remaining sub images contain the numbers of the car plate.

2.2 Algorithm2: Vertical and Horizontal Lines Recognition.

This algorithm recognizes the vertical and horizontal lines in each sub image. The process will be as the followings:

1. Find the length and width of the sub image (m, n). See Figure 1.

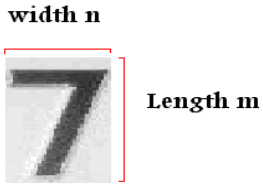


Figure 1

2. Find the position of the fist black row in the sub image form top (start) and last black row from bottom (end), this will represent the length of the number in the sub image, as in Figure2.

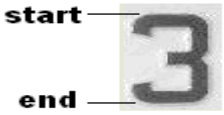


Figure 2.

3. Calculate the middle of the length and call it (Cav), as the following:

$$Cav = (end-start)/2$$

4. Calculate the middle of the sub image's width (n) and call it (Ra), see Figure 3.

$$Ra = n / 2$$

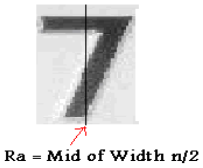


Figure 3.

5. Calculate the middle of the sub image's length (m) and call it (Rav), See figure 4.

$$Rav = m / 2.$$

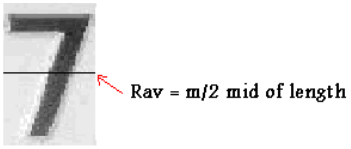


Figure 4.

6. Extract the number and position of the Vertical and Horizontal Lines:

6.1 Extract the number of the horizontal Lines:

a. Scan the sub image looking for lines with a number of black pixels nearly equals to (n).

b. Every time we found such line (horizontal line), we check the line position:

When horizontal line is found

No = No + 1
If row < Rav then
Position = upper part
Else
Position = lower part

Where:
No : is the total number of horizontal lines within the sub image.
Position : the line is either in the upper part or in the lower part of the sub image depending on Rav.
See figure 5.

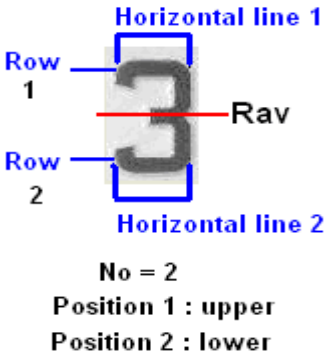


Figure 5.

6.2 Extract the number and position of vertical lines:
a. divide the sub image into two parts: upper and lower depending on Rav.
b. Scan each part looking for columns contain black pixels nearly equal to (Rav).
c. Each time we found such line (vertical line), we check vertical line position.

If Column > Ra then
Line on Right Side
No2 = No2 +1
If Column < Rav then
Line on the upper part
Q1 = Q1 +1
Else
Line in the lower part
Q2 = Q2 + 1
Else
Line on Left Side
No3 = No3 +1
If Column < Rav then
Line on the upper part
Q3 = Q3 +1
Else
Line in the lower part
Q4 = Q4 + 1

Where:
No2 : is the total lines in the right side
No3 : is the total lines in the left side
Q1 : is the number of the lines in the upper part and on the right of the sub image
Q2 : is the number of the lines in the lower part and on the right of the sub image
Q3 : is the number of the lines in the upper part and on the left of the sub image
Q4 : is the number of the lines in the lower part and on the left of the sub image

See figure 6 below:

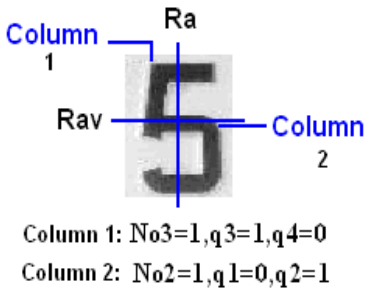


Figure 6

2.3Algorithm3:Number Recognition:

As in usual we used ten digits to represent any number, these digits start from Zero (0) and end with nine (9) as the following:

After counting the number and position of the horizontal and vertical lines from previous algorithms, this algorithm will classify the digits depending on the number of the horizontal and vertical lines as follows:

```
If  No = 3 then
{
      If  No2 = 2 then
            If  No3 = 1 then
                 digit = 9
            If No3 = 2 then
                 digit = 8
      Else
        If  No2 = 1 then
            If  No3 = 1 then
                 digit = 5
            If No3 = 2 then
                 digit = 6

} // end  if No = 3

If  No = 2 then
{
  If  No2 = 1  and No3 = 0 then
     digit = 2
  Else
     If   No2 = 2 and No3 = 2 then
        digit = 0
     Else
        If  No2 = 2 and No3 = 0 then
            digit = 3
} // end if No =2

If   No = 1 and No2 = 0 and No3 = 0
   Then
{
      If  Position = upper then
          digit = 7
```

```
    If  Position = lower then
        digit = 4
} // end if No = 1

If  No = 0 then
{
  If  No2 = 2  or  No3 = 2 then
      digit = 1
} // end if No = 0
```

3. Experimental Works:

Now apply the three algorithms on the car plate shown in figure 7:

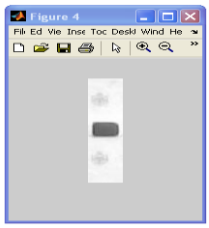
Figure 7

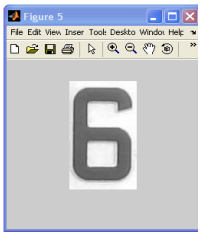
(The car plates used in the experimental work are all from Jordan)

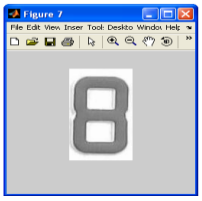
The image will be segmented by algorithm1, the first sub image will be ignored since it contains the name of the country, and the remaining image will contain only the numbers as shown in figure 8 below:

Figure 8

Proceeding with algorithm1, the image will be divided into the following sub images:

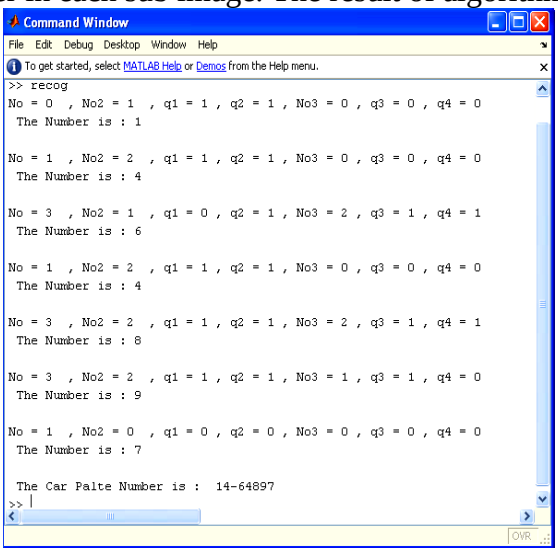






.

Now algorithm2 will be implemented on each sub image to calculate the number of vertical and horizontal lines, except the third sub image since it is always hyphen in Jordan car plates.
Finally, algorithm 3 will be implemented and according to the number and location of the lines in each image, we recognize each number in each sub image. The result of algorithm 2 and 3 will is as follows:



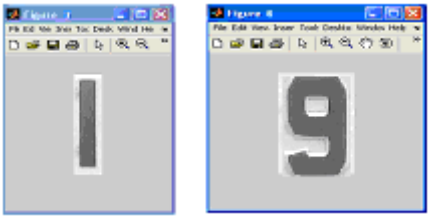
As we can see that the digits in all sub images are recognized, then the whole car plate number is connected and printed out.

Another Example:
The three algorithms will be applied on the car plate in figure 8,

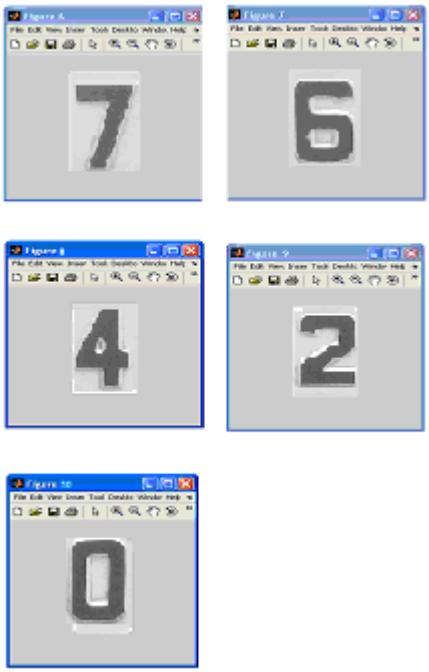
Figure 8

The first algorithm will segments the image in figure 8, it will ignore the first sub image which contain the country name, the remaining image will be as follows

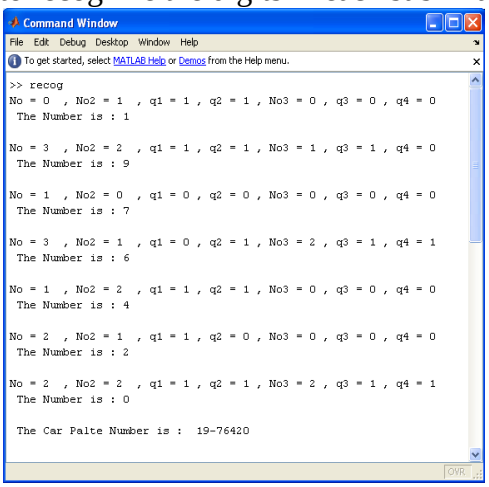
Algorithm 1 will continuo in segmentation and the result will eight sub images each one contain one digit from the number in figure 8, as follows:



Algorithm 2 now will be applied to each sub image to count the numbers of lines in each sub image and the location of each line.



Finally algorithm 3 will be applied to recognize the digits in each sub image; the result will be as follows:



4. Conclusions

Mobiles nowadays are used not only for communicating with others by voice; they are used very widely in many different things like navigation, translation (dictionary), movie player and so on. In this research mobile is used as a camera and a transmission media, the picture of the car plate is captured using mobile then it send as SMS from the same mobile to the processing center.

The recognition of numbers in a car plate depends on the quality of the image received from the mobile. The recognition algorithm starts by segmenting the image, then recognizing each number (sub image) alone by counting the number of lines in the sub image the location of each one. The shape of the numbers are standard in all car plates since it depends on the universe system of printing car numbers which uses the number 8 as a base for all other numbers.
The research produces an effective and simple method for recognizing car plate numbers using mobile images.

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