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Image processing and Biometric Approach for Licence and Vehicle documents verification

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Abstract: Fingerprints are rich in details which are in the form of discontinuities in ridges known as minutiae and are unique for each person. One of the most important tasks considering an automatic fingerprint recognition system is the minutiae biometric pattern extraction from the captured image of the fingerprint. The fingerprint matcher compares features by using Digital Image processing from input search point against all appropriate driving licences in the database to determine if a probable match exists. An extended approach of digital image processing is used for Extraction of vehicle number plate. Information from the number plate is extracted and can be used in many applications like toll payment, parking fee payment. Currently we are implementing this system for only Standardized Indian number plates. In future it can be implemented for number plates with different fonts, shapes and size. Using this method, vehicle documents are verified. With this implementation, there'll be no need to carry documents along. A single finger print and an image will be enough to recognise and verify the individual and the vehicle.

Keywords: ***Biometric, Fingerprint, Driving license recognition, number plate recognition, optical character recognition (OCR).***

1. Introduction

Nowadays, mobile devices having high resolution camera are becoming more popular. They are widely available. Research activities using these devices for Human-Computer interface have received much attention for last few years. The important and easy way of obtaining the information from captured images is Text detection and Text Recognition

The introduction is covered in two subsections viz.

I] Fingerprint Recognition

II] Number plate Recognition using OCR.

Fingerprint Recognition is divide in two steps:

1. Scanning fingerprint and extracting minutiae from fingerprint
2. Feature extraction, comparing and matching the minutiae with the list of minutiae in large database of fringerprint.

Fingerprint is captured using a live fingerprint scanner. The scanner returns a grey scale image of scanned fingerprint consisting of dark (ridges) and bright (valley) lines. They have salient singular points called minutiae. Bifurcations and terminations of the edges represent minutiae. The information of number of minutiae and minutae location are stored in a table. At final stage, the values from the table are matched with the values of the fingerprint that are stored in the large database. The matched score is returned to the user. Thus, using this biometric approach, we can verify the licence of an individual on the spot.

OCR is also known as ALPR, automatic number plate recognition. OCR is used to extract number plate from the captured image. OCR plays an important role in many real-life applications, like automatic toll collection, parking system and road traffic monitoring. OCR recognises characters from the

image of number plate which is either colour image or black and white image or a greyscale image. It comprises the combination of various techniques; such as object detection, image processing and pattern recognition. The present scope of this paper is only for Indian standard number plate. There are many challenges faced in detection and recognition of number plates. Some of them are as follows:

1. Irregular shape of number plates
2. Use of Nonstandard fonts.
3. Number plates in different colours.
4. Dirty number plates.

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2. . OVERVIEW

An individual has to carry licence and vehicle documents, if he fails to present those at the time of certain on road investigation by Government authority, He has to pay the fine, carrying documents becomes a mandatory part. So to over- come this inconveniences we use Android technology which is day by day be- coming more popular in smart phones ,Images of good quality can be clicked and can be forwarded instantly ,Different format of documents can be viewed on smart phones, Fingerprint verification systems began to appear of various access control and verification functions. In this project we are providing security, portability, digitalization to both individual and RTO System with the help of those technologies.

This paper proposes a system in which a single fingerprint and image of numberplate will be enough to recognise and verify the individual and the vehicle. This will work on an Android device (smart phone or tablets). Moreover, the records are can be made available as they are stored on central database.

3. ALGORITHMS

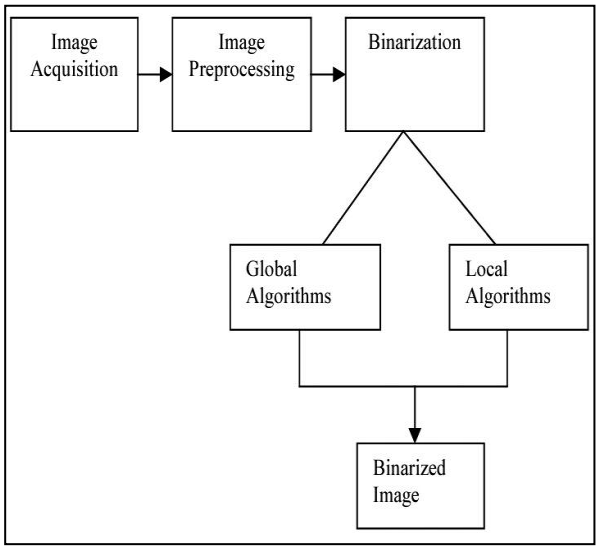
A. Bozorth 3:

Bozorth3 is an algorithm used to produce a match score from two minutiae patterns. Matching between the finger prints can be one-two-one verification or one-two-many identification. Bozorth 3 algorithm includes following steps:

Step 1: Construction of intra finger print minutiae comparison tables.
Step 2: Construction of inter finger print minutiae compatibility tables.
Step 3: Traverse inter finger print compatibility tables constructed in step 2.

B. Binarization Algorithm:

Binarization plays an important role in preprocessing phase of char algorithm. There are many algorithms that can be used to obtain a binary image. The following figure shows the block diagram of the binarization method



A threshold value is often desirable to represent grayscale or colour images as binary images. This value helps in reducing storage requirements and increasing processing speed.
Global Aglorithm: One Threshold value for the entire image is calculated. Pixels are classified into two classes foreground and background by the following equation (1).

$$I_b(x,y) = \begin{cases} black & if \quad I_f(x,y) \le Thr \\ white & if \quad I_f(x,y) > Thr \end{cases} \qquad (1)$$

Where $I_b(x,y)$ is the pixel of binarized image and $I_f(x,y)$ is the pixel of input image.
Local Algorithm: Different threshold values depending on the local regions of the image are calculated using local algorithm. A threshold value is derived for each pixel in the image so that the image is separated into foreground and background. This can be expressed as in the equation (2).

$$I_b(x,y) = \begin{cases} black & if \quad I_f(x,y) \le Thr(x,y) \\ white & if \quad I_f(x,y) > Thr(x,y) \end{cases}$$

Otsu Binarisation Algorithm:

1) Read the gray scale image pixel by pixel and calculate gray scale histogram containing values between 0-255.
2) Calculate weight's and mean for background and foreground pixels considering a gray value as threshold value starting from 0.
3) Use the weight and mean above calculated above to calculate between class variance.

Formulas:

Weight Background (wB) = Summation of Frequencies of all gray value upto threshold value

Weight Foreground (wF)= Summation of Frequencies of all gray value from threshold value upto 255.

Sum Background = (Summation of (Frequencies of gray value * gray value)) upto threshold value

Sum Foreground = (Summation of (Frequencies of gray value * gray value)) from threshold value upto 255.

Mean Background (mB)= Sum Background/Weight Background

Mean Foreground (mF)= Sum Foreground/Weight Foreground.

Between Class variance = (float)wB * (float)wF * (mB - mF) * (mB - mF).

4) Calculate Between Class variance for all gray values and the gray value for which we have maximum between class variance, that gray value will be threshold value.

5) Navigate through gray image pixel by pixel and execute the following condition.

if(pixel value > threshold value) set rgb for that pixel=255.

if(pixel value < threshold value) set rgb for that pixel=0.

6) Return the binary Image.

4. RESULTS AND DISCUSSIONS

We observe that the proposed system provides an easy and quickest way to verify the vehicle documents and license. The Bozorth3 algorithm used for finger print extraction and finger print matching provides lowest error rate and more accuracy. As compared to other image extraction methods, OCR provides suitable results.

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5. FUTURE SCOPE

1. The proposed system can be implemented at check posts.

2. This system can be introduced in Toll system and parking payment

3. Further, by introducing new algorithms and methods, the sytem can be implemented on various designs of number plate, non-standardized, fancy number-plates.

6. CONCLUSIONS

By this approach we are developing the system which will increase the efficiency, robustness and speed of the RTO system. This paper presents scope for only Indian standard number plate. In future this system should concentrate on fancy and dirty number plates

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