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License Plate Recognition Based Intelligent Car Security Management System

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ABSTRACT

With the rapid increase of automobiles in cities, parking and security problems have become worse in many areas. This paper proposes an intelligent solution monitoring and security of free parking space. It aims at implementing smarter and better parking security mechanism which significantly reduces vehicle theft. There are many applications of License plate identification (LPR) in pattern recognition and machine vision. LPR plays a major role in many applications and a number of methods have been proposed. The applications range from complex security systems for commons areas and from parking admission to urban traffic control. The main goal is to provide security of the car in parking zone through camera at entrance and exit. The camera captures the features of the face and license plate and stores it in database. Another camera at the exit of the parking lot captures the images of the license plate and driver of the leaving vehicle and compares it with the database. Thus, this paper aims at providing effective security of vehicles at parking area.

Keywords: License plate recognition, face recognition, parking, security

1. INTRODUCTION

As in today's world vehicle parking in the city has become a major problem with respect to space, security and environmental aspects. So this system is the best solution to this major problem, as it overcomes all this problems. Automatic License Plate Recognition is a computer vision technology to extract the license number of vehicles from images. The camera captures the features of the license plate and facial features of the driver and stores in data base. It is an embedded system which has many applications and challenges.LPR plays a major role in many applications and a number of methods have been proposed. The applications range from complex security systems for commons areas and from parking admission to urban traffic control. The main goal is to provide security of the car in parking zone through camera at entrance and exit. The camera captures the features of the face and license plate and stores it in database. Another camera at the exit of the parking lot captures the images of the license plate and driver of the leaving vehicle and compares it with the database.

2. LITERATURE REVIEW

In this paper [1] Automatic License Plate Recognition system is a real time embedded system which automatically identifies the license plate of vehicles. There are many applications ranging from complex security systems to common areas from parking admission to urban traffic control. Automatic license plate recognition (ALPR) has complex characteristics due to distinct effects such as of light and speed. Most of the ALPR systems are built using proprietary tools like Mat lab. This paper presents an alternate method of implementing ALPR systems using Free Software including Python and the Open Computer

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Vision Library. [2], author describes Automatic license plate recognition .It plays an essential role in many applications. These applications range from complex security devices to common areas and from parking admission to traffic control. License plate recognition has hard properties due to varied effects like fog, rain, shadows, variable distances, irregular illumination conditions, cars' velocity, scene's angle on frame, plate rotation and conservation, number of vehicles in the scene etc. These effects make plate recognition much more complex and difficult than the traditional pattern recognition systems. In paper [3], the main objective is to show a device that solves the practical complication of car identification. All steps of the process, from image scene acquisition and optical character recognition are considered to obtain an automatic identification of plates. In this paper [4], presents instant and real-time license plate recognition in an open environment. Using a non-fixed video camera installed in the car, the system captures the image of the vehicle in front and to process vehicle license plate detection and recognition. Relying on the instant vehicle recognition, the system can recognize and locate the vehicle license plate without the need of background image. In this paper [5], author has designed LPR algorithms generally composed of the following three processing steps: extraction, segmentation and recognition of each character. This task is quite challenging due to the diversity of plate formats and the non-uniform illumination environment conditions during image acquisition. Therefore, most approaches work only under barred conditions such as limited vehicle speed, fixed illumination, designated routes and stationary backgrounds. Various techniques have been created for LPR in still images or video sequences, and the purpose is to categorize and assess them. Issues such as computational power, processing time and recognition rate are also addressed, when available. In this paper [6], author developed a full-fledged image-based Car license plate recognition (CLPR) system is described in the paper. CLPR provides an automatic solution for remote vehicle recognition. Gray-level input images are assumed. The localization stage of the CLPR yields a plate clip proceeded by character segmentation and recognition. The recognition scheme combines adaptive iterative thresholding and template-matching algorithm. The method is invariant to illumination and is robust to character size, skew and small character breaks. In this review paper [7], author proposes a LPR technique that consists of two modules: a license plate locating and a license number identification. The license plate locating is done using fuzzy logic to extract license plates from an input image, while the identification module is conceptualized in terms of neural subjects identifies the number present in a license plate. Experiments have been conducted on locating license plates, 1088 images taken from various scenes and under different conditions were employed. In this paper [8] author introduced a video processing method for a field-programmable gate array (FPGA)-based license plate recognition (LPR) system is researched. During the design, Gabor filter, threshold, and connected component labeling algorithms are used to obtain license plate region. The robustness of the system has been tested with a large database acquired from parking lots. The memory requirements are uniquely designed to be extremely low, which enables usage of smaller FPGAs. In this paper [9], author originally combines the stroke width of license plate character with specified colors of license plate to segment the license plate region. Then linear fitting method is used and projecting method to rectify the position of slant license plate. In this paper [10], author worked on character recognition that plays a major role in the ALPR system, this system proposes a new method to recognize the license plates characters using the 2D Gaussian-Hermite moments (GHMs) of different orders.

3. SYSTEM MODEL

In the proposed system compared with other process we can get efficient recognized results. Here we are comparing Local & Global feature of the images of the license plate and face of the driver and compare and store it in the data base for security measures. Using our proposed algorithm we can 98 to 100% accurate retrieved data from different data bases. In this face recognition we are comparing only global feature of face. The proposed system is composed of the following three stages: 1) recognition and

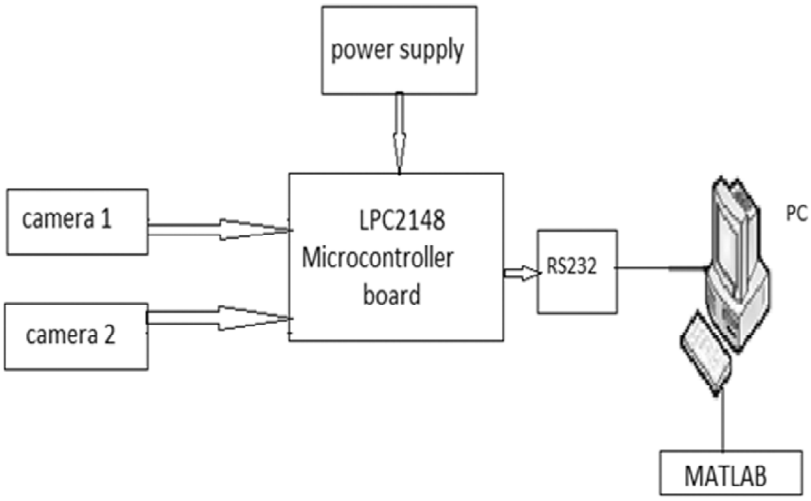

Figure 1: Block diagram of License plate recognition

extraction of a license plate area by video camera 2) segmentation of the plate characters and digits and 3) characters and digit recognition. The microcontroller used is ARM7 processor. A camera is provided at the entrance of the parking lot. It provides security of the car in parking zone through camera and buzzer at entrance and exit. The video camera captures and recognizes the features of the face of the driver and license plate and the extracted data is stored in data base. It involves the extraction of plate region and Segmentation of plate characters and recognition of characters. The image of the vehicle is captured using a high resolution camera. The camera can be rolled and pitched with respect to license plates. Run-lengths are suggested for identification and documents segmentation. Run lengths determined on the black and white image taking into consideration the black pixels corresponding to foreground or the white pixels corresponding to the background. The plate is extracted using vertical and horizontal histogram and vertical and horizontal run-length encoding. Another camera at the exit of the parking lot captures the images of the license plate and driver of the leaving vehicle and compares it with the database. If the images don't match, the alarm is set off.

3.1. License Plate Recognition

LPR devices are a surveillance method that uses optical character recognition (OCR) on video images to recognize license plates on vehicles. LPR camera systems can be mounted on fixed locations. Typically, the cameras are outfitted with a software that searches for the presence of a license plate. Once one is detected, the image is captured and then OCR extracts the characters and numbers on the license plate. The extracted data can then be stored or linked to other applications, or compared to the data in databases. LPR devices are comparable to face recognition systems, which are computer-based security devices that can automatically detect and identify human faces. LPR is a form of vehicle identification. It's an image processing mechanism used to recognize vehicles by only their license plates. LPR plays effective role in automatic monitoring of traffic rules, maintaining law enforcement on public roads. Automatic vehicle recognition systems are used for the purpose of effective control. Since every vehicle carries a unique license plate number, no tags, external cards or transmitters need to be recognizable, only license plate.

3.2. Face Recognition

Detection of faces in static or video images is a challenging problem in computer vision as faces could occur at different positions, orientations, pose and scales in an unrestrained background. Face recognition technique, is a computer application capable of identifying and verifying a person's face from a digital image or a video frame from a video source or a camera. One of the method to do this is by comparing

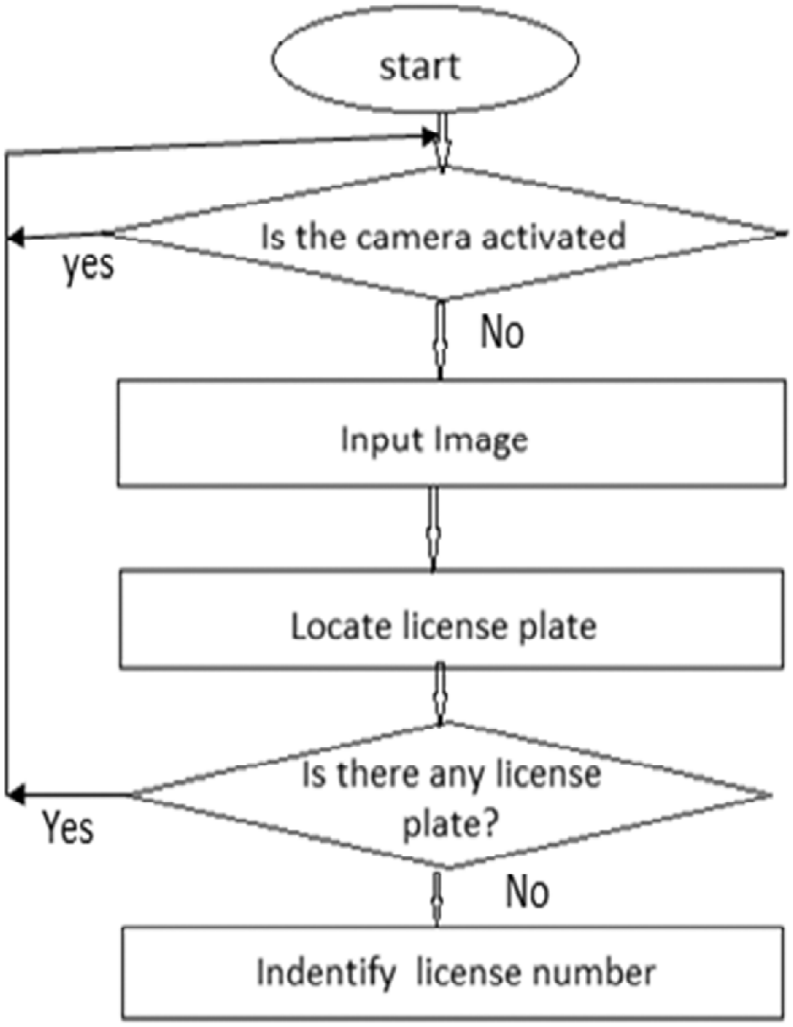

Figure 2: Flow diagram for the license plate number Identification module

selected facial features from the image and a facial database. An emerging method uses the visual details of the skin, as captured in standard digital or captured images. This technique is called skin texture analysis. A face image can be viewed as a texture pattern exhibiting symmetry and regularity. It turns the unique lines, patterns and sports apparent in a person's skin into a mathematical space. Texture is an essential characteristic for the analysis of many types of images. A textured area in an image can be characterized by a non-uniform or changing spatial distribution of intensity. Intensity variation reflects some changes in the scene being imaged. Experimentation results have shown that with the addition of skin texture analysis, performance in recognizing faces can improve up to 20 to 25 percent. A high resolution camera is used to detect the face of the car driver. The texture of the face are extracted by the camera and compared with the face of the driver. We consider two types of features: Statistical and multi resolution features: The Statistical features capture the coarseness, randomness and high frequency edge information inherent in facial images. A multi-resolution feature captures the regularity and homogeneity of the pattern. Suppose that there are N (size: $S1 \times S2$) face images belonging to M persons in the training set. These persons have $N1$, $N2$, ..., NM face images, respectively. In other words, $N = N1 + N2 + \bullet\bullet\bullet + NM$. Each face image is first partitioned into K equally size non overlapping sub-pattern images after which these sub-pattern images are transformed into corresponding column vectors with dimensions of $d = S1 \times S2/K$. Afterwards, we collect the vectors at the same position of all face images forming sub-pattern's training set. In this way, we get K sub-pattern's training sets, and each of them can be expressed in form of d-by N column data matrix $Xi = \{xi1, xi2, ..., xiN\}$ with $i = 1, 2, ..., K$.

4. RESULT AND DISCUSSION

Matlab R 2009a tool is used for the experiment. The data set used in the experiments is collected from the captured images of original real plates (Fig. 4).The features are obtained from the image. The face textures are extracted (Fig. 5).Selection of query is made, where a number plate is selected from the captured image (Fig. 6).License plate features are extracted and compared with the result of the face extraction image (Fig. 7). This is compared with the database and if both the facial features and license plate doesn't match then it's a unknown sample (Fig. 8).

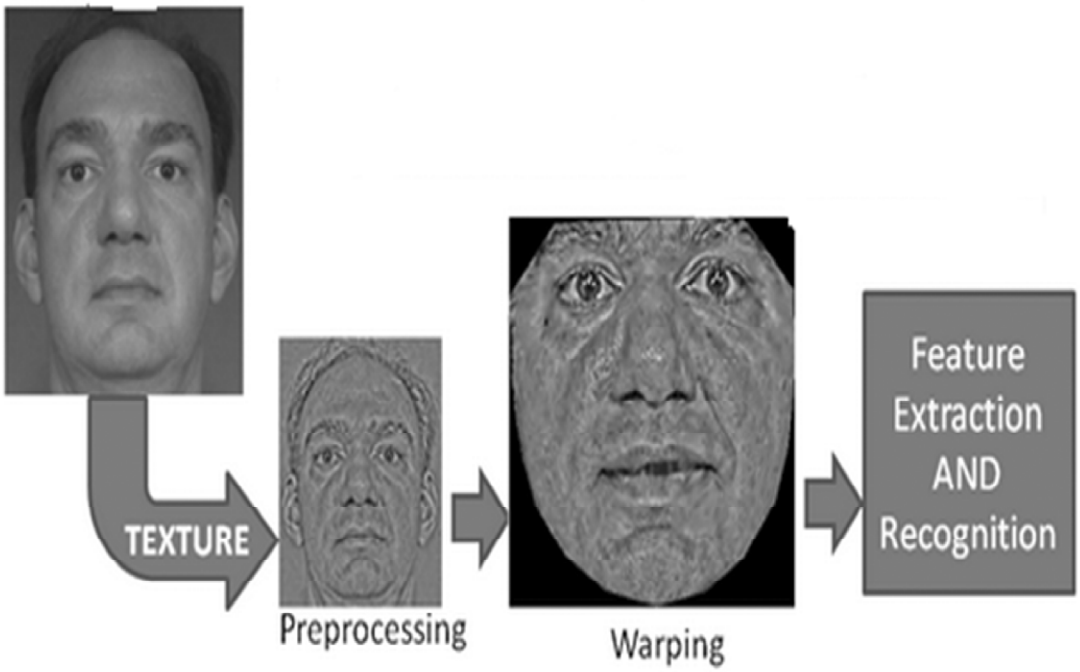

Figure 3: Face recognition based on texture

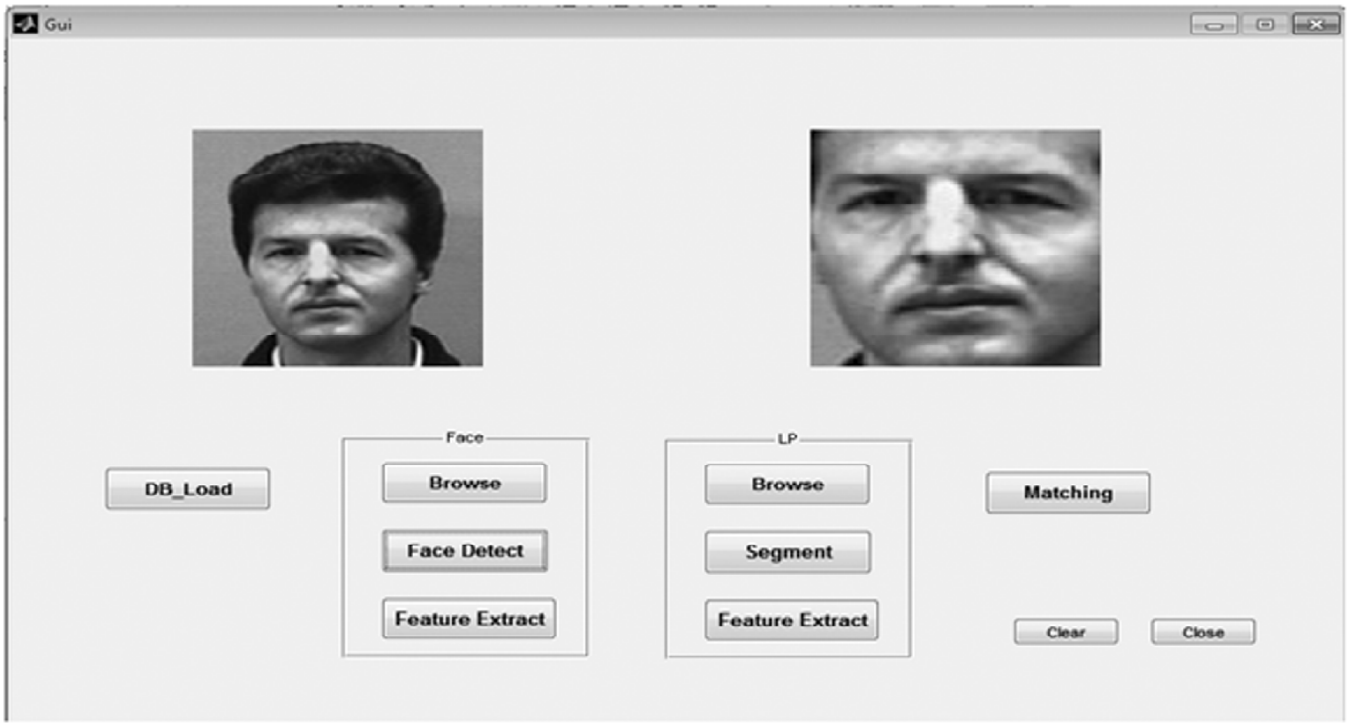

Figure 4: Browse the file

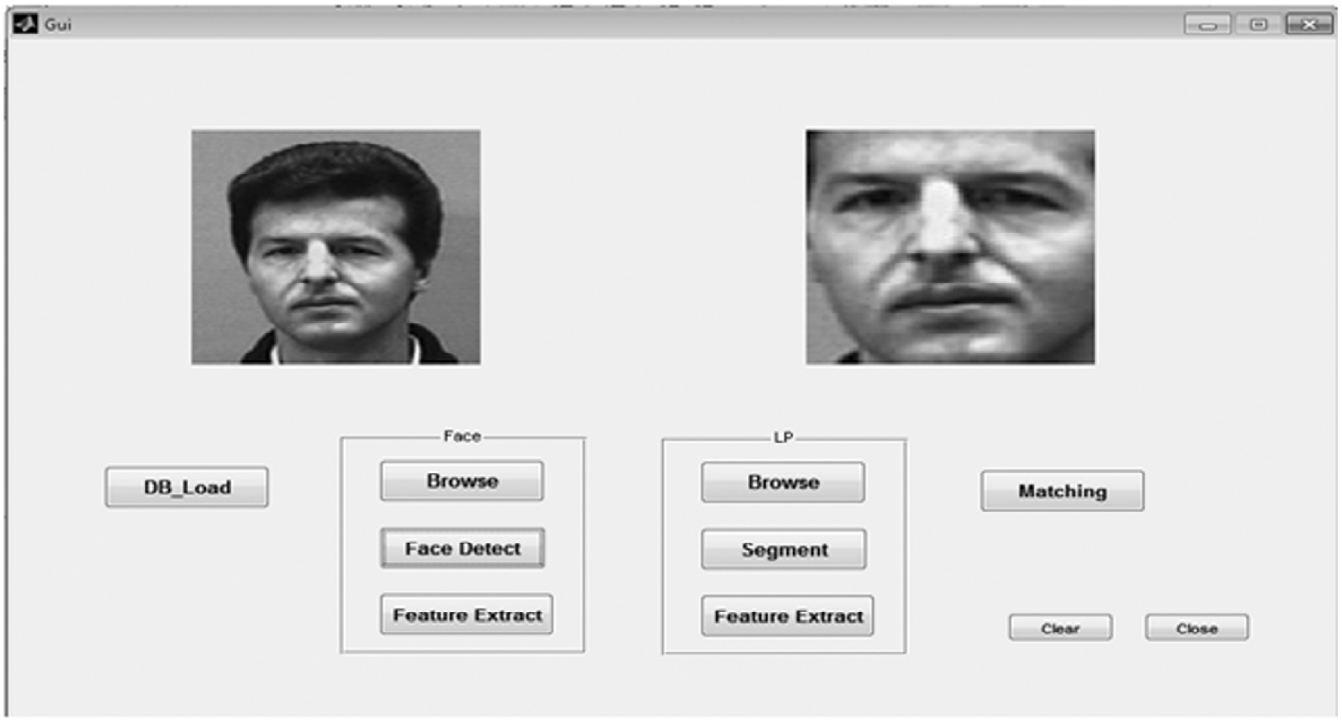

Figure 5: Face extraction

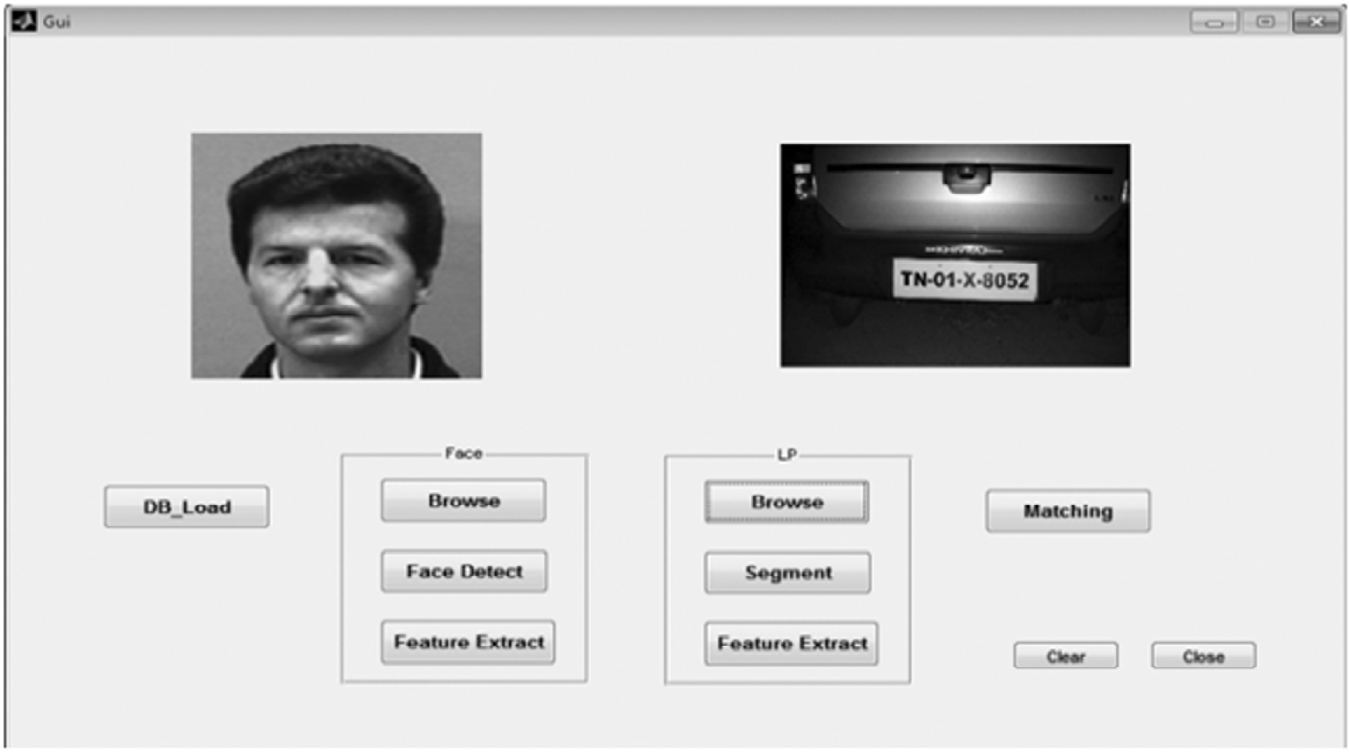

Figure 6: Select a query

Figure 7: License plate features extraction

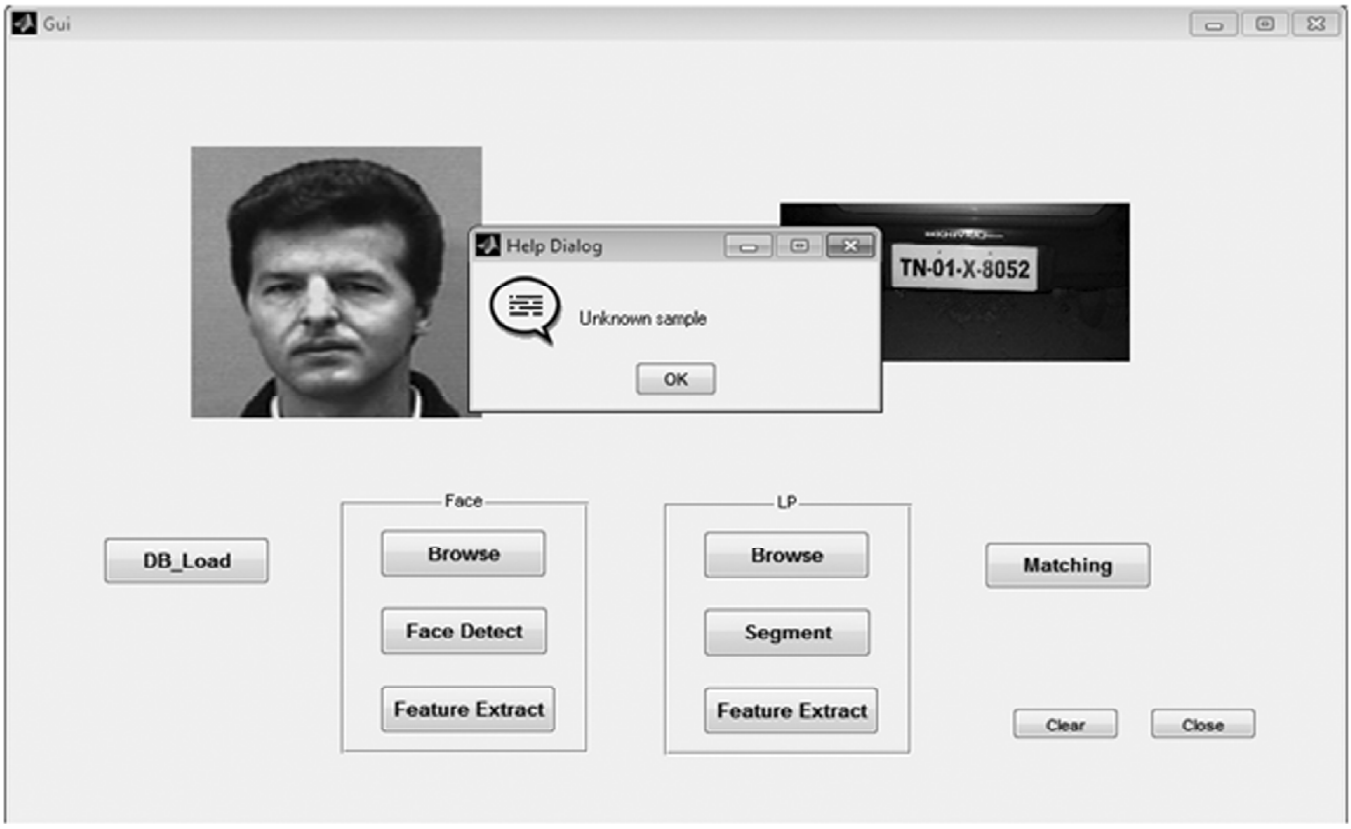

Figure 8: Recognized result

5. CONCLUSION

The data used in the experiments is collected from the captured images of original real plates. A face texture features have been used for face detection and extraction, the technique detects face under diverse scenarios. And the features of the license plate are extracted. Experimental comparison is done between the saved database and the image captured by the camera at the exit. The proposed system achieves high recognition rate and provides efficient security for vehicles.

In future Open source Computer Vision can be implemented on this system and would also do the performance analysis of the system designed. Performance analysis of number of plates can be successfully recognized. A comparative study of different optical character recognition present in the market can be done and the best can be chosen and implemented in the system.

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