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An Efficient Way of Detecting a Numbers in Car License Plate Using Genetic Algorithms

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Abstract - To detect the numbers and characters inside the license plate using image processing and genetic algorithm (GA). For this Number plate detection many algorithms are used. But in my project mainly focusing on the genetic algorithm for provide perfect accuracy compare to any other systems. This paper describes a detection method in which the vehicle plate image is captured by the cameras and the image is processed to get the plate's numbers and characters. The system is implemented using MATLAB and various images are processed with to verify the distinction of the proposed system.
Index Terms - Genetic algorithm (GA), Image processing, License plate (LP), Number plate localization, Perfect accuracy.

I. INTRODUCTION

Nowadays number of automobiles grows quickly, the traffic problems arise as well, for example car robbery, over speeding and moving on the red light. To avoid these problems an efficient real time working vehicle identification system is needed. Most usually suitable technique is license plate (LP) detection based on image processing by capturing license plates using cameras. All the implemented techniques can be classified according to the selected features. Color information based systems have been built to detect specific plates having fixed colors. Shape- based techniques were developed to detect the plate based on its rectangular shape. Edge-based techniques were also implemented to detect the plate based on the high density of vertical edges inside it. GAs has been used infrequently because of their large computational needs. Variety of research has been tried at different levels under some constraints to minimize the search space of genetic algorithms (GAs). Researchers in based their GA on pixel color features to segment the image depending on stable colors followed by shape dependent policy to identify the plate's area. In, GA was used to search for the best fixed rectangular area having the same texture features. GA was used in to identify the LP symbols not to detect the LP.

Detecting license character and at the same time differentiating it from similar patterns based on the geometrical relationship between the symbols constituting the license numbers are selected approach in this research. Consequently, a new approach genetic algorithm is initiate in this paper that detects LP symbols without using any information linked with the plate's external shape or interior colors to allow for the detection of the license numbers in case of shape or color distortion either physically or due to capturing conditions. Further processes are explained in the next sections.

II. PROPOSED TECHNIQUE

The proposed system is comprised of two phases: image processing phase and GA phase. Each phase is composed of many steps. The Fig. 1 depicts the various image processing steps that finally produce image objects to the GA portion. GA selects the best LP symbol locations depending on the input geometric relationship matrix (GRM).

III. IMAGE PROCESSING PHASE

In this phase, an input color image is used to a sequence of processes to extract the relevant 2-D objects that may represent the symbols. It has different stages, as depicted in Fig. 1.

A. Color image to Grayscale conversion

he input image is used as a color image to bring other information relevant to the concerned vehicle. Color (*RGB*) to grayscale (*gs*) conversion is

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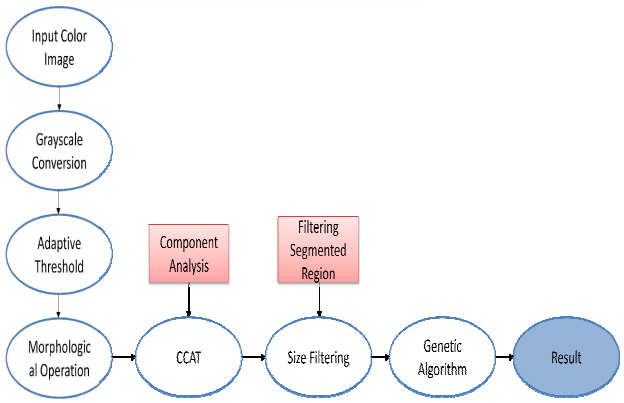

Fig. 1. Overall system Flowchart for localization of LP symbols.

performed using the standard NTSC method by removing the hue and saturation information while holding the luminance as follows:

$$gs=0.299*R+0.587*G+0.114*B \quad (1)$$

Fig. 2. Converted grayscale image.

B. Grayscale to Binary Using Dynamic Adaptive Threshold

Converting the input image into a binary image is one of the most important stages in localizing LPs to overcome the illumination problems. In my system, a local adaptive threshold technique has been implemented to determine the threshold at each pixel depending on the average gray level. This process as shown in Fig.3

C. Morphological Operations

Morphological operations, like dilation and erosion, are important processes needed for pattern recognition systems to eliminate noisy object.

Fig. 3. (a) Converted binary image for image in Fig. 2, using Otsu's method. (b) Car image with variable illumination. (c) Output when using Otsu's method for image in (b). (d) Output when applying local adaptive threshold method for same image in (b).

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In LP detection, closing and opening operations are applied to fill noisy holes and remove objects.

Dilation:

This is the b asic operators in the part of morphology. It is usually applied to binary image, but there are versions run on grayscale image. the basic effect of the operator on a binary image is to progressively extend the boundaries of regions of foreground pixels (ie, white pixels). Applications of dilation for bridging gaps in an image. It can remove unwanted information. Opening of an image is erosion followed by a dilation using the same structuring element. Shown in fig 4.

Erosion:

This is also very important operator for the morphological operation. The basic effect of the operator on a binary image is to erode away the boundaries of regions of foreground pixels (ie, white pixels). Shown in fig 5.

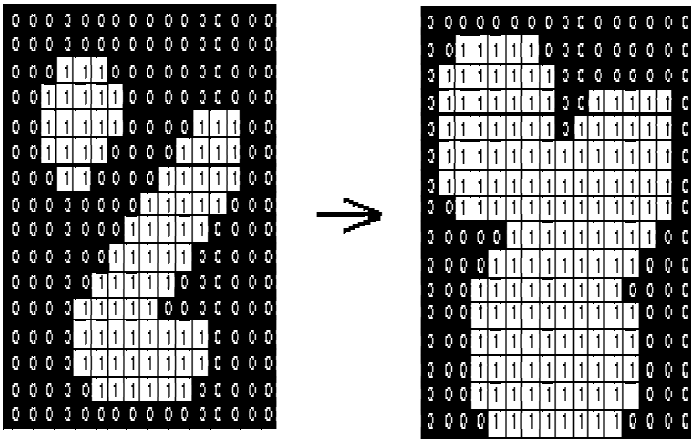

Fig 4. Effect of dilation using 3x3 square structuring element

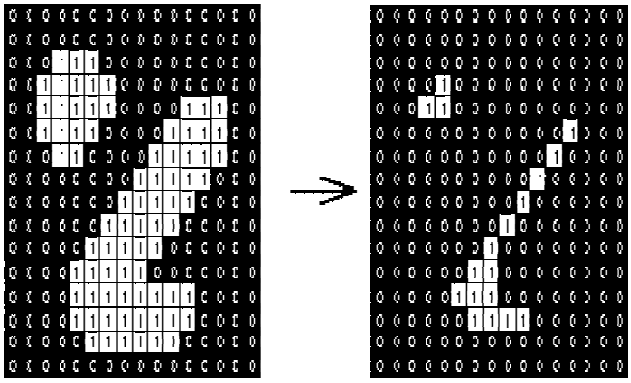

Fig 5. Effect of erosion using a 3×3 square structuring element Strip away a layer of pixels from an object, shrinking it in the process.

D. Connected Component Analysis

CCA is one of the technique in image processing that scans an image and groups pixels in components depends on pixel connectivity. The result of this stage is an array of N objects.

E. Size Filtering

The output of the CCA stage are filtered on the basis of their widths W_{obj} and heights H_{obj} lie between their respective thresholds

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as follows:

$$W_{\min} \le W_{obj} \le W_{\max} \quad and \quad H_{\min} \le H_{obj} \le H_{\max} \qquad (2)$$

$H_{\min}$ and $W_{\min}$ are the value below which a symbol cannot be recognized (for example 8 pixels) and $W_{\max}$ can be set to the image width divided by the number of symbols. $H_{\max}$ is estimated as $W_{\max}$ divided by the aspect ratio of the used font. The result of this stage is an array of M objects. The output of this stage is given in Fig. 6.

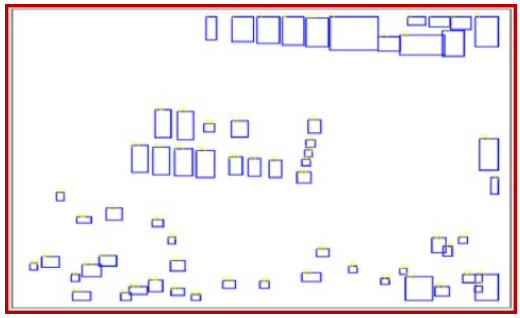

Fig. 6. M objects (64) output after size filtering of N objects in Fig. 5(2).

IV. GENETIC ALGORITHM

In this phase M objects are given to the input. This phase is used to resolve the 2D compound object detection problem. It contains many steps.

A. Chromosome Encoding

In chromosome encoding an integer encoding scheme is selected and each gene assigned to an integer. Seven genes are forming a chromosome as shown in fig. 7. An output is extracted as a M objects.

gene number (i) :	1	2	3	4	5	6	7
object index (j)	3	1	5	7	11	2	15

Fig 7. Chromosome of seven genes for representation of Saudi license plate.

B. Fitness Function

Simple function of the fitness measure is used by some genetic algorithms to select individuals. In this proposed system fitness is used as the inverse of the estimated objective distance between the prototype chromosome and the current chromosome.

C. Selection Method

In this selection method, the stochastic universal sampling (SUS) method each individual is formed to a continuous segment of a line. Depending on the percentage of individuals to be selected by a number of pointers over the line.

D. Mutation Operators

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This mutation method is used to remove unfit members in genetic iterations. It can eliminate some features of genetic material. To maintain the mating pool variety by Gas ensures that the new parts of the search space. They are two kinds of mutation operators.

1) *Substitution Operator*
2) *Swap Operator*

E. Crossover Operator

In genetic algorithm crossover operator is used to produce new chromosome (offspring) by groups two chromosomes (parents). This new chromosome is better than the both parents if it takes the best characteristics from each of the parents. In my project, the two parents chromosomes are combined into the array Carray as shown in fig.8. In my project USPS crossover operator is used.

F. Replacement Strategy

A lot of alternate strategies are used to replacing only a portion of the population between generations. The most frequent strategy is to probabilistically replace the unfit individuals in the earlier generation. In elitist strategy the greatest fit individuals of the previous generation are appended to the recent population. In my proposed system, the best 10% of the parents are selected and appended to the offspring(90%) to produce the new generation (100%).

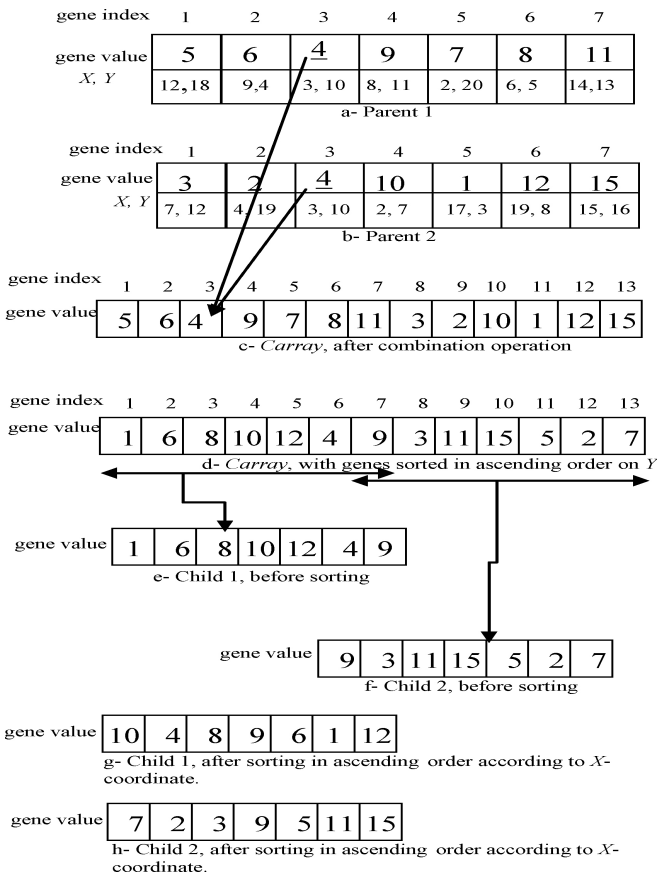

Fig. 8. Proposed crossover operator steps.

V. CONCLUSION

In this paper describes the localization of license plate in a efficient manner. For this purpose i used genetic algorithm (GA). The license plate contain many unwanted details. These are first remove by the image processing phase and then localized by the genetic algorithm

phase. The results were encouraging and a new approach for solving the LP detection problem relying only on the geometrical layout of the LP symbols. Also, a flexible system was introduced that can be simply adapted for any LP layout by constructing its GRM matrix. The proposed system possessed high immunity to changes in illumination either temporarily or spatially. A high percentage success rate was achieved with the aid of the adaptability aspect of the GAs. A very important attainment is overcoming most of the problems arising in techniques based on CCAT by allowing the GA. Moreover, an enhancement in the performance of the developed GA was achieved by applying the new USPS crossover operators, which greatly improved the convergence rate of the whole system.

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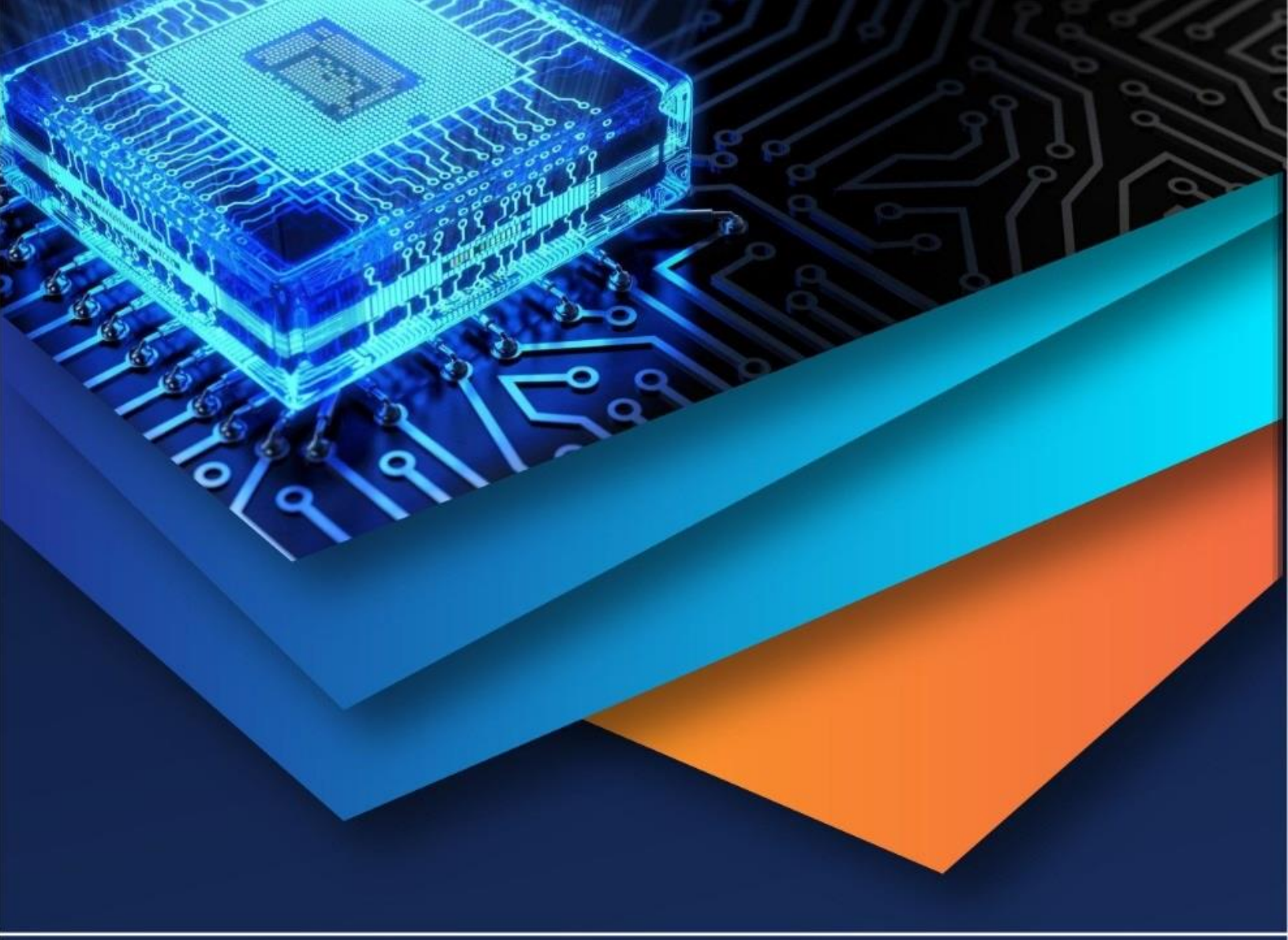

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