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Smart Vehicle Integration Module Testing through MATLAB

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Abstract: Intelligent computers may be defined as devices that are both physically and scientifically advanced. Intelligent gadgets come in a variety of shapes and sizes, including autonomous vacuum cleaners and face recognition apps, among others. The area of Intelligent Systems is concerned with the ways in which intelligent systems can interact with their human counterparts. Early robots could only do tasks for which they had been specifically programmed. Today, robots are being designed to feel and function in a real-world context in order to achieve certain goals. As a result of the study inquiry carried out, this thesis has discovered that the suggested work has made significant use of three distinct models, all of which were created using the Pattern Matching Method. ITS module integration is improved over the current model, which has just one module of work and no integration with the rest of the model. The precision of the tests is also not mentioned. According to the findings of this suggested study, more than 91.0 percent of the participants were successful in identifying the number on the trails of ten photographs throughout the testing process. In comparison to conventional parking facilities, automated parking systems need much less space and volume for a given number of parking spots. Automatic parking systems make it possible to use valuable land for residents, green space, and other purposes in a more profitable manner. They also provide property development companies with a variety of options, such as minimizing the amount of parking space required while increasing the number of parking spaces available, or finding the optimal location between parking spaces.

Keywords: - Pattern Matching Method, ITS, Automatic parking, intelligent device, AI-based software

I. INTRODUCTION

An intelligent device is a machine with an integrated internet linked computer system capable of collecting and processing data. Often, intelligent structures need to be adaptable to current situation, be scalable and operate both locally and remotely. The IT Framework is characterized as a set of linked objects that are arranged for a shared purpose. As such, intelligent structures comprise not only intelligent devices but also integrated arrays of such devices, such as networks. Similarly, software systems named 'Intelligent Systems' can also be identified among AI-based software. An intelligent system can be described as a device that contains a general-purpose machine linked to the Internet. An embedded device can be strong, but it will be only powerful for that particular computer. Intelligent devices are available in self-service kiosks, wireless TVs, traffic signs, smart meters, vehicles, digital signage and aero plane sensors, among many other fields. A major part of IoT is a built-in intellect for nearly anything imaginable. [1-5]

Types of Intelligence: According to the explanation provided by the American developmental psychologist Howard Gardner, there are various forms of intellect.

Intelligence: Knowledge is always intangible. It includes –.

- Logic.
- Training.
- Handling Disputes.
- Content
- Language intelligence. [5]

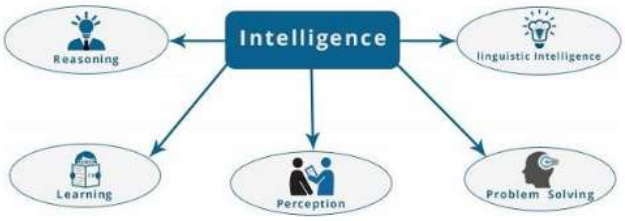

Fig. 1: Types of Intelligence

There are some distinguishing gaps between Human and Artificial Intelligence.

- Machines are abstract whereas humans interpret in terms of patterns.
- Machine's store and remember knowledge through pattern recognition. For e.g., the number "40404040"

can be processed, noted down, and retrieved quickly as its format is easy.

- Humans may remember the entire object, even though certain pieces of it are blurred or absent. On the other hand, robots cannot do it.

Vehicle detection in intelligent transportation systems

Vehicle identification is one of the significant subjects of Intelligent Transportation Networks. As computer vision methods have emerged, a number of uses of on-road vehicle identification have become feasible. This paper offers an analysis of the studies relevant to vehicle recognition under different conditions. Vehicle identification will face various issues since each vehicles respond differently under different circumstances. However, there are many techniques introduced from appearance-based methods to motion-based methods. Topics including lighting, temperature and weather conditions are illustrated in the talk. Efforts should be based on robust on-road vehicle identification methods for different driving environments. [6-8]

Smart detection of vehicle accidents using object identification sensors

According to government of India, about 1,46,000 citizens lost their lives owing to medical mistakes, which might have been prevented if they would have received timely medical treatment. This can be done by utilizing robots that can detect what sort of injuries occurred in a very minimal time frame. The accidents are observed using Oden machine, and it transmitted to the control unit using nearby antenna, where seriousness of accidents is graded using data mining. Then the fetched data is matched with current injury database, and the analyzed findings are then passed to local ambulance unit.

Future Implementation through IVIoT Architecture

Now IVIoT has become well-known and plays an important position within the internet's networks. the Internet of Things is not only an integral aspect of a modern wave of information technology, but it is still an updated version of the Internet (IoT). I-VIoT may provide perceiving knowledge through means of visual sensors, and information transmission. Connecting items to the internet provides simple knowledge sharing and makes collaboration easy. [9]

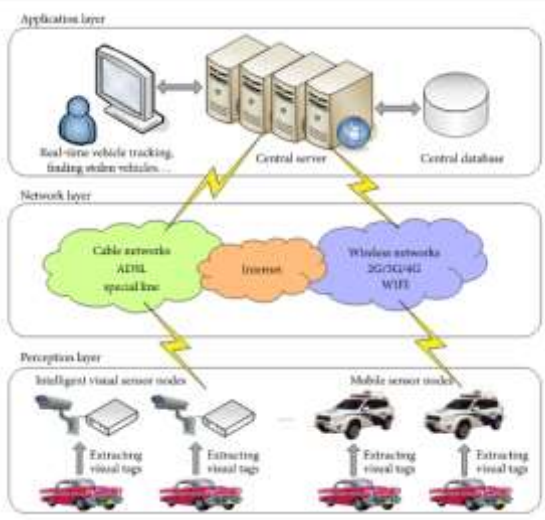

Fig. 2: Future Implementation through IVIoT Architecture

II. LITERATURE REVIEW

Du et al. (2018), have developed a scalable 3D vehicle detection method. The 3D scanners cannot comfortably adhere to the pipeline. An extended calculation to calculate vehicle dimensions was found to be sufficient. The pipeline also picks points from 3D modelling. The aim of this study is for an improved effective object fitting algorithm that is used to mark vehicle models utilizing the 3D point cloud. **Schilling et al. (2018),** suggested the approach of identification. This thesis explores the creation of a workflow that utilizes optical and elevation data to locate vehicles in remotely sensed urban data. These three stages include: implementing an applicant's concept, designation and exclusion of a specific vehicle. The two data sets are being combined as vigorously as practicable at all levels. The second and third phases of the project took advantage of the fact that most man-made objects are rectangular in form and were executed using Machine Learning methods utilizing particular functions. Input is sequenced through phases to accommodate several sensor inputs. A analysis of their experiments found that while their solution included hand-coding elements, it nevertheless was much more effective than a machine-based method. **Wu et al (2020),** has been demonstrated for remote sensing pictures for the tracking of vehicles. With very little knowledge of these crime incidents, their identification is limited. Often it is challenging to collect more precise information if data services tend to come from different outlets. A universal multi-source active mobile exercise vehicle recognition device is proposed. The proposed method has a groundbreaking concept in the creation of the brain space. In this scenario, an additional application item set is then designed to meet the specificity of vehicle categories and then create a multi-source-based segmenting community. High-quality vehicles should be recognized in a timetable. Finally, the three branches are merged. **Arabi et al. (2020),** intended to provide the engineering practitioners the first step in creating a scientifically systematic approach for the recognition of construction vehicles. The primary emphasis of this paper is on the unclear last point. The first phase in solving the issue is doing data processing, model discovery, model training and model validation. **Zhang et al. (2020)** propose intelligent traffic control (ITC) schemes that have been drawing various researchers and the general public. Various alternatives for traffic details may be completed through the Artificial Intelligence phase. The report presents the current analysis for self-driving vehicles (PD-ITSC). Researchers will experiment different rates of vehicles to explore the effectiveness of this method. Their solution would have increased ability to cross roads with reduced fines. **Wei et al (2019),** In some works of the literature indicated the methods of detecting individual vehicles in a reasonably simple scenario. In the field of transportation, more than a few vehicles are commonly used. The proposed approach has greater recognition accuracy and is more effective than traditional models owing to the combined usage of the hair and HOG characteristics.

III. METHODOLOGY

Data format should be converted into a readable computer to modify the figure format. This process is called digitalization. You can use different modes to change a photo in a digital format. The same method is to use the scanner. Another way is to convert the Pic into a digital format using the digital conversion analog. Another way is to use a multi-channel scanner placed on the aircraft or satellite for remote sensing. The digital Pic is formed in the result of a process of converting analog signal into the digital signal. This process allows the digital signal to enter the detection range by the power spread (analog signal) which is expected to be electromagnetic sensor to the digital signal into the detection range. Figure is a related example for Pic digitalizing. [11-15]

Fig. 3: Pic Digitalization

Pic Types

This picture is the smallest part of a pixel. A digital Pic size is made by the pixels whose dimension is MxN. The figure is an example of an Pic created by pixels.

Fig. 4: the Pic is formed by Pixels.

Detection and localization for Number Plate

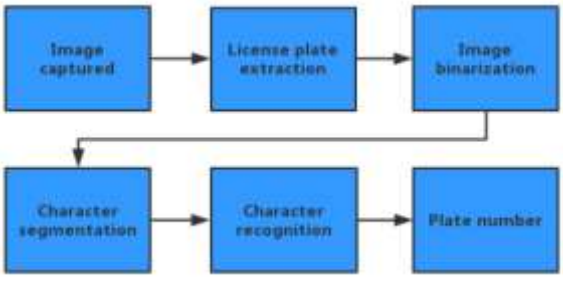

Fig. 5: A simple flowchart

Pic range can be obtained in different Binarization methods. It includes global boundaries, integration methods, aerobic algorithms, and so on. These methods can isolate the preview from the background. Therefore, this technique can provide us with white preview text and a dark background.

Character segmentation.

Character segmentation is a key area of processing process and is a major processing for character identification. The board has been removed from the previous steps. To identify each character, the same character can be found in the picture. Many methods have been offered, such as projection, attached components or morphology. As a result, each character is extracted. There are three parts of "detection of license plate". These sections are part of the Pic acquisition, section localization or segmentation of number plate, and in a different form of Pic conversion. A brief description of the following sub-sections is as follows:

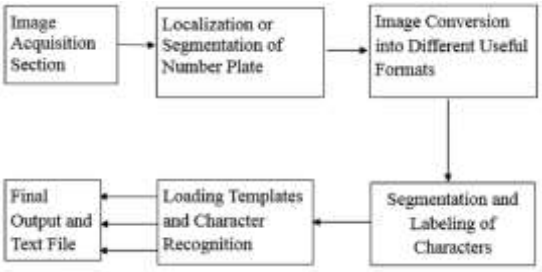

Fig. 6: Architecture diagram of the thesis project.

Localization and Segmentation of Number Plate (Running Vehicle)

This section is responsible for the detecting number plate from the picture taken by the camera. The color features based on "morphological processing" have been applied for the position of license plates. Here the "feature of the color" means that this method of color is a localize plate. The project is fully trained to train localize licensed license plates based on the background color for example yellow, white, etc.

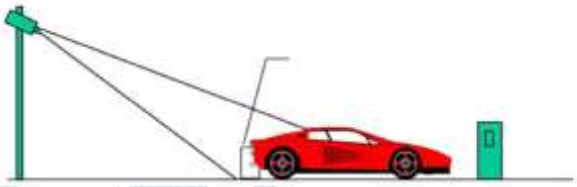

Fig. 7: Pic captured through camera.

The main functions used in this section are the 'make form' function that creates a color conversion structure, and the 'apply form' function that applies to device-free color space conversion. The next is the ‘morphological processing’, which has a 'reshape' function to recreate the distribution method and create a segment Pic accordingly. [15-17]

IV. SIMULATION AND RESULT

The virtual simulation has to set up under the MATLAB-2017 platform. A GUI has been constructed to execute the proposed scenario of smart vehicles movement and detection. The operation has been performed with the template matching algorithms on the pictures taken from the camera. The systems have to match the test pic with the template pics of the stored database. In this research we apply the Enhanced -TMA to enhance the overall capacity of detection and analysis of images or Pictures. With the implementation of Enhance-TMA, improves the existing template matching algorithms. MATLAB-SCRIPT GUI with each of three features has been illustrated below.

Vehicle Detection

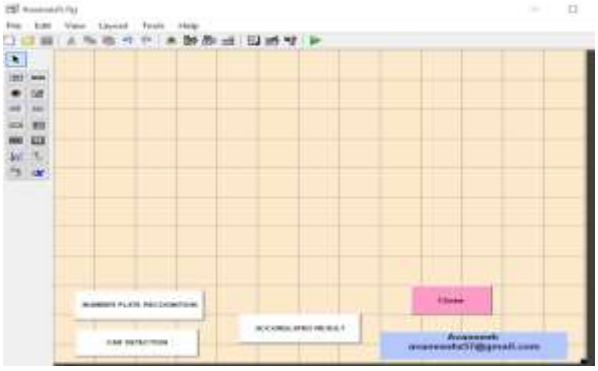

Fig. 8: Vehicle Dtection Layout

This had four buttons as presented in above figure for execution of each model for ITS. The last has the exit button which has log out the GUI. This ha build in the GUIDE plate form of MATLAB-SCRIPT 2013. This button is executable type button which imitate the code of said module.

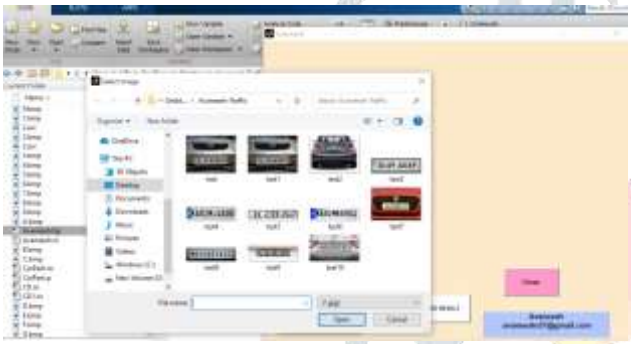

Fig.9: Select Pic

This is the figure where the process of fetch the folder of Pics has been presented. There are 10 test Pics in this investigation.

Number plate Detection

After the image is captured, the system clears it by filtering out background noise and then handles it for further processing. In the next module, image segmentation is performed, which separates the required object from the background and differentiates pixels with similar values to improve the contrast. The image recorded by the camera is subtracted from the reference image to determine whether there is a change in the image. If there is a change, additional processing is performed on the car to determine the changes in the parking lot numbers. The image is turned to black and white, or grayscale. The last module is for image enhancement. The produced noise is eliminated in this module utilizing morphological functions that exclude pixels that do not belong to the item of interest. The boundary items in the illustration are tracing, with an emphasis on the outside borders. The last module is Pic detection, which is utilized to ascertain the presence of cars in a Pic.

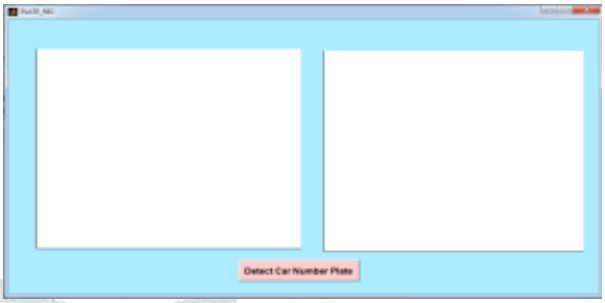

Fig. 10: Layout of Number plate Detection

The layout is designed for number plate Detection**.** One for fetch the Pic of Number plate of vehicle and second is the test of highlight. Same as the earlier layout, but this figure of vehicle-1 has only executed the area of number plate and found the same result**.** The figure clearly presented that the highlighted alpha numeric numbers and popup the detected number.

Fig. 11: Number Detected of vehicle plate

Same as the earlier layout, but this figure of vehicle -2 has only executed the area of number plate and found the same result**.** The test has been repeated for ten times and the result has been drawn as in form of table of basic information of figure taken.

Table 1 Testing Result

Pic name	Pic type	size(kb)	pixel info	Detected/ yes /no	Total no./detection.	Success
Test 1	JPG	97.9	575*432	yes	10TN/9DN	90
Test 2	JPG	247.9	1602*1201	yes	10TN/10DN	100
Test 3	JPG	14.5	510*139	yes	8TN/8DN	100
Test 4	JPG	78.3	958*253	yes	10TN/9DN	90
Test 5	JPG	38.0	873*570	yes	10TN/9DN	90
Test 6	JPG	92.2	915*288	yes	10TN/8DN	80
Test 7	JPG	67.2	833*338	Yes	10TN/9DN	90
Test 8	JPG	22.3	941*350	Yes	10TN/9DN	80

Test 9	JPG	32.4	870*573	Yes	10TN/9DN	90
Test 10	JPG	92.9	935*280	yes	10TN/9DN	90
					Average	**90.1**

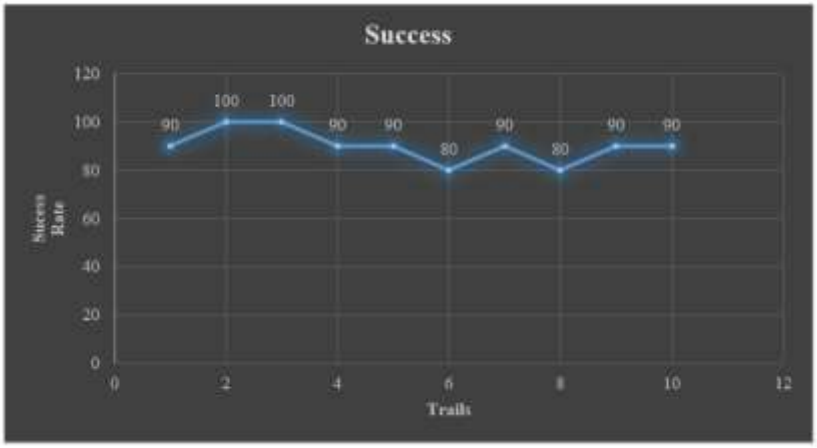

Fig. 12: Pixel Information Increases the Accuracy of Detection

As figure presented that the pixel information increases the accuracy of detection. The trend line clearly reflected that more pixel information surely increases the detection of number plate. Intelligent vehicle detection systems need considerably less land area and volume for the same amount of parking spaces than alternative parking options.

Table 2 Existing Model and Proposed Model

	Existing model	**Proposed model**
Platform	MATLAB-SCRIPT-2013	MATLAB-SCRIPT-2017
Research Area	Pic Recognition	Pic Recognition + Running Pic Recognition
Method	Improved Segmentation Method	Pattern Matching Method
Modules	Single	Multiple
Testing Accuracy	N/A	More Than 91 %
Simulation Performed	Simulated	Performed

As the research investigation has been performed, this thesis find that the proposed work has been extensively used of three different model which has built with the Pattern Matching Method. This enhances the existing model which has only one module work and no integration for ITS module.

V. CONCLUSION AND FUTURE SCOPE

The technology involved makes for a much less illuminated parking grid, meaning less time wasted searching for a spot, which reduces the need for artificial lighting that most parking lot owners choose because it can be used for public areas. The testing accuracy also not mention. Automatic parking systems enable the use of valuable land for residents, green space etc. in a more profitable way and provide property development companies with various options like: minimizing the parking space needed to maximize the number of parking spaces or an optimum spot between them. Another concern is because there is confusion that occurs while you are attempting to park, and there is no specific method someone would use to park somewhere and often creates harm to the vehicles when driving out or in the parking lot. Protection is also of importance in this problem.

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