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LabVIEW Based Smart Speed Detection and Automated Number Plate Recognition System in Indian Scenario

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ABSTRACT: Road accidents are rapidly increased because of violating the traffic rules and driving the vehicle at high speed. The Traffic police has to spot out these vehicles and thereby the vehicle number, name of the violator is noted. This project enhances the productivity of road traffic enforcement system by identifying the violator who drives the vehicle at high speed. This paper is projected on the speed measurement of vehicle at a stationary point and Licence Plate Recognition. At first, Ultrasonic sensor LV- MaxSonar is interfaced with the NI myRIO and is programmed to measure the speed of the vehicle. Secondly, Load cell is employed to measure the same speed for higher accuracy. License Plate Recognition is an effective form of surveillance system. LPR algorithm consists of Image Acquisition, Tracking of plate region, Character segmentation and optical character recognition. The performance of the algorithm has been tested in the real time scenario. Based on the experimental output, the proposed algorithm as shown efficiently superior performance. The proposed system is implemented using LabVIEW.

KEYWORDS: License Plate Recognition,LV - MaxSonar, NI myRIO, LabVIEW.

I.INTRODUCTION

Road accident rates in India is higher due to the over speeding. According to Indian penal section 112/183 MV, the violator is punished. Government officials uses to control the over speeding by the basis of important decision consists of timed traffic signals, setting speed limits and speed breaker that are installed on the roads. There are commercial speed measuring portable devices such as the radar gun, laser gun.

Still with perfect instruments and practice, the uncertainty is inborn in the natural phenomenon. The speed measuring instrument causing discrepancies that responding differently to the real scenario. For that reason, speed measurement devices should be upgraded. Throughout the previous few years, Smart speed detection Systems (SSDS) have had a wide impact in people's life as their possibility is to improve transportation protection and agility and to enhance productivity through the use of advanced technologies. In the current information technology era, the use of automations and intelligent systems is becoming more and more widespread. The smart speed detection System (SSDS) technology has received so much attention that many systems are being developed and applied all over the world. Therefore number plate (NPR) has turned out to be a significant research issue. Number Plate Recognition has many applications in traffic monitoring system, including controlling the traffic volume, ticketing vehicle without the human control, vehicle racking, policing, security, and so on. The most vital and the most difficult part of any LPR system is the finding and extraction of the vehicle number plate, which directly affects the systems total accuracy.

The presence of noise, distorting in the image, uneven brightness, dim light, variation in license plate sizes and unclear conditions make the task even more difficult. Therefore the complete difficult may be segmented into three distinct key modules: (a) localization of license plate from vehicle image (b) segmentation of the characters within the license plate and (c) appreciation of segmented characters within the license plate.

The main role of the module is to find out the possible regions within the image that may contain the license plate. The function of module is to separate the forefront characters from the background within the sensed license plate region.

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And the purpose of the module is to recognize the sections in terms of known characters or digits. Though modules and employ most of the traditional ways available to the technologists, module i.e. localization of possible number plate regions from vehicle images is the most puzzling job due to the huge differences in size, shape, colour, surface and spatial alignments of number plate areas in such images. Hence, in this work a fresh method is suggested for detecting the location of vehicle number plates and identifying the numerals and characters in it. In this paper, a new model for License Plate Recognition (LPR) system is presented. The projected method for number Plate Recognition (LPR) system works in three modules: localization of license plate, segmentation of the characters and recognition of the characters from the license plate. Localization of the license plate is done using morphological processes, horizontal & vertical edge processing. Character segmentation is carried out using linked component identifying. Character recognition is done by using Neural Network classifier. The method is tested on 100 samples of Indian vehicle images. The system attains 86% accuracy in localization, 81% accuracy in segmentation and 80% accuracy in character recognition.

II.LOAD CELL BASED SPEED DETECTION

A Load cell is a sensor or a transducer that converts a load or force acting on it into an electronic signal. This electronic signal can be voltage change, current change or frequency change depending on the type of load cell circuitry used. There are many different kinds of load cells. We offer resistive load cells and capacitive load cells. Resistive load cells work on the principal of piezo-resistivity. When a load/force/stress is applied to the sensor, it changes its resistance. This change in resistance leads to a change in output voltage when a input voltage is applied.

Fig. 1 Load cell CZL601

1. Rated Load 5-60 (Kg)
2. Rated Output 2.0mV/V±5%
3. Zero Balance ±1%F.S
4. Input Resistance 405±6Ω
5. Output Resistance 350±3Ω
6. Excitation Voltage 9-12VDC
7. Nonlinearity 0.017%F.S
8. Hysteresis 0.02%F.S
9. Repeatability 0.01%F.S
10. Creep(30min) 0.015%F.S
11. Operating Temperature -20°C To + 65°C
12. Temperature Effect on Zero 0.017% F.S/10°C
13. Temperature Effect on Span 0.014% F.S/10°C
14. Insulation Resistance 5000MΩ(50VDC)

Fig. 2 CZL601 Specification

A load cell is a sensor or a transducer that exchanges a load or force acting on it into an electronic signal. This electronic signal can be a voltage change, current change or frequency change depending on the category of load cell

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and circuitry used. There are various different varieties of load cells. We deal resistive load cells and capacitive load cells. Resistive load cells work on the standard of piezo-resistivity. When a load/force/stress is functional to the sensor, it fluctuations its resistance. This modification in resistance pointers to a change in output voltage when an input voltage is applied.

The four strain gauges are constructed in a Wheatstone bridge configuration with four separate resistors linked as shown in what is called a Wheatstone bridge network. An excitation voltage – normally 10v is functional to one set of turnings and the voltage difference is measured between the other two corners. At equilibrium with no practical load, the voltage output is zero or very close to zero when the four resistors are strictly matched in value. That is why is mentioned to as a stable bridge circuit.Typical examples of invasive technologies, their sensor types and fitting locations are shown in Fig. 1. The first types of units are inactive magnetized or magneto-meter sensors that are either everlastingly mounted within holes in the road, or affixed to the road surface in some fashion. The unit interconnects to a nearby base station processing unit using either wires suppressed in the road, or wireless communications. The sensor has a circular or elliptically offset *zone of detection* (i.e., the blue area).The second types of units use pneumatic tubes that are overextended across the roadway and affixed at the verge side at both ends. Such systems are only be organized on a temporary basis, due to the fragile nature of tubes, which are easily damaged or torn up by weighty or fast moving vehicles. The third type are inductive detector loops (IDL), consisting of covered wire coils buried in furrows cut in the road surface, wrapped over with bituminous filler. A cable suppressed with the loop sends data to a roadside processing unit. The region of detection for inductive loop sensors depends on the cut figure of the loop slots. The regions depending on the total sensitivity of system not match precisely to the slot extents. IDLs are a cheap and settled technology. They are fixed on both major roads and within city areas, forming the backbone detector grid for most traffic regulator systems. The fourth type of insensitive system is Weigh-In-Motion (WIM) shown in Fig. 2, detectors that consist of a piezoelectric sensor system laid in a station through the road. These systems are moderately rare and are used in specific locations for implementation or access control. They are habitually united with other systems, either intrusive or non-intrusive, to provide additional verifications on collected data.

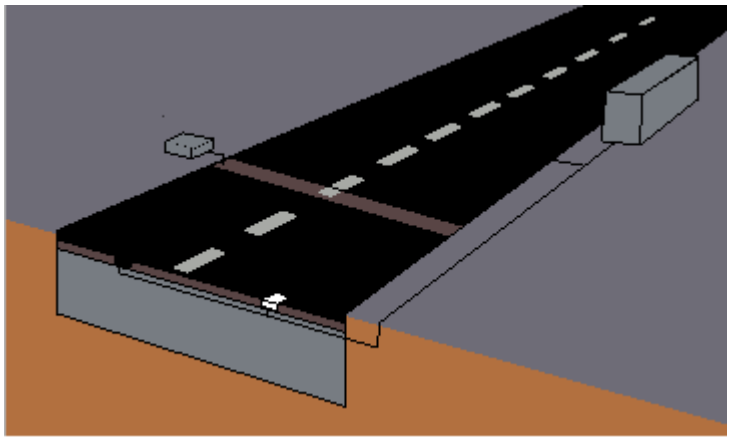

Fig. 3 Load cell configuration in Indian Roads

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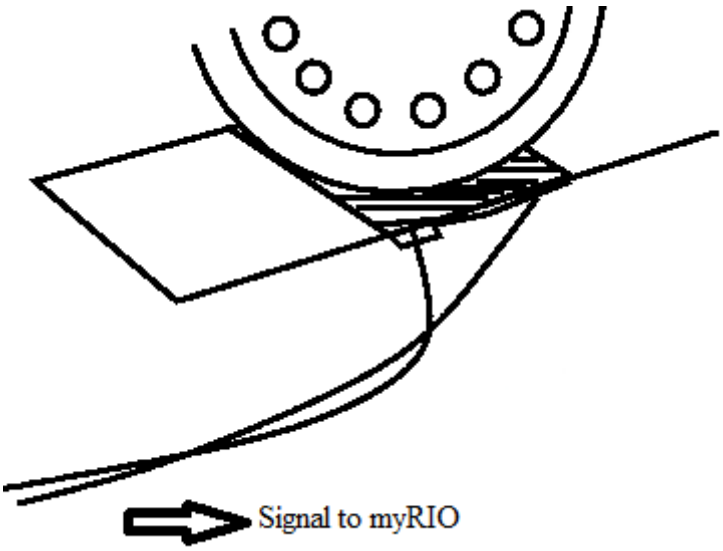

Fig. 4 Load of the Vehicle Acts on Load cell

III.ULTRASONIC SENSOR BASED SPEED MEASUREMENT

We have interfaced NI myRIO with pc (LabVIEW 2014 student evaluation). LV-MaxSonar®-EZ™ is the sensor which transmits and receives ultrasonic waves. Initially 3.3 Volts is supplied to sensor. When the ultrasonic waves approach an object, the output voltage is generated. Here two LV-MaxSonar®-EZ™ is employed. And is placed at a distance of 30cm (0.0003km). When the vehicle crosses the first sensor, corresponding output voltage is generated and time at which the vehicle crosses the sensor is noted. The same is repeated for the second sensor. The time difference is determined. Speed= distance / time.

The time in second is converted into hours. The speed (km/hr) of the vehicle is found. The operating temperature range of the MaxSonar ultrasonic sensors is -40C to +65C. We have calibrated the ultrasonic sensors at laboratory temperature.

Fig. 5LV-MaxSonar®-EZ™

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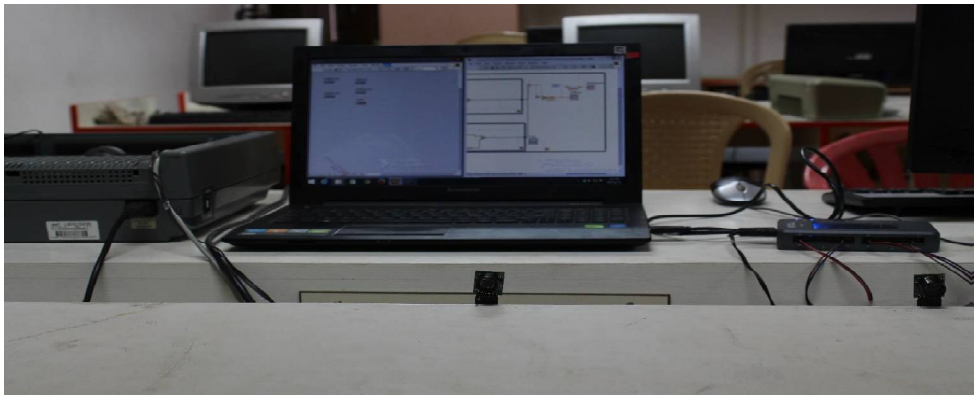

Fig. 6 Experimental setup of Speed monitoring

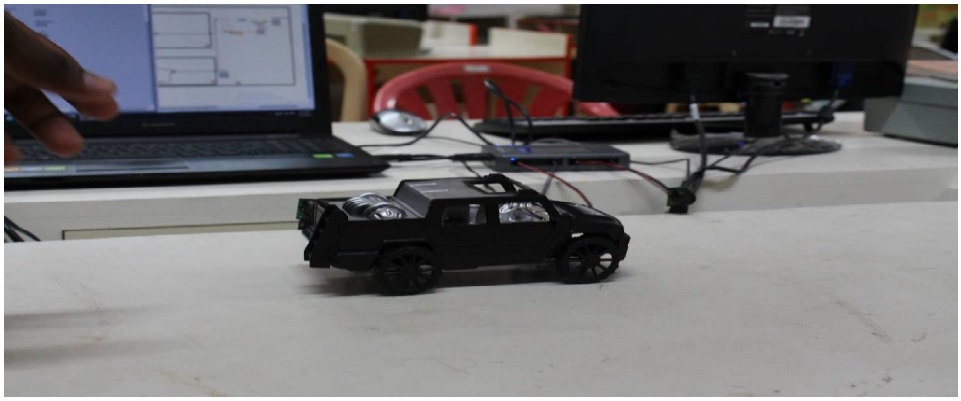

Fig. 7 Real time Speed measurement of vehicle

IV.NUMBER PLATE RECOGNITION

Image Acquisition is the first step in an NPR system and there are a number of ways to attain images, the current collected works claims different image attainment methods used by various authors. The paper used an image acquisition card that adapts video signals to digital images based on some hardware-based image pre-processing developed a identifying system, which uses two CCDs (Charge Coupled Devices) and a prism to split an incident ray into two lights with dissimilar strengths. The main feature of this detecting system is that it covers wide clarification conditions from twilight to noon under sunshine, and this system is skilful of catching images of fast moving vehicles without distorting. This paper used a Sensor subsystem having a high firmness CCD camera accompanied with a number of new digital operation abilities. It uses a video camera to acquire the image. It uses a TV camera and an edge grabber card to acquire the image for the developed vehicle NPR system.

License Plate Extraction: License plate extraction is the most important phase in an NPR system. This section discusses some of the previous work done during the abstraction phase. The paper proposed a method for extracting characters without preceding knowledge of their position and size in the image. The method is based on scale shape analysis, which in turn is based on the assumption that, characters have line-type shapes locally and blob-type shapes globally. In the scale shape analysis, Gaussian filters at various measures blur the given image and larger size shapes appear at larger measures. To sense these scales the idea of principal curvature plane is familiarised. By means of regularised principal curvatures, typical points are extracted from the scale space x-y-t. The position (x, y) indicates the position of the figure and the scale t indicates the intrinsic characteristic size of matching figures. All these characteristic points enable the extraction of the figure from the given image that has line-type shapes locally and blob-type shapes globally. The two Neural Networks used are vertical and horizontal filters, which inspect small windows of vertical and horizontal cross units of an image and choose whether each space contains a license plate. Cross-sections have

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adequate evidence for distinguishing a plate from the background. The paper planned a method to extract license plate depending on the colour of the plate.

Segmentation:This unit discourses previous work complete for the segmentation of characters. Several dissimilar methods have been suggested in the literature and some of them are as monitors, used area developing for segmentation of characters. The simple idea behind region increasing is to detect one or more standards that are characteristic for the preferred region. After establishing the norms, the image is searched for any pixels that fulfil the requirements. Whenever such a pixel is encountered, its neighbours are tested, and if any of the neighbours also match the standards, both the pixels are measured as belonging to the same region.

Recognition:This section offerings the ways that were used to order and then identify the individual characters. The grouping is based on the extracted structures. These features are then characterized using either the statistical, syntactic or neural methodologies. Some of the previous work in the ordering and recognition of types is as observers, the paper discusses a statistical design recognition approach for recognition but their technique found to be inefficient. This approach is based on the probabilistic model and uses statistical pattern recognition approach. The paper discussed the recognition of individual Arabic and Latin types. Their method classifies the characters based on the number of black pixel rows and columns of the character and decision of those standards to a set of templates or signatures in the record. This approach is based on the detection of holes and concavities in the four directions (up, down, left and right), which permits the classification of characters into different classes. In addition, secondary characteristics are used in order to differentiate between the characters of each class. The approaches discussed in this paragraph are based on the structural information of the characters and uses syntactic pattern recognition approach. This proposed seven moment that can be used as features to classify the characters. These moments are invariant to scaling, rotation and translation. The obtained moments acts as the features, which are passed to the neural network for the classification or recognition of characters. Zemike moments have also been used by several authors for recognition of characters. Using Zernike moments both the rotation variant and rotation invariant features can be extracted. These features then uses neural network for the recognition phase. Neural network accepts any set of distinguishable features of a pattern as input. It then trains the network using the input data and the training algorithms to recognize the input pattern.

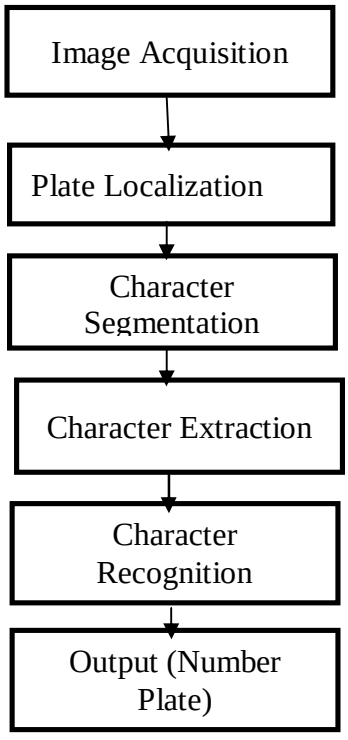

Fig. 8 Block Diagram of Number plate Recognition

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Extracting colour planes from image:Since the colour information is redundant so we extract colour plane from the acquired 32-bit colour image to make it an 8-bit greyscale image.

Image mask: An image mask isolates parts of an image for processing. If a function has an image mask parameter, the function process or analysis depends on both the source image and the image mask. An image mask is an 8-bit binary image that is the same size as or smaller than the inspection image. Pixels in the image mask determine whether corresponding pixels in the inspection image are processed.

Optical Character Recognition (OCR):The exact mechanisms that allow humans to recognize objects are yet to be understood, but the three basic principles are already well known by scientists – integrity, purposefulness and adaptability. These principles constitute the core of OCR allowing it to replicate natural or human-like recognition. Optical Character Recognition provides machine vision functions we can use in an application to perform OCR. OCR is the process by which the machine vision software reads text and/or characters in an image. The process of locating characters in an image is often referred to as character segmentation. Before we can train characters, we must set up OCR to determine the criteria that segment the characters you want to train. When we finish segmenting the characters, we'll use OCR to train the characters, storing information that enables OCR to recognize the same characters in other images. We train the OCR software by providing a character value for each of the segmented characters, creating a unique representation of each segmented character. You then save the character set to a character set file to use later in an OCR reading procedure.

Fig. 9 Number Plate String is obtained

Reading Characters: When we perform the reading procedure, the machine vision application we created with OCR functions segments each object in the image and compares it to characters in the character set you created during the training procedure. OCR extracts unique features from each segmented object in the image and compares each object to each character stored in the character set. OCR returns the objects that best match characters in the character set as the recognized characters.

Character Segmentation:Character segmentation applies to both the training and reading procedures. Character segmentation refers to the process of locating and separating each character in the image from the background.

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Thresholding:Thresholding is one of the most important concepts in the segmentation process. Thresholding is separating image pixels into foreground and background pixels based on their intensity values. Foreground pixels are those whose intensity values are within the lower and upper threshold values of the threshold range. Background pixels are those whose intensity values lie outside the lower and upper threshold values of the threshold range. OCR includes one manual method and three automatic methods of calculating the thresholding range

V. RESULT AND DISCUSSION

The method of vehicle number plate recognition needs a very high grade of precision when we are employed on a very busy roador car parks which may not be imaginable physically as a human being inclines to get exhausted due to dull nature of thejob and they cannot retain path of the vehicles where there are multiple number of vehicles are fleeting in a very short time .To overcome this problematic situation, many hard work have been made by the investigators across the world for last several years. A related work has been made in this effort to progress a precise and programmed automated number plate recognition system. We have used Vision assistant 2015 along with LabVIEW 2015 to obtain the desired output. The arrangement has been confirmed for automobiles comprising dissimilar number plates from different states. We develop an efficiency of 98% for this system.

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