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Automatic Damaged Number Plate Recognition System In Image Processing

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ABSTRACT: *Damaged number License Plate Recognition system is a real time embedded system which automatically recognizes the license plate of vehicles. There are many applications ranging from complex security systems to common areas and from parking admission to urban traffic control. Damaged number license plate recognition (DLPR) has complex characteristics due to diverse effects such as of light and speed. Most of the DLPR systems are built using proprietary tools like Matlab. This paper presents an alternative method of implementing DLPR systems using Free Software including Python and the Open Computer Vision Library.*

INDEX TERMS*: Camera, Processor, OCR algorithm, Template Matching, Image Recognition, Image Construction.*

I. INTRODUCTION

The scientific world is deploying research in intelligent transportation systems which have a significant impact on peoples´ lives. Damaged number License Plate Recognition (DLPR) is a computer vision technology to extract the license number of vehicles from images. It is an embedded system which has numerous applications and challenges. Typical DLPR systems are implemented using proprietary technologies and hence are costly. This closed approach also prevents further research and development of the system. With the rise of free and open source technologies the computing world is lifted to new heights. People from different communities interact in a multi-cultural environment to develop solutions for mans never ending problems. One of the notable contribution of the open source community to the scientific world is Python. Intel's researches in Computer Vision bore the fruit called Open Computer Vision (OpenCV) library, which can support computer vision development. The scientific world is deploying research in intelligent transportation systems which have a significant impact on peoples´ lives. Automatic License Plate Recognition (ALPR) is a computer vision technology to extract the license number of vehicles from images. It is an embedded system which has numerous applications and challenges. Typical ALPR systems are implemented using proprietary technologies and hence are costly. This closed approach also prevents further research and development of the system.

II. LITERATURE SURVEY

Sean et al (2016): This paper is based on the image of tyre movement on mud. So that image by comparing with the dataset can be recognized that to which vehicle this type belongs. This sometime can be used in forensic activities.

Zhuowen. et al (2015): This paper is based on the technique of identifying the text objects from image with complex backgrounds and noise and tiltation. This paper uses the voela jones algorithm to extract the text objects.

Andrew et al (2015) Reading text from photographs is a challenging problem that has received a significant amount of attention.

Two key components of most systems are (i) text detection from images and (ii) character recognition, and many recent methods have been proposed to design better feature representations and models for both. In this paper, we apply methods recently developed in machine learning–specifically, large-scale algorithms for learning the features automatically from unlabeled data–and show that they allow us to construct highly effective classifiers for both detection and recognition.

Priyanka et al (2014): Neural Networks are found as an effective tool for pattern recognition. In this paper a Feed Forward Neural Network and an Izhikevich neuron model is applied for pattern recognition of Digits and Special characters

III. METHODOLOGY

In India, basically, there are two kinds of license-plates, black characters in white plate and black characters in yellow plate. The former for private vehicles and latter for commercial, public service vehicles.

Capture

The image of the vehicle is captured using a high resolution photographic camera. A better choice is an Infrared (IR) camera. The camera may be rolled and pitched with respect to the license plates.

Preprocess

Preprocessing is the set algorithms applied on the image to enhance the quality. It is an important and common phase in any computer vision system. For the present system preprocessing involves two processes: Resize – The image size from the camera might be large and can drive the system slow. It is to be resized to a feasible aspect ratio. Convert Color Space – Images captured using IR or photographic cameras will be either in raw format or encoded into some multimedia standards. Normally, these images will be in RGB mode, with three channels (viz. red, green and blue).

After performing the steps 1 and 2, the image is passed to next component.

License Plate Extractor

This is most critical process in License Plate Recognition System. In this process we apply different techniques on image to detect and extract license plate. This process is divided in two parts.

License Plate Detection through Haar-like features

In image processing techniques, Haar-like features are used to recognize objects from image . If our proposed system is selected to detect only license plates then the Haar-like features are used for this purpose and no further processing is done. This technique is old and laborious and more over needs a large database to store the collected samples nearly about

10000 images of the plates and characters

License Plate Detection through Edge Detection

In the other case, if our proposed system has to recognize license plates, then the binary image is created from the image. After that following steps are performed to extract license plate from binary image: 1. Four Connected Points are searched from binary image. 2. Width/Height ratio is matched against those connected points. 3. License Plate region is extracted from image. 4. Transformation of extracted license plate is performed. Then the extracted license plate is passed to next component for further processing. This approach is quick and takes less execution time and memory with high a efficiency ratio. That's why we have adopted this technique in our project

Character Segmentation

In this part further image processing is done on extracted license plate to remove unnecessary data. After character segmentation, the extracted license plate has only those characters that belong to license number. This also achieved with the width height ratios matching with the contours detected on extracted number plate.

Optical Character Recognition

Finally, the selected blobs are send to a Optical Character Recognition (OCR) Engine, which returns the ASCII of the license number.

IV. TOOLS USED

A. Python

Python is a remarkably powerful dynamic, object- oriented programming language that is used in a wide variety of application domains. It offers strong support for integration with other languages and tools, and comes with extensive standard libraries. To be precise, the following are some distinguishing features of Python:

• Very clear, readable syntax.
• Strong introspection capabilities.
• Full modularity.
• Exception-based error handling.

- High level dynamic data types.
- Supports object oriented, imperative and functional programming styles.
- Embeddable.
- Scalable
- Mature With so much of freedom, Python helps the user to think problem centric rather than language centric as in other cases. These features makes Python a best option for scientific computing.

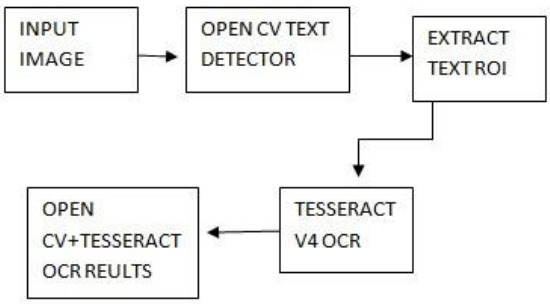
B. OpenCV

OpenCV is a library of programming functions for real time computer vision originally developed by Intel and now supported by Willogarage. It is free for use under the open source BSD license. The library has more than five hundred optimized algorithms. It is used around the world, with forty thousand people in the user group. Uses range from interactive art, to mine inspection, and advanced robotics. The library is mainly written in C, which makes it portable to some specific platforms such as Digital Signal Processor. Wrappers for languages such as C, Python, Ruby and Java (using JavaCV) have been developed to encourage adoption by a wider audience. The recent releases have interfaces for C++. It focuses mainly on real-time image processing. OpenCV is a cross-platform library, which can run on Linux, Mac OS and Windows. To date, OpenCV is the best open source

C. Tesseract

Tesseract is a free software OCR engine that was developed at HP between 1984 and 1994. HP released it to the community in 2005. Tesseract was introduced at the 1995 UNLV Annual Test OCR Accuracy [2] and is currently developed by Google released under the Apache License. It can now recognize 6 languages, and is fully UTF8 capable. Developers can train Tesseract with their own fonts and character mapping to obtain perfect efficiency.

V. ALGORITHM BLOCK



1. Gray scale

In photography and computing, a gray scale or gray scale digital image is an image in which the value of each pixel is a single sample, that is, it carries only intensity information. Images of this sort, also known as black-and-white, are composed exclusively of shades of gray, varying from black at the weakest intensity to white at the strongest. Grayscale images are distinct from one-bit bi-tonal black-and-white images, which in the context of computer imaging are images with only the two colours, black, and white (also called bi- level or binary images). Grayscale images have many shades of gray in between.

2. Converting color to gray scale is not unique; different weighting of the color channels effectively represent the effect of shooting black-and-white film with different-colored photographic filters on the cameras

3. Morphology is a technique of image processing based on shape and form of objects. Morphological methods apply a structuring element to an input image, creating an output image at the same size. The value of each pixel in the input image is based on a comparison of the corresponding pixel in the input image with its neighbours. By choosing the size and shape of the neighbour, you can construct a morphological operation that is sensitive to specific shapes in the input image.

4. Dilation

Dilation is a transformation that produces an image that is the same shape as the original, but is a different size. Dilation stretches or shrinks the original. Dilation increases the valleysand enlarges the width of maximum regions, so it can remove negative impulsive noises but do little on positives ones.

5.Erosion

It is used to reduce objects in the image and known that erosion reduces the peaks and enlarges the widths of minimum regions, so it can remove positive noises but affect negative impulsive noises little.

6.Median Filtering

Median filtering is a nonlinear process useful in reducing impulsive, or salt-and-pepper noise. It is also useful in preserving edges in an image while reducing random noise. For example, suppose the pixel values within a window are

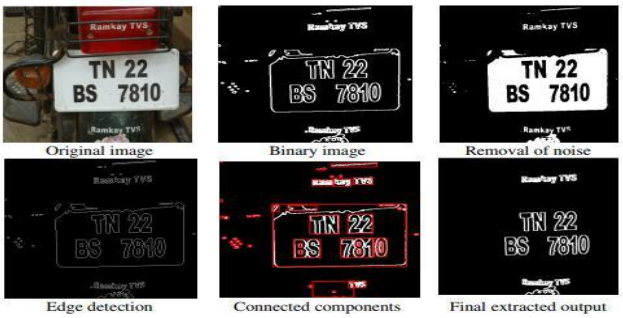
56, 55, 10 and 15, and the pixel being processed has a value of
55. The output of the median filtering the current pixel location is 10, which is the median of the five values.

7.Out-Range Pixel Smoothing

Like median filtering, out-range pixel smoothing is a nonlinear operation and is useful in reducing salt-and-pepper noise. If the difference between the average and the value of the pixel processed is above some threshold, then the current pixel value is replaced by the average. Otherwise, the value is not affected. Because it is difficult to determine the best parameter values in advance, it may be useful to process an image using several different threshold values and window sizes and select the best result. An edge in an image is a boundary or contour at which a significant change occurs in some physical aspect of an image, such as the surface reflectance, illumination or the distances of the visible surfaces from the viewer. Detecting edges is very useful in a no of contexts. For example in a typical image understanding task such as object identification, an essential step is to segment an image into different regions corresponded to different objects in the scene.

8.Image Restoration is the operation of taking a corrupt/noisy image and estimating the clean, original image. Corruption may come in many forms such as motion blur, noise and camera mis-focus. Image restoration is performed by reversing the process that blurred the image and such is performed by imaging a point source and use the point source image, which is called the Point Spread Function (PSF) to restore the image information lost to the blurring process.

V. SIMULATION RESULT



The above simulation diagram represents how the numbers from damaged number plate is been detected in every steps.

VI. CONCLUSION

We were able to solve a subset of a very difficult and complex problem that continues to be pursued by researchers today. Finally, the characters are recognized in the character recognition stage by using OpenCV. The message of this research is to show that free and open source technologies are matured enough for scientific computing domains. OpenCV is good points of start for researchers and students of computer vision.

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