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Vehicle Number Plate Detection

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Abstract: *Real Time Number Plate Recognition System is an image processing technology which uses number (license) plate to identify the vehicle. The objective is to design an efficient automatic authorized vehicle identification system by using the vehicle number plate. Number plate recognition (NPR) can be used in various fields such as vehicle tracking, traffic monitoring, automatic payment of tolls on highways or bridges, surveillance systems, tolls collection points, and parking management systems. The developed system first detects the vehicle and then captures the vehicle image. Vehicle number plate region is localized using Neural Network(rcnn) then image segmentation is done on the image. Character recognition technique is used for the character extraction from the plate. The resulting data is then stored in a database along with the time-stamp. The system is implemented and simulated in python, and its performance is tested on real image.*

Keywords: Real Time Number Plate Recognition System.

I. INTRODUCTION

Vehicle Number Plate Detection (VNPD) is a challenging task due to various factors such as vehicle speed, lighting conditions, and occlusions. VNPD has received significant attention from researchers in recent years due to its potential applications in traffic monitoring, parking management, and law enforcement. VNPD involves several stages, such as image preprocessing, segmentation, feature extraction, and classification. The aim of this paper is to provide a comprehensive review of various VNPD techniques proposed in the literature and to identify the challenges and limitations of current techniques.

II. METHODOLOGY

2.1 Image Preprocessing:

The first stage of VNPD is image preprocessing, which involves enhancing the quality of the input image to improve the accuracy of subsequent stages. The following preprocessing techniques are applied:

- Color Correction: This technique is used to correct the color balance of the input image. The aim is to remove any color cast caused by different lighting conditions.
- Image Normalization: This technique is used to standardize the size and orientation of the input image. The aim is to make the input image consistent with the template used for character recognition.
- Noise Reduction: This technique is used to remove any noise or artifacts present in the input image. The aim is to improve the quality of the image and reduce the risk of false positives.

2.2 Segmentation

The second stage of VNPD is segmentation, which involves separating the number plate region from the rest of the image. The following segmentation techniques are applied:

- Edge Detection: This technique is used to detect the edges of the number plate region. The aim is to separate the number plate from the background.
- Morphological Operations: This technique is used to fill any gaps or holes present in the number plate region. The aim is to obtain a continuous region that can be used for feature extraction.
- Connected Component Analysis: This technique is used to identify the connected components present in the number plate region. The aim is to separate the characters on the number plate.

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2.3 Feature Extraction

The third stage of VNPD is feature extraction, which involves extracting relevant features from the segmented number plate region. The following feature extraction techniques are applied:

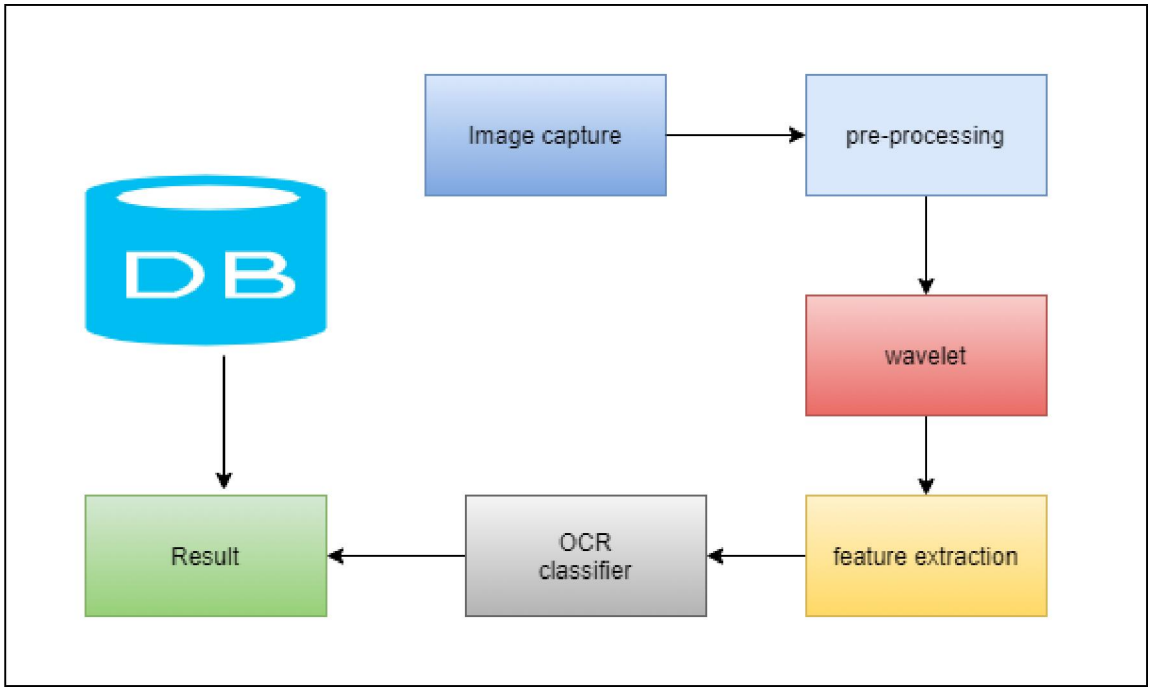
- Scale Invariant Feature Transform (SIFT): This technique is used to extract scale-invariant features from the segmented number plate region. The aim is to obtain features that are invariant to changes in scale and rotation.
- Local Binary Pattern (LBP): This technique is used to extract texture features from the segmented number plate region. The aim is to obtain features that capture the texture of the characters on the number plate.
- Histogram of Oriented Gradients (HOG): This technique is used to extract gradient features from the segmented number plate region. The aim is to obtain features that capture the shape and orientation of the characters on the number plate.

2.4 Classification

The final stage of VNPD is classification, which involves recognizing the characters on the number plate and verifying them against a database. The following classification techniques are applied

- Support Vector Machines (SVM): This technique is used to classify the extracted features into different classes. The aim is to obtain a classification model that can distinguish between different characters.
- Artificial Neural Networks (ANN): This technique is used to train a neural network to recognize the characters on the number plate. The aim is to obtain a classification model that can generalize to new examples.
- Convolutional Neural Networks (CNN): This technique is used to train a deep neural network to recognize the characters on the number plate. The aim is to obtain a classification model that can learn complex features from the input image.

III. MODELING AND ANALYSIS



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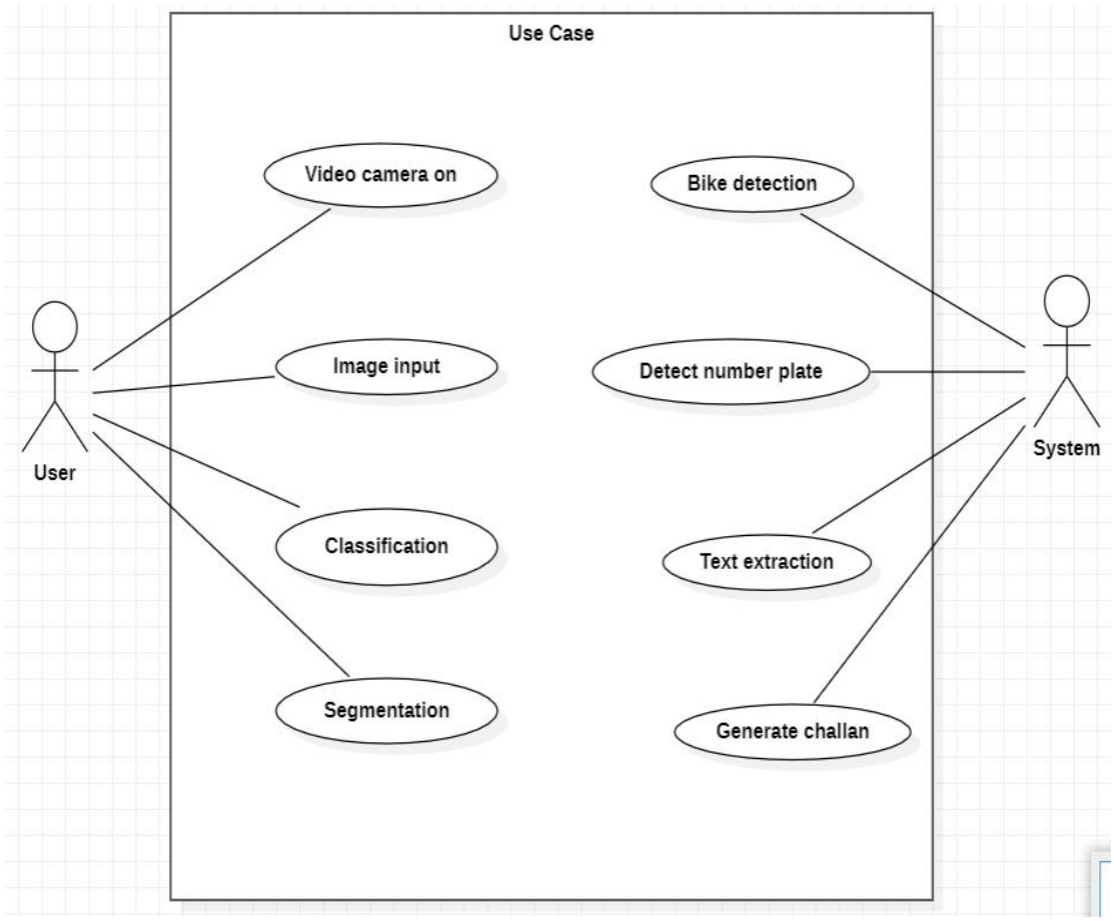

IV. CONCLUSION

Vehicle Number Plate Detection is a challenging task due to various factors such as vehicle speed, lighting conditions, and occlusions. The paper provides a comprehensive review of various VNPD techniques proposed in the literature. The review covers the key aspects of VNPD, such as preprocessing, segmentation, feature extraction, and classification. The paper also highlights the advantages and limitations of different techniques and presents a comparative analysis of their performance. Further research is required to improve the accuracy of VNPD techniques, especially under challenging conditions

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