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VEHICLE NUMBER PLATE DETECTION

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ABSTRACT:

Text detection and classification in natural images is very important in present situations. At present the main challenge in text identifying is to detect the text in natural images due to many factors like low quality images, unclear words, typical fonts. Our project mainly focus on recognition of text on licensed number plates. Automatic text detection and classification can be assisted in the detection of stolen vehicles and also useful for controlling traffic and vehicle owner identification which has become major problem in every country. Sometimes it is very difficult to identify owner of the vehicle who violates the traffic rules and drives too fast. This paper presents a detection method in which at first the vehicle plate image is obtained by the digital cameras and the image is processed to get the number plate information. There are several algorithms that can be used to process the image and get the text. In this context, CNN (Convolutional neural networks) algorithm is used for recognizing the text clearly. The main purpose of this project is to identify the text clearly by removing noise in the Images.
Keywords: Number Plate Detection, CNN, Noisy Images

INTRODUCTION:

Text detection plays a vital role in the field of AI, augmented reality and other innovations. It helps to get rid of noise in images and identify text. In previous couple of years, Vehicle Number Plate detection and classification or car plate recognition has been one among the useful approaches for vehicle surveillance. It will be applied at number of public places for fulfilling a number of the needs like traffic safety enforcement, automatic toll text collection, parking area system and Automatic vehicle parking system. 2 Vehicle Number Plate detection and Automatic Number Plate and classification in natural Images algorithms are generally divided in four steps: (1) Vehicle image capture (2) Number plate detection (3) Character segmentation and (4) Character recognition. The text detection plays a vital role in life because it is employed for vision type applications. Currently vehicle number plate detection faces difficulties like different direction of the text, complexity in backgrounds, blur images etc. so as to overcome all these difficulties, CNN (Convolutional neural networks) algorithm is employed. Now the task is to detect the text and increasing the accuracy level of identifying the text.

RELATED WORK:

This section, tells a brief explanation about the works that are done on text detection and classification

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C.P. Chaithanya, N. Manohar, Ajay Bazil Issac (2019) proposed an innovation algorithm to detect the text and to increase the accuracy. This includes pre-processing, segmentation, NSER, Stroke with calculation, feature extraction and text detection. They used different classification methods like CNN and related methods are used and in some cases valley and ridge techniques are used. By using these technologies they implemented different methods to detect the text which forms meaningful words or sentences. The dataset is used from ICDAR (International Conference on Document Analysis).They trained and tested the dataset and they got the accuracy of training set as 92.31% [1].

Dipti Shah, Chirag Patel, Atul Patel(2013) proposed Automatic Number Plate Recognition(ANPR) system. This work mainly focus on identifying the owners of a particular vehicle who violates the traffic rules and drives too fast. It is not possible to catch and punish these kind of people because the traffic person might not be able to retrieve vehicle number from the moving vehicle because of the speed of the vehicle. Therefore, ANPR system is developed. In this report different techniques of ANPR are discussed by considering the points like Size of the Image, Rate of Success and the time taken for processing. Different algorithms like Artificial Neural Networks, Character segmentation, Image segmentation and other are also used. In this ANPR there is no possibility of 3 getting 100% accuracy as each phase is dependent on previous phases [2].

S.Kranthi, K.Pranati, A.Srisaila (2011) developed an Automatic Number Plate Recognition Techique for recognizing the License numbers. In this study a method is introduced in which the image of a vehicle plate is captured by a digital camera and that Image is processed to get the Information of number plate. A rear Image is captured and processed using various algorithms. In this state of affairs the number plate area is localized using a novel "feature-based number plate localization" method which consists of many algorithms. Though there are many algorithms this study focuses on two major algorithms they are Edge Finding Method and Window Filtering Method for developing the Vehicle Number Plate Detection system. By applying different algorithms vehicle number plate is processed [3].

PROBLEM STATEMENT:

Now a days we know that traffic polices are given smart cameras for capturing the pictures of the vehicle number plates who violates the traffic rules. But, there is a problem that when the

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traffic is at high, capturing pictures is difficult and captured pictures may be blur by that text cannot be identified. To avoid this problem we used an CNN (Convolutional neural networks) algorithm in Machine Learning to identify the text clearly by removing the noise present in the Images.

OBJECTIVES OF THE PROJECT:

- The main objective of this project is to detect the text from Licensed Number Plates with high accuracy.
- Identification of blur Images and process them to get high accuracy is the main objective.
- By this, it helps to detect the traffic rules violators and is helpful to punish them and make them not violate the traffic rules.
- Sometimes there is a chance of sending challan to the other persons due to the noise present in the images, so this project is helpful to avoid this problem.
- This project is also helpful to maintain security in the restricted areas like military places and others.
- When someone makes an accident and try to escape at that time our project is helpful to identify their vehicle number and catch them.

PROPOSED METHODOLOGY:

We strongly believe that number plate text detection is more important in today's life as it is helpful to reduce wrong sending of challans to people, to detect the persons who violates the traffic rules and also can be helpful to know the persons who enters the restricted areas like military zones or area around top government offices e.g. Parliament, Supreme Court etc. Therefore, our proposed system aimed to focus on number plate images as dataset. Then we applied CNN algorithm for processing the image and avoid noise in the images.

Convolution Neural Network (CNN):

Convolution Neural Network or CNN is a category of Artificial Neural Network used in the fields of image recognition and processing. CNN is especially designed to process the pixel data [4].

Steps:

1 Convolution

2 Pooling

3 Flattening

4 Fully Connection

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Convolution*:* Convolution refers to the mixture of two functions to produce a third function. Convolution combines two sets of Information. In case of Convolution Neural Networks, the convolution is executed on the input data with the use of a filter to produce a feature map.

Pooling**:** The primary aim of a pooling operation is to reduce the size of the image as much as possible. The main task of pooling is to reduce the spatial size of the representation to reduce the computation in the network and number of parameters required. Pooling layer works on each and every feature map separately. The approach that is used in poolingconcept is max pooling**.**

Flattening**:** Convert all the pooled images into a continuous vector through Flattening. Flattening is one of the important step to understand in CNN. The task that is done here is taking a 2-D array, i.e. pooled image pixels and converting them to one dimensional single vector.

Fully Connected**:** Fully connected layer task is to connect every neuron present in one layer to every neuron present in another layer. It is same as the traditional multi-layer perception neural network (MLP). To classify the images the flattened matrix goes through a fully connected layer.

By applying all these steps a noisy image is converted to noise free image that is easy to detect the text easily.

IMPLEMENTATION:

Data mining course starts with data preprocessing. Data preprocessing is one of the data mining technique that involves converting of the unprocessed data into an understandable format. The data collected from the real world is often incomplete, inconsistent, and/or lacking in certain behaviors and may contain many errors. Data preprocessing involves the following steps:

1. Get data
2. Importing libraries
3. Importing datasheet
4. Checking missing data
5. Working with categorical data
6. Splitting dataset into training and test data

1. Get Data*:*

In order to train our machine, we need a huge amount of data so that our model can learn from them by identifying out certain relations and common features related to the objects. Many such datasets are available on internet. We collected the dataset manually, we collected the images of different vehicles having number plates. By giving the images as input we trained the dataset and tested it whether we got the correct output or not. The following figure 1.1 shows the

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dataset in json file format.

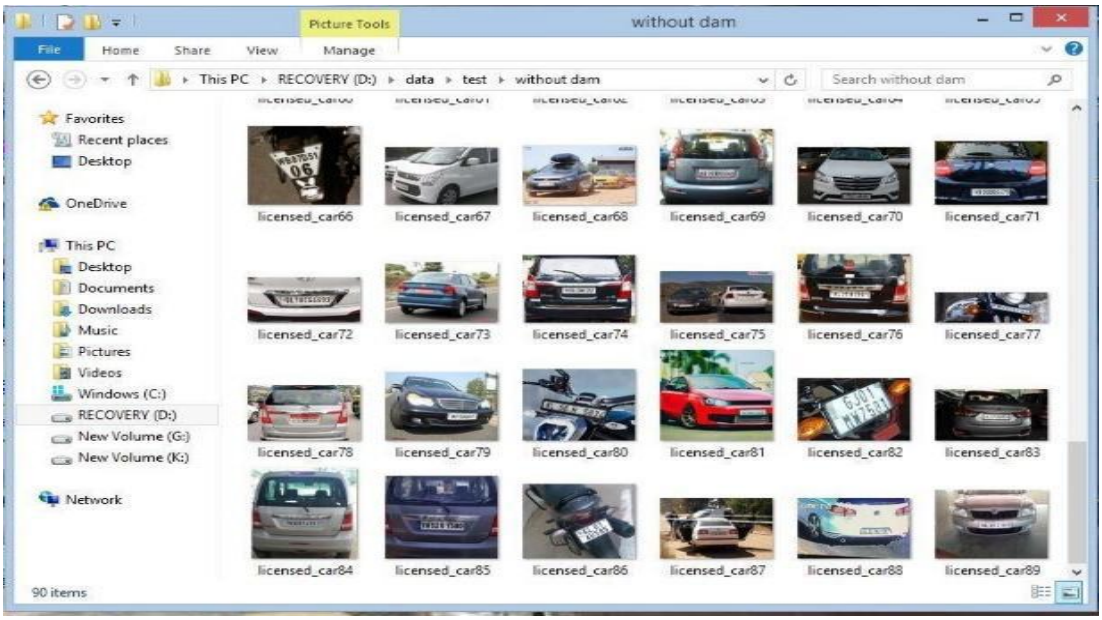

Figure: 1. Dataset

JSON stands for JavaScript Object Notation is a data interchanging format for transferring data as text. JSON files are easy for machines to parse and generate and are also easy for humans to read and write. Processing of JSON data is fast and easy, unlike the other complex process of parsing. Most modern programming languages currently support JSON formats.

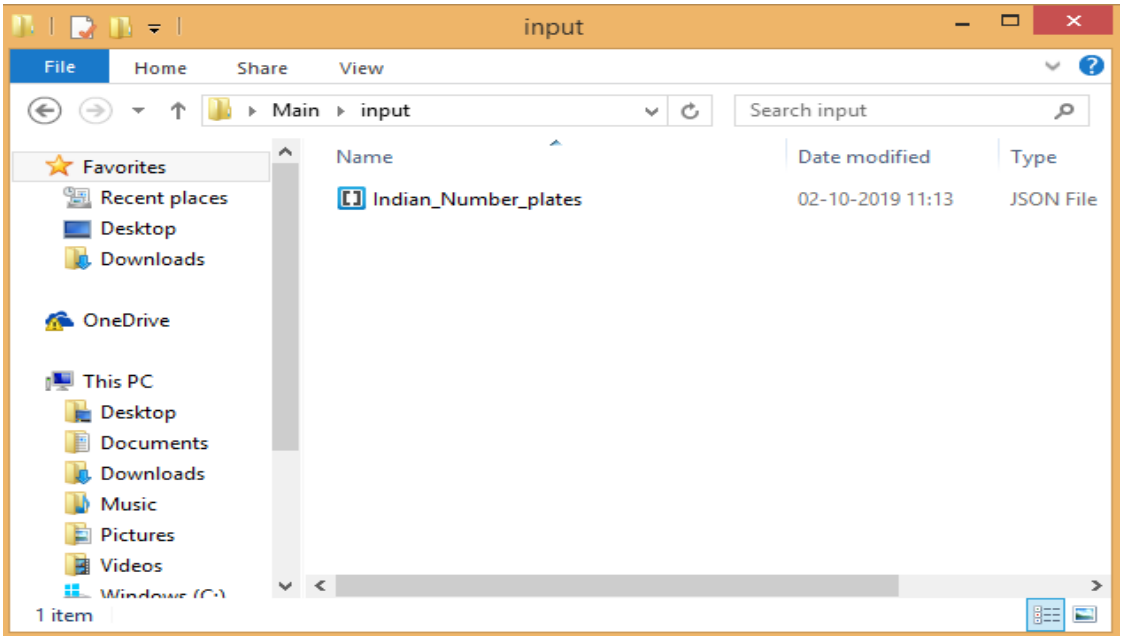

Figure: 2. Dataset in json Format

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2. Importing Libraries:

To execute the algorithm, for making predictions and to process the returned data few standard libraries are used. Those libraries are pandas, numpy, matplotlib, Keras, OpenCV, PyTesseract, and Imutils. The format for importing a library can be referred below

```
import tensorflow.keras
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Convolution2D
from tensorflow.keras.layers import MaxPooling2D
from tensorflow.keras.layers import Flatten
from tensorflow.keras.layers import Dense
```

3. Importing datasheet:

For importing the dataset firstly a Pandas Data Frame will be created by loading the datasets from existing storage, that storage can be SQL Database, CSV file, or Excel file. For creating the Pandas Data Frame lists, dictionary, and from a list of dictionary etc can be used. The csv file (dataset) is read using pandas and an object to the dataset is created i. e, df (data frame).

4. Checking for missing data:

The real world data may contain inconsistent, incomplete and noisy data. While applying the machine learning algorithms, the dataset should be cleaned. However, it is done in pre-processing. In order to remove inconsistency and incomplete data, we check for any missing values. This can be done using the function null (). It checks each value in each row and tells whether the dataset contains any missing values for all columns. The output value is Boolean (true/false). False indicates the value is not null and true indicates that the value is missing.

5. Splitting dataset into training and test data:

While working with datasets, in machine learning there two stages in which those machine learning algorithms work they are train stage and test stage. We split the data around 30%-70% between testing and training stages. In supervised learning, the data is split into two stages train set and test set. A training set of 70% (contains images of license plates) and a test set of 30% (images of license plate). A systematic method was required to compare and evaluate the classification models to determine the performance for our specific problem. For training the model and fitting the dataset train set is used and test set is used for testing Therefore, this study implemented validation to minimize the impact of random variation in the training set.

6. Epochs should be run:

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The dataset contains the images, to run the dataset epochs should be run. In respect of artificial neural networks, an epoch is one cycle through the full training dataset. An epoch is mixed up with an iteration, but the difference between epoch and iteration is Iterations are the total number of steps that are needed to complete one epoch. The number of epochs should be as high as possible and terminate training based on the error rates. An epoch is one learning cycle where the learner concentrates on the whole training data set. If there are two batches, the learner needs to go through two iterations for one epoch.

7. Feature Scaling:

Feature Scaling is a method of working to systematize the independent features present in the data in a fixed range. During the data pre-processing stage Feature Scaling is performed to handle highly varying values or units. So, Feature Scaling is used to bring all values to same magnitudes and thus, handle this issue. Feature Scaling helps to normalize the data within a particular range. Sometimes, Feature Scaling helps in speeding up the calculations in an algorithm.

All the steps that are implemented are shown in the figures below:

Figure: 3. Image of a Vehicle

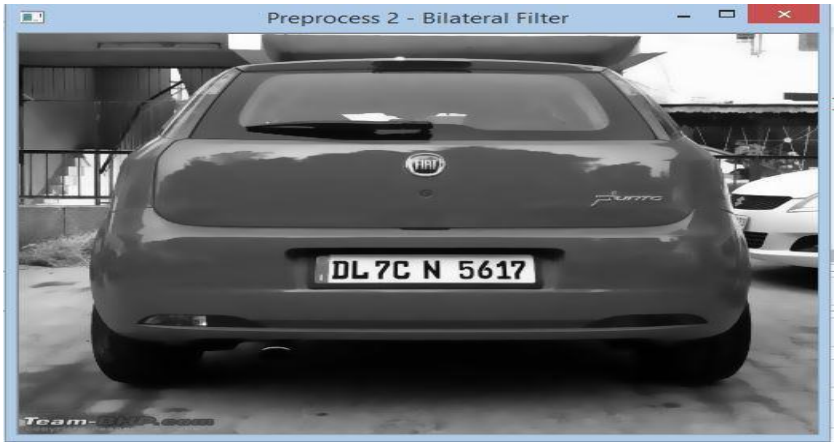

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Figure: 4. Gray scale Image of vehicle

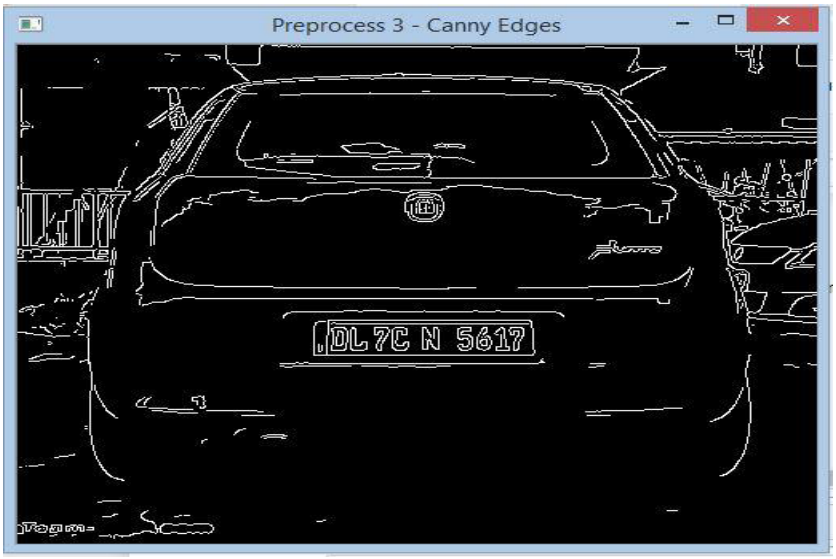

Figure: 5. Extraction of Number Plate in the Image

Figure: 6. Select the Number Plate from the Image

Figure: 7. Image of Number Plate without Noise

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RESULTS AND DISCUSSION:

The vehicle ought to stay stationary while taking the picture and the picture is caught from settled point may be unrecognized. We may face some problems like improper identification either because of the system that was not able to extract the number plate from grayscale of the image taken improperly or because of luminance conditions and blurry background. Number plate detection needs a great degree of high exactness when capturing images of busy streets or parking areas. For identifying the number plates without noise present in it Vehicle Number Plate Detection is implemented. This project uses the Convolutional Neural Network (CNN) algorithm for removing noise present in the images and detect the number plate.

CONCLUSION AND FUTURE SCOPE:

This proposed system presents a detection method where the vehicle plate image is obtained by the digital cameras and the license number of the vehicle is perceived with the goal that the data and information about the vehicle owner can be obtained. An image of a vehicle is captured and processed using various algorithms. Text detection can be applied in real world scenarios like character recognition, Artificial Intelligence, distinguish between human and machine inputs and in spam removal. Text detection is the process of locating area in an image where, a meaningful text is occurred. Change in environment in which the image is captured makes it a difficult to process. The characters which are identified are classified into meaningful word or sensible sentences. The identified words are chained together and checked whether they form the meaningful sentences. In this paper, a system which detects the text clearly is presented. The accuracy of the proposed system is 93.31%.

In Further studies we are planning to study about all the characteristics that are involved with the Vehicle Number Plate Detection for better performance. In future, the detection of number plate should be possible from the video processing also.

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