Number Plate Detection and Recognition Using Python

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ABSTRACT

Over the past two decades, the automobile industry has made large strides in embodying technological advancements in its environment. We know see smarter vehicles on road that facilitates for efficient communication with humans. The automobile we own now is capable of providing statistical analysis of the usage associated with it. With technological concepts revolving around machine learning, artificial recognition and data analytics, we see that the advancements taking birth in the automobile sector is making it a very promising industry for automobile aspirants. To be a part of this technological marathon that is running across the world, we aim to deliver a simple yet efficient method of handling the data of numerous vehicles that enter and exit a particular location. The data that is linked to such a scenario is large and can be tedious to work with, if done manually. Adding to this, it does not provide a reliable source for working on, as data that is handled manually can be redundant and inaccurate. We use the python programming language that has shown to be the face of much advancement to solve this issue. With python and its packages, we can now detect the number on the number plate and store it in a database, that is easily accessible and functions can be performed on it with ease. A CCTV can aid us in capturing the front/back portion of the automobile where the number plate is attached to it. This image is now sent to an environment in python for image filtration techniques that processes the image to an extent where it filters out all the contours except our number plate. The string on the number plate can now be recognized by the software and is stored in a database with the additional information on when and what time the automobile entered/exited a particular location.

Keywords - Python, Penultimate, Utility, Display

I. INTRODUCTION

As we progress into the third decade of the 21st century, the need to comply with automation has given birth to a wide range of tech that makes human life at ease. But with this being the frontal part of a monumental background, we often do not seem to know how a particular function is processed. It comes with great power to understand technology as it opens up a wide array of possibilities for development. This array, more or less, circulates around the need for programming and developing problem solving skills. As we dig deep into concepts such as machine learning and artificial intelligence, we find there is a correlation amongst the two and can be logically devise it to be a subset of data analytics. We see various fields being automated with the concepts of machine learning and artificial intelligence. Let us take an example of home automation. It can be seen that anything that is electrically run, can be automated to make it a smart home. For example, a light bulb turns on when someone enters the room.

This can be achieved with the help of sensors. Automatic door locks can recognize when your cell phone is near or far and can lock doors accordingly. Such is the need for easing up complicated tasks. We use automobiles on a day to day basis and there can never be another substitute for it. As we progress into the future, development can take place only when there is sufficient data to work on. As aforementioned in the abstract, manual typing and handwritten tasks are often tedious and laborious. It becomes difficult to operate with such data as they need to be made computer- ready data for processing. With this, a logical conclusion to this problem, would be to automate any such tedious processes. Man-kind has almost reached the place, where a car no longer needs a driver to navigate himself to a destination. These techs are leaps and bounds ahead of what man could have imagined the industry of automobile to be at, 5-10 years back. As mentioned earlier, all this is only possible with the key factor of programming. Python in recent times has had great success in the programming environment with its ease of understanding and executing. In the coming chapters we will take a look at why python provides a great opportunity to learn and invest our time in, that can help us provide solutions to various problems in our day to day life.

II. LITERATURE REVIEW

The birth of this beautiful programming language took place in the late 1980's, and it we began seeing its implementation in the year 1989. Van Rossum, also known as the father of python, is python's primary author. Python 1.0 was initially launched in the year 1994. This saw of the rise of python's most prominent functions such as lambda, filter, reduce and map. Version 1.2 was later released in the year 1995. Python version 1.4 saw a great change in the functions it possessed. It now included key-word arguments and also supported complex numbers.

Python 2.0 saw its rise in the early 2000's. It now possessed features like list comprehension, garbage collection, the with statement and many more. it also the coming together of python's types and classes into one hierarchy. It also saw the newly included warning feature that told the user, the existing feature is being removed in the upcoming versions. The support for python 2.0 saw its end in the early stages of 2020 and was put to bed with fixes for bugs and blockers that caused issues in the penultimate version of python 2. Python 3.0 also called as py3k announced its grand arrival on the 3rd of December in the year 2008. It is not backward compatible with python 2.0 and hence any script to run on python 3 which ran in python 2, had to be modified. Some of the major changes saw the print function being made available as a built-in function and did not require any imports. It also saw the replacement of the input statement i.e. raw_input () to just input (). In this project we use three important modules cv2, imutils and tesseract which we will look into much deeper in as we progress. These modules help in image recognition and processing that will help us with our project in obtaining data accurately. We will also take a step by step tour how this script is understood by the python interpreter and how the desired output is obtained.

III. OPERATING STEPS

Step 1 : Start.

Step 2 : Load captured image. Introduction

Step 3 : Resize image to standard size. (change width to 500)

Step 4 : Convert RGB image to grayscale.

Step 5 : Remove noise with bilateral filter. (preserve edge)

Step 6 : Find edges in the grayscale image.

Step 7 : Find contours based on the edges in the image.

Step 8 : Create a copy of the image to draw all the contours based on edges.

Step 9 : Sort all the contours and derive top 30 contours.

Step 10 : Loop over the contours to find a rectangular contour.

Step 11 : Draw the obtained contour on the image.

Step 12 : Crop the number plate from image.

Step 13 : Convert image to string.

Step 14 : Append the obtained string to a database with date and time of entry.

Step 15 : Finish.

IV. PYTHON MODULES USED

CV2

Open computer vision alias OpenCV is an open source python library, which within itself several algorithms for computer vision. This package can simply be described best, for its image and video processing capabilities. In this project we will focus mainly on its image processing functions. OpenCv accommodates a wide range of functionality including linear and non-linear filtration processes, image transformation with respect to geometry, inversion of colour, plotting of histograms and many more.

In this project we have used the following functions from the module CV2:

- Imread (): reads an image from the specified location.
- Imshow (): display the image mentioned as arguments
- find Contours (): finds all the contours in the given image.
- approxPolyDP (): Structures a closed and continues curve
- boundingRect (): Finds the co-ordinates of the given closed curve.

- drawContours (): embodies the contours into an image.
- Imwrite (): stores a new image with desired name.

Imutils

The imutils, short for I am utility function, in python is an open-source library that is made available for basic processing functions that can be applied on images. These functions include resizing, rotation, translation, displaying, sorting of contours, which is used in accordance with the OpenCv python module. To install this module in your python project run the following command on your terminal: Pip install imutils

The following functions were used from the module imutils:

Resize (): this function enables the user to resize any image accordingly, to obtain a desired image of the required dimensions. In accordance with the OpenCv python module, the imutils module helps in detecting contours, sorting the contours, and obtaining a closed rectangular contour which helps in the final step of getting a cropped image of the number plate.

Pytesseract

The pytesseract is short for the module called python source is which is another open source build available for python users. It is best described for its OCR prowess. In simple terms it can translate any text embodied in an image and return its user a string. The images can be of the format jpeg, jpg, bmp, tiff, png, gif and many others. This module holds the key factor in making this project what it is, as the text on the number plate in the image is transcript by the computer to append it to a database. Originally, it stood as a wrapper for Google's Optical character recognition engine.

To install this module in your python project run the following command on your terminal: Pip install pytesseract

The following functions were used from the module pytesseract:

- Pytesseract. Pytesseract. tesseract_cmd="": This tells the python interpreters to search for an executable file in the specified location that assigns it to the variable that will provide us with the OCR engine.
- Image_to_string() – this function, as the name suggests, runs through the image to find all the strings present in it and return the same.

This is the final step in our project after all the image filtration and processing has taken place. The filtered image is sent to the optical character recognition engine where the desired registration number of the given vehicle is obtained.

Time

The time module in python offers its users time related functions.

Pandas

The pandas library is one which is used vividly across any python platform. It provides functionality for data manipulation, in particular, numerical table and the series of time. It handles data exceptionally well and provides for a fast and flexible way for manipulation of data. Data structures including, lists, dictionaries and tuples can be converted to data frame using pandas.

V. CONCLUSION

Programming modules have set of collected packages and libraries which assist in complex data handling through pre-defined functions and help in the generation of new code without overly complication the process. The key is to minimize iteration and maximize efficiency via compact data code that ensures the most direct route to obtaining the output.

In this case the various stages of image recognition, scanning and conversion to numeric data to be input into a charted form, it is a directive of the fact that automation of this avenue is possible which indicates that further optimization is possible. With the world going digital, the scope for such software is the demand of the hour. One can argue that is might affect the grass-root level employees of any organization but the obvs counter to this will be the fact that this instead opens up better data entry handling process and instead of eliminating the manual labor all together it promotes it to the position of supervision and maintenance, this creating more sources of revenue.Practically speaking, one to one input of any data is prolonged task, hence software application is the required levels is a necessary part of digital transformation and is becoming an increasing investment within any origination's portfolio. Hence coding is setting the new precedent for efficiency especially with the changing trends of the industry.

VI. REFERENCES

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