**Report**

What is the main idea of your report? Is it a problem -solving, compare and contrast, cause and effect, describing a personal event/description report? Why did you choose so? What is the purpose of this study? How important and to whom is this project useful? How are you going to start your project? Present a timeline for this in the form of a table.

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| The main idea of my project is to build a system that would make the current tollgate systems automatic and would save our precious time near the toll plazas.  It is a problem solving report as I build a system that would encounter the traffic problems near the tool plazas.  Generally, I love travelling. I have travelled to many places in south India. So, when I want to go from one place to another, the only way for me was through road. National highways really help me a lot in my travel. When I have started travelling through these highways, I have faced many toll plazas. The common problem that I faced near the toll gates was there are no automated or semi-automated systems. Because of that people travelling on the highways waste their precious time near the tolls. If it is a festive season, then there would be heavy traffic than the ordinary traffic near the toll plazas. Many countries like Dubai, USA are equipped with fully automated toll gates where people won’t even spend one second near the toll plazas. All these reasons made me to develop a system that would really save time near the toll plazas.  This project is really important for us to save our time near toll plazas. Day by day population is increasing and also no. of vehicles on the highways is also increasing. So to accommodate all the new as well as old vehicles on the highways we need to have this kind of system. If this system is practically introduced, then it would benefit the people. And also we can alert the people who are not paying their traffic challans at the toll plaza itself. Moreover traffic police have a great chance to catch hold of the vehicles that took part in crimes.  I am going to start my project by understanding the low pass filter, high pass filter, thresholding, resizing, contours concepts from open source computer vision library (openCV). Apart from these, learning the basic image processing techniques through python programming language, the main reason to choose python as it is easy to handle relative to the other programming languages.  The timeline of the project:  Vehicle comes near toll plaza  High resolution ccTV cameras takes the image of the vehicle  My algorithm finds the number plate details  Toll fare deduction takes place from the corresponding back account of that particular number plate  Vehicle exits the toll plaza |
| Max 100 words Word length: |

In this section you need to present an extended abstract. You have to cover, the main objective, tools, research design (Whether qualitative or quantitative), research procedure, subjects if any, research outcomes of this project.

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| The main objective of this work is to developa model that saves precious time near the toll plazas using Image processing techniques. The ultimate way to make our lives comfortable is through Image processing. It is one of the most exciting fields of science and technology. Starting from the mobile phones we use, to the modern satellites, Image processing techniques play a crucial role in human’s life. It can be defined as, the process of manipulating images in a desired way.  Image processing has a wide range of applications in nuclear field, Medical Diagnosis, Automated Industrial Inspection, Remote sensing, weather prediction, Military security and surveillance, computer-vision, biometrics (like Fingerprints and iris scan) and many more.  Many of us have encountered heavy traffic jams near tollgates. As Image processing has a great scope in security and surveillance field, we have used those techniques in our work. Our objective can be achieved if we try to get vehicles number plate information from the images captured by the high resolution CCTV cameras.  In the first part of the work we need to take the data or the images captured from the CCTV cameras. The captured images are to be filtered by eliminating the unnecessary background textures. After eliminating the background, the image should be resized so that useful information can be obtained.  In the second part we use active contour function from the OpenCV library which actually enables us to figure out the outlines of the closed characters or shapes in the resized image. All the found contours are then sorted as per their areas in an array.  In the final part, with the help of the sorted array and pytesseract function we extract the text from the resized image that we had in the first part. This makes us to extract the required information from the images that are captured by the CCTV cameras installed near the toll gates. |
| Max words:300-500 Word Length: |

In this section you have to cover the following aspects while you present the report.

Brief Introduction, objectives, research design, tools, procedure, field study, measures, analysis, results, implications, scope for further study and conclusion.

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| As many of us have wasted precious time near the toll plazas due to lack of a system that makes the toll fare collection process easier, I have developed a system that will semi automate the process of toll fare collection and saves the time of the passengers. This is the main objective of the project. I have made use of technologies like computer vision and Image processing to successfully achieve the main objective.  To achieve the main objective we need to get the number plate details from the image captured by the cctv cameras. And the second part is that all the registered vehicles should link their bank accounts with the corresponding number plates. If the above mentioned tasks are achieved then we can successfully build the system that we thought of.  The first part can be achieved by performing several image processing steps to the image captured from the cameras. With the captured image, we need to convert that image into gray scale image. To apply any image processing techniques first we need to gray scale the image. Then, I have used bitwise-not function present in openCV library and applied it to the gray scale image. This function converts all the pixels with higher values to lower values and lower pixel values to the higher values.  As we know that the number plate of any vehicle is situated in the lower half of the front image frame. Knowing this logic I have resized the image to remove the unnecessary part. This logic made my work really simple because it is always easy to search text in a shorter image rather than bigger images. We can also increase the accuracy of the model by the above mentioned logic. Then I applied some thresholding functions from openCV library to process the resized image. At this stage I made use of Canny edges to detect the edges from the image. Canny edge detector uses Fourier transform to detect the edges in an image. It is an important image processing tool which is used to convert an image into its frequency components. The output of Fourier transform represents image in the frequency domain which play a vital role in detecting the edges, corners and other hotspots of the image. After detecting the edges in the image, Ii found the contours in the image. In general contours mean the outline representation of closed figures. After finding all the contours in the processed image, I sorted the contours based on the area. Then the sorted contours are stored in an array in descending order. So now I am having all the contours of the image in an array. This makes my work simple and easy. Finally I used pytesseract function from opencv. This function actually searches the text from the image that we provide. So this function helps me in extracting the text from the final processed image.  At the time of vehicle registration, we need to link our number plate to our bank account. So that near the toll plazas we can save our time. As soon as the vehicle comes near the toll gate, automatically our system deducts the toll fare from the bank account corresponding to that particular number plate.  These are the parts and steps that my system performs. As soon as the vehicle comes near the toll plaza, cameras near the plazas capture the image of the vehicle and perform all the actions mentioned above and give the vehicle number plate as the output. As I have already discussed that at the time of vehicle registration we need to link our bank account details, so whenever our number plate is recognized automatically toll fare gets deducted from the corresponding bank account. This take around 2 to 3 seconds of time which is far better than wasting several minutes near the toll plazas.  Moreover this system even alerts the vehicle owner to pay the traffic fines if he/ she are having a pending due. In general traffic police have a database of all the vehicles which took part in criminal activities. As we get the number plate details at the toll plazas by our system, we can the number plate details that we got from our system and cross check it with the traffic police database. If any of the number plate details match then that particular vehicle took part in some criminal activity. Then nearby police station will be given a alert about the criminal vehicle found near the toll plaza.  I have tested the algorithm that detects the number plate with several sample images. I found that only 4 to 5 results out of 10 are correct. So the accuracy of my system is 40% to 50%.  So the accuracy implies that our model is not too accurate in detecting the number vehicle plate details. To make the model more accurate, we need to train the model with several sample models. And also we can make use of machine learning techniques which helps us to build a model with high accuracy.  There is a lot of future scope of this project. We can still make this system more user friendly and more automated. I am currently working on a system that is much more advanced than the present described system. In that system people need not stop their vehicles at the toll plazas to pay the toll fare instead my new system will sense the vehicle irrespective of the speed it is travelling and automatically deducts the fare amount from their account.  Previously our government introduced RFID tags system near the toll gates. But that initiative wasn’t successful. The main reason of its failure was, all the vehicle owners need to buy RFID cards and they need to recharge it as we recharge our mobile phones and cable TVs that was really a hectic task to the normal people. Moreover the systems installed near the toll plazas were not working properly and there were many technical issues running over them.  But the system that I have proposed is really a simple one and people need not spend much time on this system. It also supports the concept of digital India.  So finally I conclude that rather than wasting our time near the toll plazas with the traditional manual fare payment methods, if would be good if we make use of new technologies in the market and automate the toll gate systems in our country. If this system gets practically implemented in the field then we can replace the humans with the machines. We all know that machines with high accuracy and precision than the human round the clock. So if we put one time investment on machines we need not pay the salaries of the employees near the toll plazas. A monthly or weekly service checkup will be enough to maintain the machines.  r.JPGr1.JPG |
| Max :1800-2000 words Word Count: |

References:

Mention any of the four sources like books /articles/videos, that you referred for this study.

<https://opencv-python-tutroals.readthedocs.io/en/latest/>

<https://www.youtube.com/watch?v=82Sx57q-5DQ>

LEARNING\_OPENCV\_3\_COMPUTER\_VISION\_WITH\_PY(book)

<https://www.sciencedirect.com/science/article/pii/S1077314218304296(article)>