iJRASET
International Journal For Research in Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 10 **Issue:** IV **Month of publication:** April 2022

DOI: https://doi.org/10.22214/ijraset.2022.41426

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 10 Issue IV Apr 2022- Available at www.ijraset.com

A Research Paper on Fast Toll System

Soumyait Roy[1], Dr. Preeti Savant[2]
[1]*MCA, Jain University, Jayanagar 9 Block, Bengaluru*
[2]*Assistant Professor, Jain University, School of CS & IT*

Abstract: FAST TOLL is a project that will make traveling through toll gates a lot faster and more secure. This system is more secure as compared to the current system, that is, the Fastag. The Fastag uses an RFID tag to pay at the tollgate. But there is a chance that the RFID tag may get stolen or get damaged and also anyone can use another's RFID tag to pay at the tollgate.
So to overcome this I have proposed the idea of FAST TOLL. The FAST TOLL system will use image recognition to extract the vehicle's number and check whether the vehicle is registered in their database, if it is registered then the user will get a payment link on the website when they login to their account. Through that link, the user can pay the fee of using the toll gate at any time. This system will also send the details for the payment that is for which tollgate the user is paying the fee. This will help the user if their car gets stolen. Because the user will get to know through which tollgate their stolen vehicle has passed and it will help the police to narrow down their search.
Keywords: FastToll, FastTag, RFID (Radio Frequency Identification).

I. INTRODUCTION

A. *What is a Camera?*

A camera is an optical machine that captures a image. At a basic level, camera consist of sealed boxes, with a small hole that allows light to pass through to capture an image on a light-sensitive surface. [1]

B. *What is a Toll Booth?*

A Toll Booth is a counter/booth on a toll road where the driver must stop to pay the toll taxes to drive any further.[2]

C. *What is Toll Plaza?*

A row of tollbooths on a toll road.[3]

D. *What is a Database?*

A database is an collection of structured information or data, usually stored electronically in a computer system.[4]

E. *What is Image Processing?*

Image processing is a method to perform some operations on an image, to get an enhanced image, or to extract some useful information from it.[5]

F. *What is Python?*

Python is a high-level object-oriented programming language. Its high level built in data structures, combined with dynamic typing and binding, make it very attractive for Application Development, as well as for use as a scripting language to connect existing components together. Python is simple and easy to learn syntax emphasizes readability and therefore reduces the cost of program maintenance. Python supports packages and modules, which encourages program modularity and code reuse. The Python interpreter and extensive standard library are available in source or binary form without charge for all major platforms, and can be freely distributed.

G. *What is a Tessaract?*

In geometry, the tesseract is the four-dimensional analogue of the cube; the tesseract is to the cube as the cube is to the square. Just as the surface of the cube consists of six square faces, the hypersurface of the tesseract consists of eight cubical cells. The tesseract is one of the six convex regular 4-polytopes. The tesseract is also called an 8-cell, C_8, (regular) octachoron, octahedroid, cubic prism, and tetracube. It is the four-dimensional hypercube, or 4-cube as a member of the dimensional family of hypercubes or measure polytopes. Coxeter labels it the polytope. The term hypercube without a dimension reference is frequently treated as a synonym for this specific polytope.

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According to the Oxford English Dictionary, the word tesseract was first used in 1888 by Charles Howard Hinton in his book A New Era of Thought, from the Greek téssara (τέσσαρα 'four') and aktís (ἀκτίς 'ray'), referring to the four edges from each vertex to other vertices. In this publication, as well as some of Hinton's later work, the word was occasionally spelled tessaract.

H. What is Tesseract used for?

Tesseract is an open-source optical character recognition (OCR) platform. OCR extracts text from images and documents without a text layer and outputs the document into a new searchable text file, PDF, or most other popular formats. Tesseract is highly customizable and can operate using most languages, including multilingual documents and vertical text. Although the software can be used on Windows or Linux, this guide will be based on Mac operating systems which is done through the terminal application.

I. What is Django?

Django is a free and opensource web application framework written in Python. It is used for rapid web development and clean, pragmatic design. It is built by experienced developers to make repetitive tasks easier, so we can focus on writing apps instead of reinventing the wheel.

J. The Origins of Django

Django was created in 2003 when web developers at the Lawrence Journal-World newspaper started using Python for their web development.

After creating a number of websites, they started to factor out and reuse lots of common code and design patterns. That common code led to a generic web development framework that was open-sourced as the “Django” project in 2005. Since the original developers were surrounded by those newspaper writers, well-written documentation is a key part of Django. This means that there are excellent references to check out on the official Django documentation pages.

K. The Django Community

The Django framework is extremely large, but the Django community is absolutely massive. The community has contributed a lot of third party code for Django. No matter what we are trying to do, there’s a good chance that we will find the solution for it on djangopackages.org.

The website includes everything, from authentication and authorization to full-on Django-powered content management systems, from e-commerce add-ons to integrations with Stripe.

The FastToll system will use a camera to take a picture of the car and then it will extract the number plate from the picture of the vehicle using the tessaract. After that, the system will perform some tasks and extract the number from the number plate and check if the car is registered in their database or not.

If the vehicle is registered then the gate will open and the amount to pay will be added to the account in the database.

If the vehicle is not registered the gate will not open and the user has to pay at the tollgate itself to go through the toll gate.

II. RELATED WORK

The current system uses the FastTag which is an RFID tag that stores the user’s details such as name, bank details, etc.

There are many problems with the current system:-

1) If one loses the RFID tag or the FasTag then the user has to pay the bill manually at the Toll plaza.
2) If the user doesn’t have money in their account then the toll gate will not open as the system will be unable to process the transaction.
3) If the bank server gives issues then also the toll gate will not open as the system will be unable to process the transaction.
4) If the RFID tag or FastTag of one gets stolen by someone then he or she can use the tag to pay at a toll gate using someone else’s tag.
5) If the vehicle gets stolen and the thief removes the FastTag then the user will not be able to know if the car passes through the toll plaza or not.

So to overcome these problems I have introduced the FastToll system.

a) The system will use the vehicle's number plate instead of the RFID tag or FastTag. So, there is no risk of losing anything.
b) The system will not deduct the money from the bank itself so if one has no money in their account it will not cause any problem.
c) Banks are not directly connected to the system so the bank server issues will not cause problems.
d) No one can use your account to pay their bill.
e) If the vehicle gets stolen then the user can know if the car passes through a tollgate or not. It will significantly narrow down the search area.

III. ANALYSIS AND INTERPRETATION

In the system FastTag the user has to register his/her vehicle in the website first.

The camera of the toll booth will capture the picture of the vehicle in the toll booth. The system in the toll plaza will process the image and will extract the number from the number plate of the vehicle and check with the database if the car is registered or not.

If the car is registered then the bill will be added to the pending bill (if any) in the website. And the user can pay the bill anytime through the website.

If the user is not registered then the gate of the toll plaza will not open and will show not registered and the user have to pay the money to the toll plaza itself to pass through the gate.

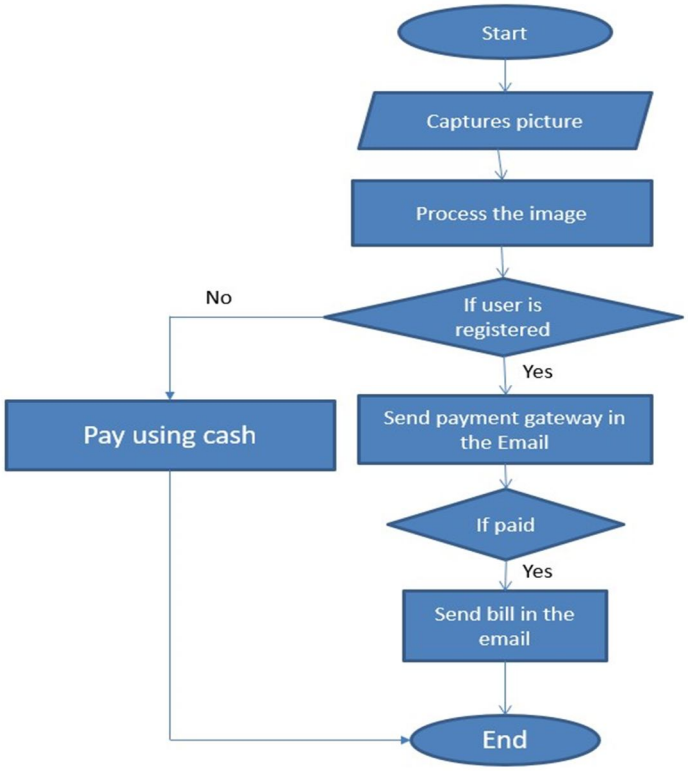


Fig:- Flow Chart

Working of the FastToll system:-

1) The system will capture the picture of the vehicle.
2) The system will process the image.
3) The system will check if the vehicle is registered or not.
4) If registered then the system will send the bill to the website.
5) If not then the user has to pay the bill with cash.
6) Then it will check if the payment is done or not.
7) If the payment is done then it will share the receipt with the user.

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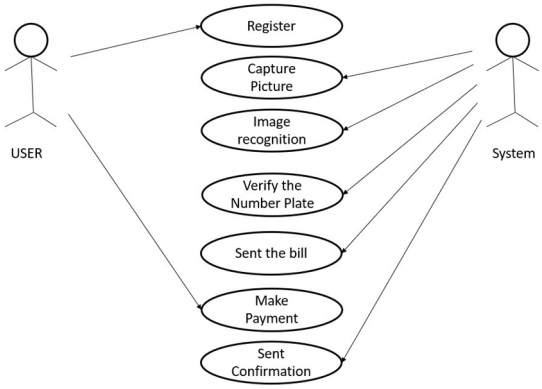


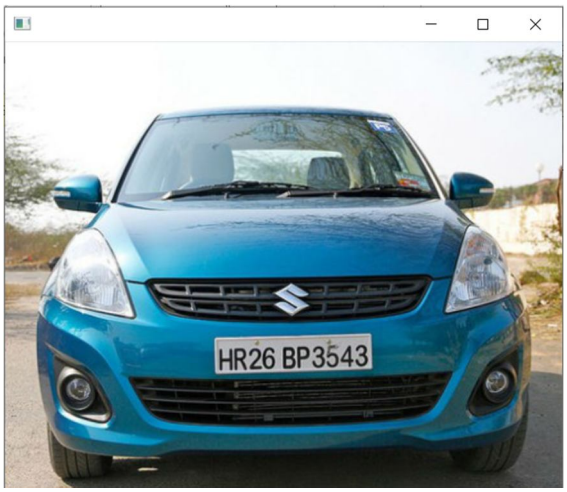
Fig:- Use Case Diagram

The User just have to register and make payment.

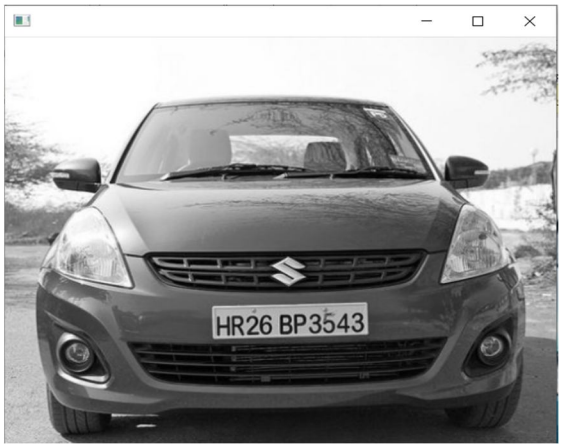
IV. HOW IT IS WORKING?



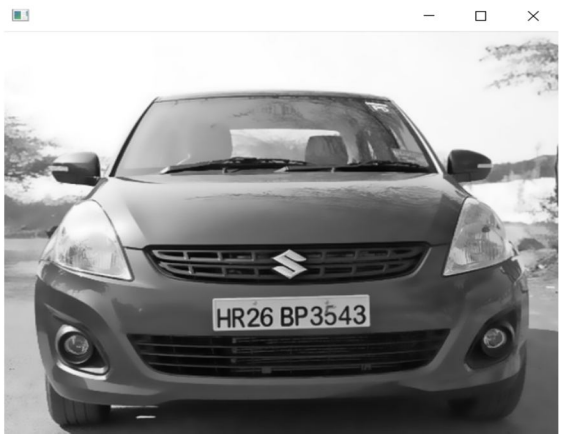
The system's camera will capture the image of the vehicle in the toll booth.



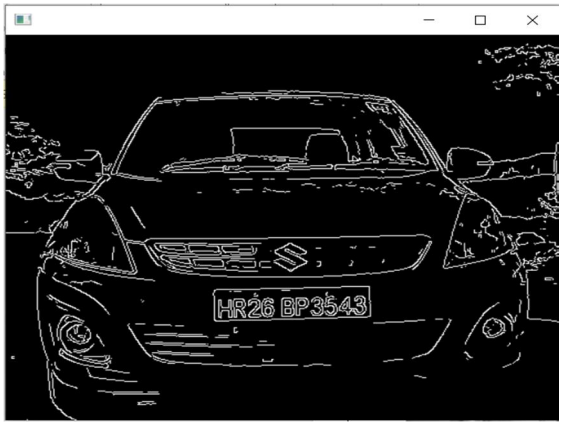
The system will reduced the size to 500px X 500px.



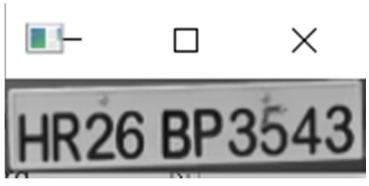
The system will change the color of the picture into gray.



The sytem will smooth the edegs tof the image.



The system will convert the picture in black and highlight the edges.



The system will extract the number plate from the image.

ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 10 Issue IV Apr 2022- Available at www.ijraset.com

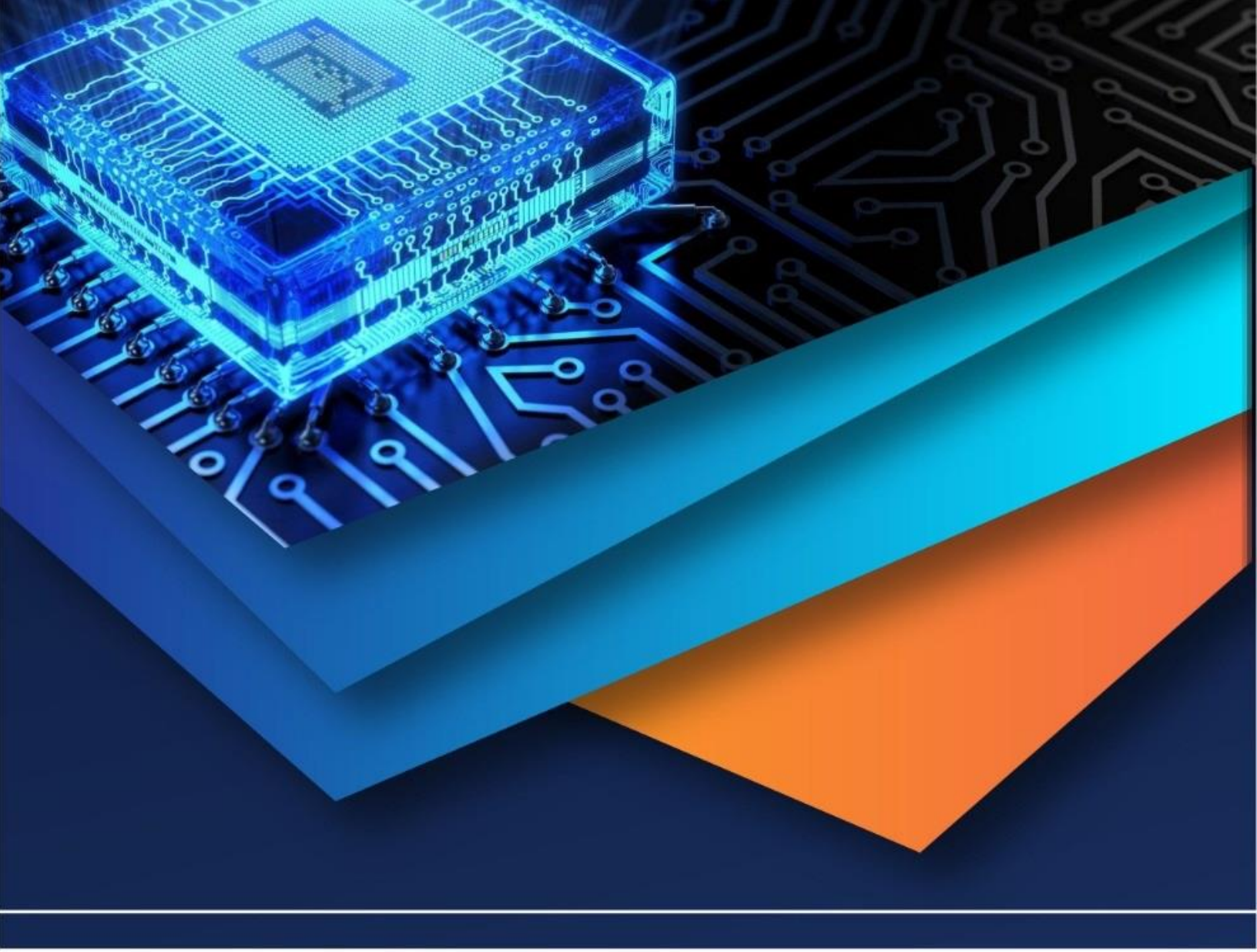
V. CONCLUSION

The project FastToll makes traveling through toll gates a lot faster, more secure, is user friendly.
FastToll has decreased the common problem of waiting in long queues by automatically sending bills to the account of the user on the website. The need for carrying cash to pay at the toll plaza is reduced. The system will provide a smoother and safer journey for passengers.

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