

## **ABSTRACT**

FASTag which is the brand name of Electronic Toll Collection (ETC), is an initiative of Ministry of Road Transport & Highways by the Government of India. A Radio Frequency Identification Device Tag is usually placed on the windscreen of the vehicles allowing them to go through the toll plazas without having to stop for cash transactions.

It helps in saving time, reducing pollution as user does not have to wait for the cash transaction. It also reduces congestion and prevents any type of corruption by any official. The applications of FASTag are limitless and hence must not be limited just to toll plazas.

Currently in India, payments of all traffic violations is through cash and therefore the presence of policemen is a necessity. This scenario creates multiple problems like corruption by policeman, fleeing of traffic violator, in-noticed traffic violation etc. The presence of a policeman is not even necessary as this technology may be implemented using IoT in multiple scenarios for example, speed detecting cameras along with FASTag device be placed in multiple locations across the highways.

The use of FASTag can be extended by allowing the respective authorities to impose fines which would be immediately deducted using the Radio Frequency Identification Device technology from the user's FASTag account.

FASTag may also be used at petrol pumps for direct payments for fuel. Hence, the user does not have to even open the window and just from sitting inside the vehicle can he make his fuel payment.

# **I. INTRODUCTION**

FASTag is a new way of payment at toll booths which uses Radio Frequency Identification (RFID) technology for making direct payments at toll booths from prepaid/savings account linked to the FASTag system.

FASTag is operated by the National Highway Authority of India. This system must expand to every toll booth in India and be employed in all countries by governments as the ROI is massive. The government of India has made FASTag mandatory for all new four wheeler vehicles with effect from December 1, 2019.

The device is fixed on the windscreen of cars enabling the driver to drive without stopping at toll plazas and the payment is automatically made.

As the vehicle approaches the toll plaza, a unique identification number which identifies the vehicle is read by the RFID tag reader. The RFID tag reader identifies the vehicle and the FASTag account linked to the vehicle.

Every FASTag has a unique identification number through which it is identified. For the respective tollbooth, tax is collected directly via the prepaid FASTag account. The toll amount is deducted from the FASTag balance of the user.

The user can directly pass through the toll without stopping, thus saving time and preventing traffic congestion. It is an automatic toll collection technology.

The use of this technology is certainly currently very limited and it can and should be extended to the convenience of the general public. Making FASTag a more common mode of payment is a possibility which must be explored.

## **II. MOTIVATION**

Currently there is lot of corruption happening due to corrupted policemen and fleeing away of violators. It has created an undesirable corrupted environment on the road. To overcome these problems we have taken the existing system FASTag which collects toll tax money by scanning RFID (Radio Frequency Identification) Tag attached on windscreen of cars, and extended its use to incorporate challan collection by police and fuel transactions at fuel stations. The policemen can take advantage of it by imposing fines on the violators directly by scanning this RFID Tags and as Government has instructed all manufactures to attach RFID Tags on each car w.e.f December 2019. This will make easier for them to collect fines and without intervention of any other person. This can also be extended for use of making online payment at Fuel Stations. Person can take his car to petrol pump and without having to even open the window can directly pay using the app hence making payment extremely convenient.

### **III. LITERATURE SURVEY**

#### **III.1. BACKGROUND KNOWLEDGE**

##### **PYTHON:**

Discovered in 1991, and currently a very popular programming language, being an easy to understand language and due to wide varieties of modules available which can be used for web development, software development, etc.[1]

All major platforms like Windows, Mac, Linux are supported, it has simpler syntax similar to English language which is easily readable and understandable, codes can be written in fewer lines so that there's less code complexity, and code can be executed as soon as it is written.

##### **FUNCTIONS:**

Block of code which runs only when called by its name. Data, Parameters and Arguments can be passed to it and data can be produced as a result. We have used different user-defined functions for performing tasks our programme like Petrol\_Amount(), Toll\_Amount(), Admin(),etc. And also some inbuilt functions like range(), random(), etc.

##### **CLASSES AND OBJECTS:**

Close to everything in Python is an object, having its own unique properties and methods. A Class is like an constructor for an object, or a "blueprint" for object creation. We have made various classes and respective objects for it. We have made classes like User, Toll, Police, etc.

## MODULES

FASTag : This module contains two scripts namely getotp and clearscr.

The getotp script contains a function which generates a random 5 digit OTP used for the confirmation of Petrol Pump payments making them secure.

The clearscr script contains a function which is used to clear the command prompt(for Windows)

## API (Application Program Interface):

Interaction of software components are specified using **API**.

- fast2sms : fast2sms is an API which can be utilized to send SMS to a phone number of a user. The Developer's API has a unique API Authorization Key which is used to send 20 free SMS per day.

## **III.2 STUDY OF MULTIPLE RESEARCH PAPERS**

The following section aims to evaluate the extent to which this technology has been developed and how it can be enhanced.

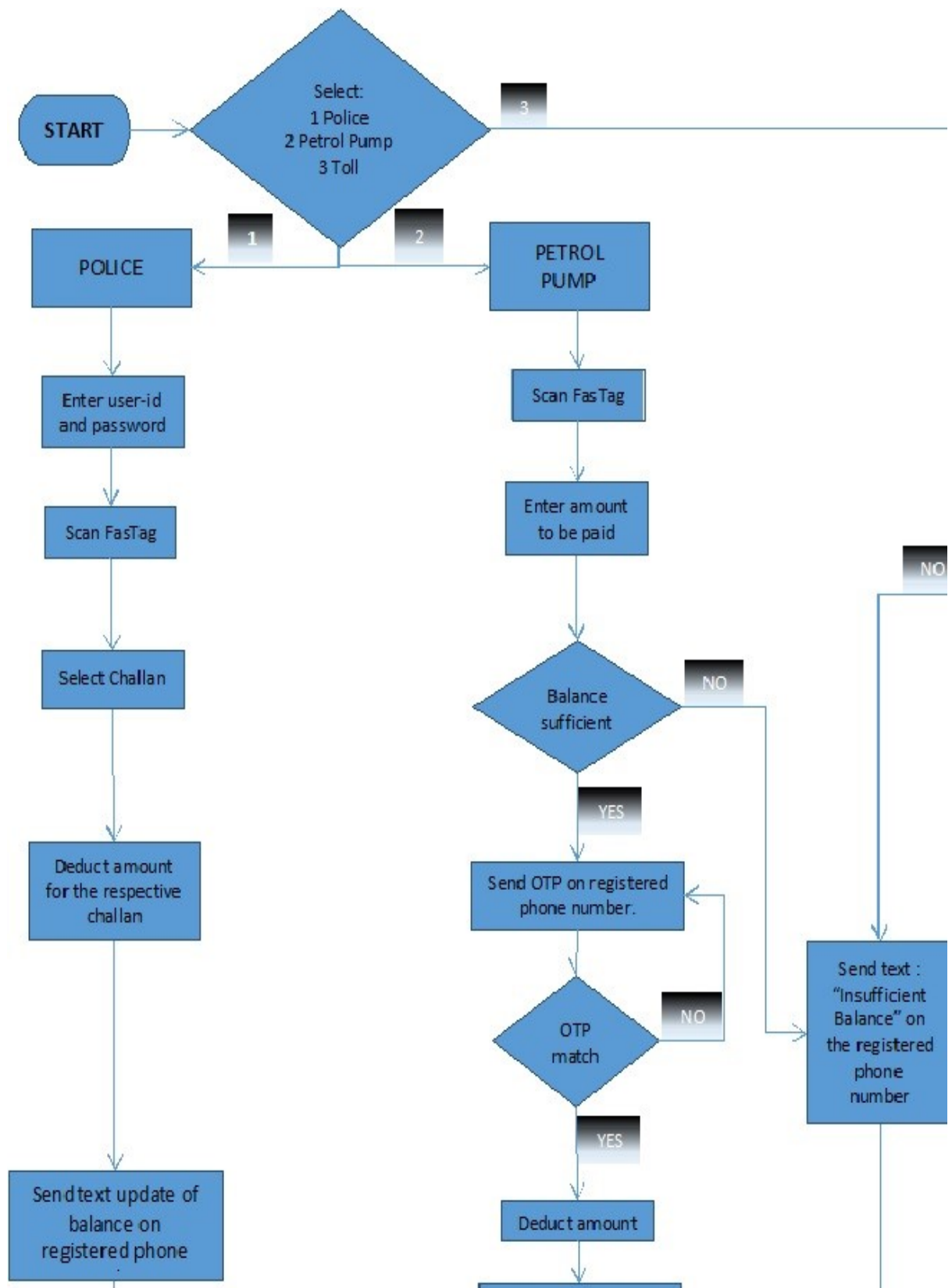
Automatic toll collection systems used at a large scale worldwide are discussed in the paper are FASTag and ATCS (“A Comparative Study of Toll Collection Systems in India”) [2]. Automated Toll Collection System (ATCS) which is used for collecting tax automatically without any intervention of a person, through a unique tag known as RFID which is attached on the windshield of the car. FASTag employs RFID (Radio-Frequency identification) technology.

National Highway Authority of India currently operates FASTag System. This system must and should expand to each and every toll booth in India and be employed in every country by governments as the ROI is massive. Traffic jams can be totally avoided at toll booths which is a major concern at various places (eg. Delhi – Gurugram Highway Toll Booth) and the user need not worry about carrying change or physical money. Cars can slide through without stopping which reduces the car concentration levels which would indirectly reduce the air pollution by a large extent nearby toll booths as major pollution produced by vehicles is due to stop-go traffic.

Another research paper (“A Comparative Study of Toll Collection Systems in India”) is based on comparison of conventional toll collection and some existing automatic toll collection systems [3]. This research paper discusses FASTag, BookMyToll and Automated Toll Collection System (ATCS) by comparing them against one another.

Hence, it has been brought to our observation after studying various research papers that the Radio Frequency Identification Technology has only been used for payments at toll plazas. Hence, no work has been done in extending this technology to payments for challans which we will be attempting.

#### IV. FASTag Extension(Proposed Work)



There will be an Admin account which will add tollbooth, add user and add policeman. When the tollbooth is added, information such as the entry and exit point of the tollbooth, various tolls according to the vehicle are to be provided.

When the user is added, an account is made and the user enters the mobile number and a password to register. The user also specifies the type of vehicle he owns.

Every policeman will be given a username and a password. The police can change the password.

- The customer can add money in its account using various banking options. He/she can view the balance and will get an SMS. The user will also be notified deduction in funds of the users account through SMS.
- The police will have an altogether different interface in which they can select the different challans from various options of different vehicles and their respective rule violation. When the FASTag is scanned, the rule violation list of the respective vehicle registered with the scanned FASTag is automatically displayed. The police can choose the challan from the app and the amount will be deducted from the account of the violator even if the balance is less than zero and the user will be notified of any deduction in funds of the users account through SMS. The user will have to recharge the FASTag account to make the account balance positive in a time period as stated by the law.
- The petrol pump executive will just scan the FasTag and enter the amount to be deducted. If the balance is sufficient, an OTP will be sent to the customer. The executive will verify the OTP and the amount will be deducted, then both the customer and the petrol pump executive will get a message. If the amount however is not sufficient, the customer will get a message and the process will be aborted.
- For Tollbooths, the procedure will be same as the petrol pump but there will be no OTP. The tollbooth part will be the same as before. The new functions added are the police and the gas payments.



We implement this in a program using python. The flowchart given above describes how we implement this idea. This idea can then be incorporated in the original app.

We can choose the option from Police, Petrol Pump or Tollbooth. Then we will enter the user id of the respective executive in the program. Then the respective executive will scan the FasTag. We will implement this in our program by entering a user id to make payment from as we cannot practically demonstrate the scanning of an actual FasTag. Basically the scan of the FasTag returns the user id and we are manually inputting the user id.

The respective operation will take place. We use python libraries to send respective messages to the mobile phones. We can then see the balance deduction from the respective user id's.

## **REQUESTS**

HTTP requests in Python are made using REQUESTS, Form data can be filled automatically, it can also add headers, etc without visiting the HTTP page. We have used this for filling data in fast2sms.com (which is a site to send SMS).

## **VIRTUALENV**

This is another package python provides to create a virtual environment to make projects. We have used this package to create a virtual environment in which we import the packages necessary for the project.

## **DISUTILS**

This package is used for creating the setup.py file which helps in the distribution of the software. The setup.py file contains data like packages used, libraries used, name of the author, email of the author, etc. We can create a zip file or a windows installer of software.

```
dic_user[reg_no].balance = dic_user[reg_no].balance - int(amount)
payload = "sender_id=FSTSMS&message="+ "Your updated balance is: "+str(dic_user[reg_no].balance)+'&language=english&route=p&u
response = requests.request("POST", url, data=payload, headers=headers)
:
payload = "sender_id=FSTSMS&message="+ "Insufficient balance"+ '&language=english&route=p&numbers='+dic_user[reg_no].ph no
```

This piece of code uses the request module to make HTTP requests. 'payload' is a string variable that has to be sent to the API fast2sms as data. The first instance of 'payload' is used to send message to the registered mobile number to show the updated balance. The latter instance is used to send the information that the user has insufficient balance in his account.

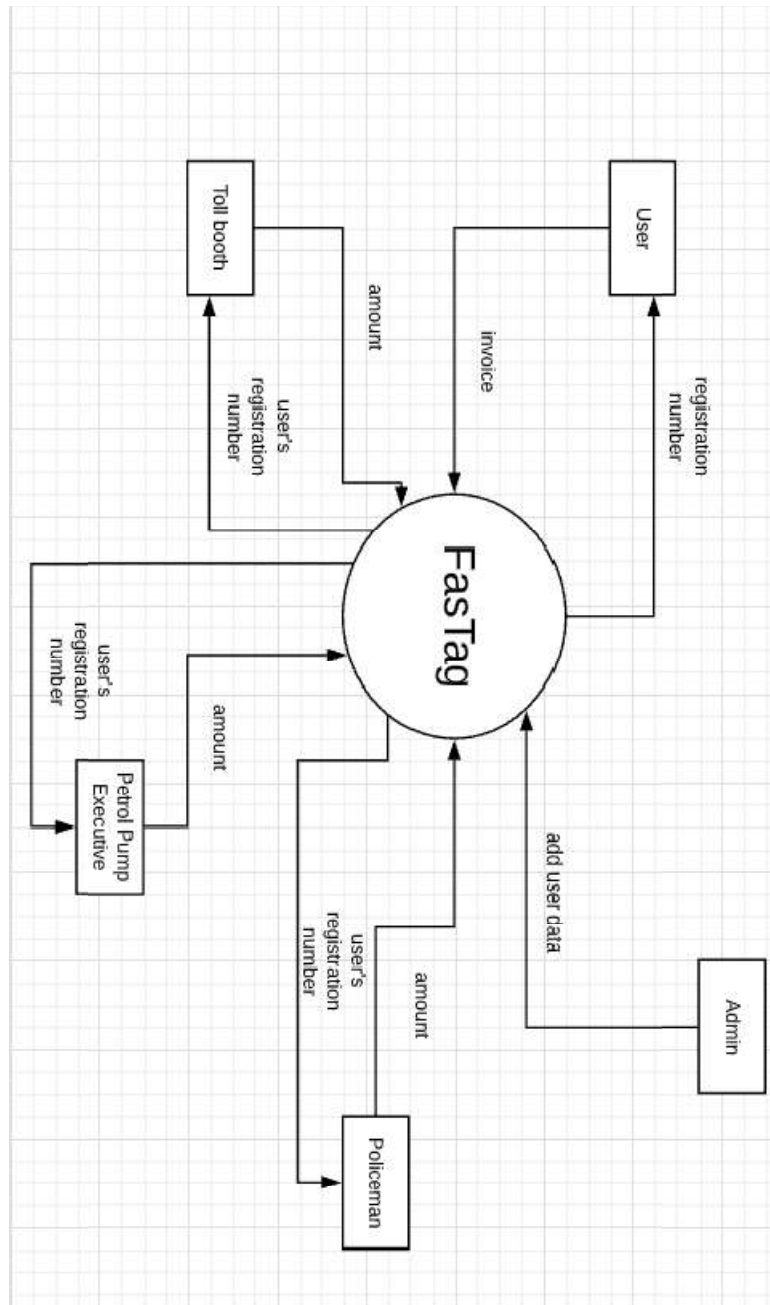
```
import requests
url = "https://www.fast2sms.com/dev/bulk"
headers = {
'authorization': "ZJloIiF3AhbUdWnkDfaTepqm2js7BYMVSPyL4C9NzK8xGQR5gcQMFAfTXaungk
'Content-Type': "application/x-www-form-urlencoded",
'Cache-Control': "no-cache"
```

## GETTING STARTED

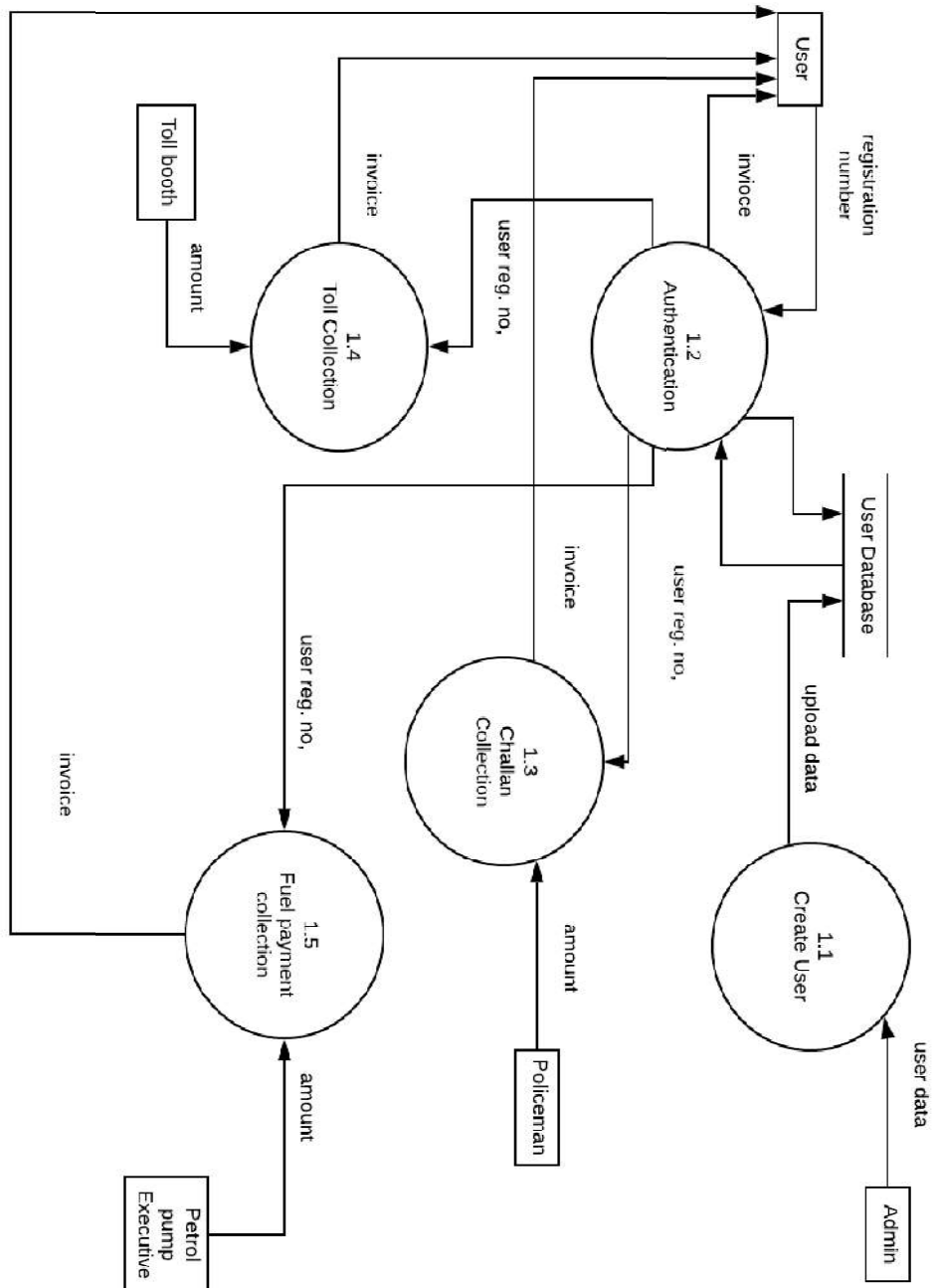
1. Download the FASTag WinRar Archive file from here:  
<https://drive.google.com/open?id=1Ry2pRuXhcD6qM3VRDkoKosueYZewqPmL>
2. Unzip the downloaded FASTag zip file.
3. Go to bin folder where Run.py is located.
4. Copy the Location.
5. Run command prompt from start.
6. Type `cd _your_Location` and press Enter
7. Type : `python Run.py` and press Enter.

## V. DATA FLOW DIAGRAM

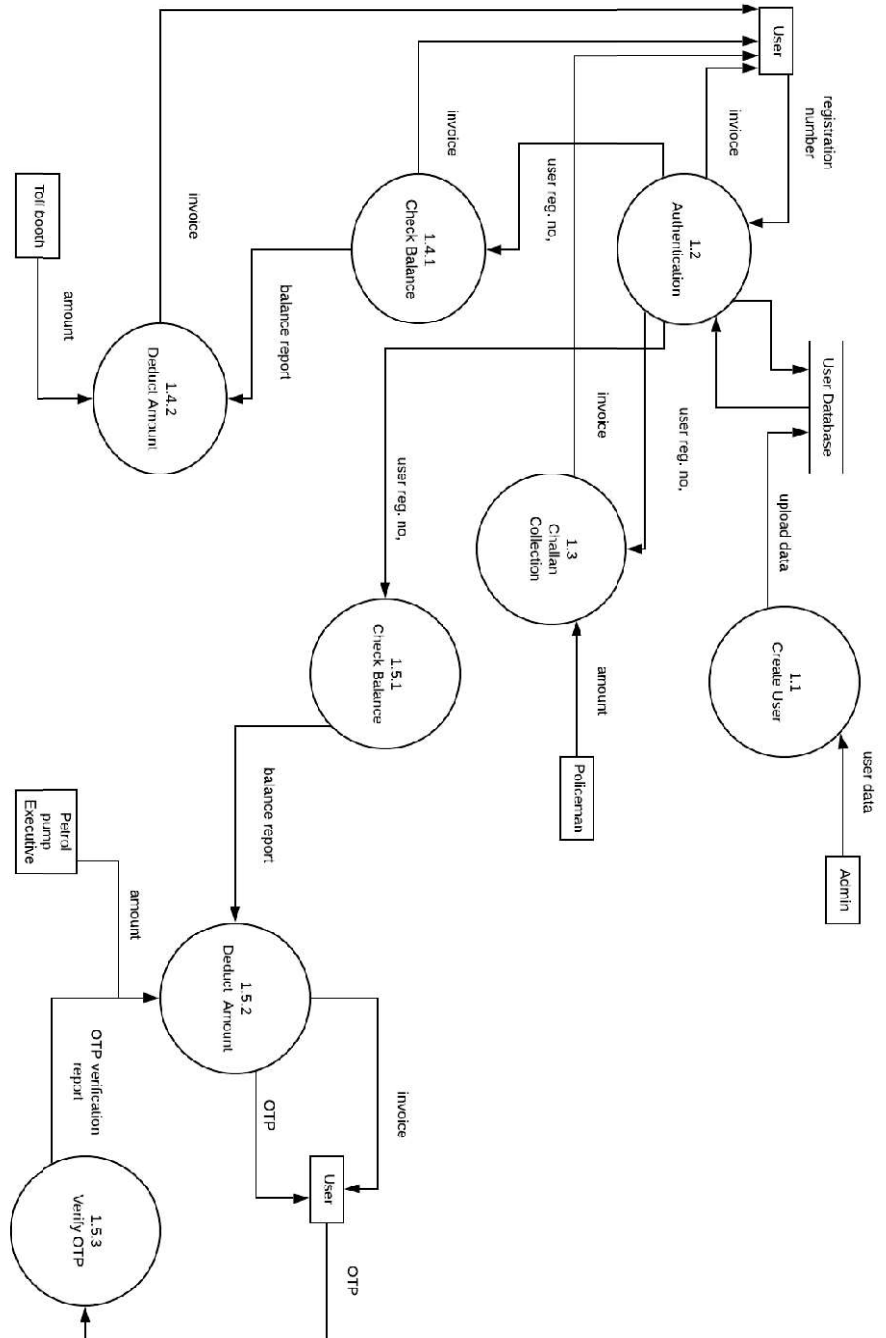
### V.1 Level 0 DFD



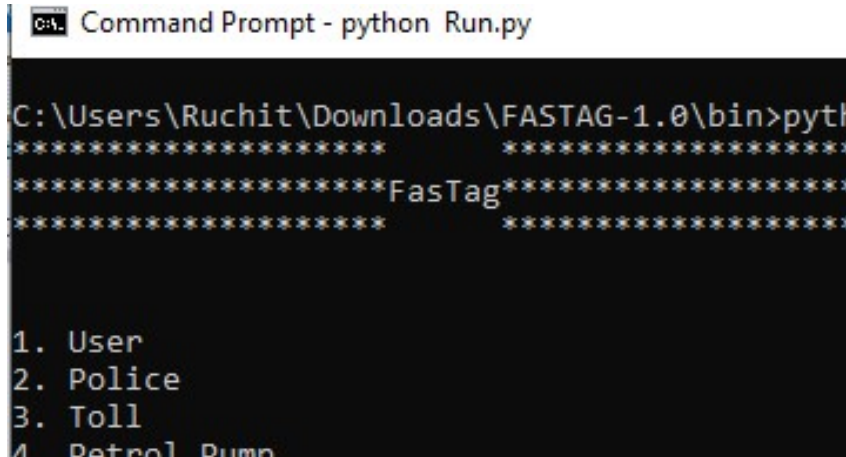
## V.2 Level 1 DFD



### V.3 Level 2 DFD



## VI. RESULTS



```
C:\Users\Ruchit\Downloads\FASTAG-1.0\bin>python Run.py
*****
*****FasTag*****
*****
1. User
2. Police
3. Toll
4. Petrol Pump
```

The starting interface of the software looks like this.

If the user selects User, he/she can add/view balance.

If the user selects Police, he/she can login using Police id and collect challans.

If the user selects Petrol pump, he/she can collect fuel payments.



```
C:\Users\Ruchit\Downloads\FASTAG-1.0\bin>python Run.py
1. Update_fine
2. Add user
3. Add policeman
4. Add tollbooth
5. Change admin password
0. Back
```

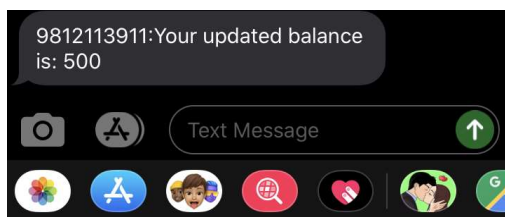
This is the Admin window. The Admin can update the values of different challan fines. The admin can add a User, Policeman and tollbooth. The admin can also change the Admin password.

```
Command Prompt - python Run.py
Choose vehicle type:
1. Bike
2. 3 wheeler
3. Light motor vehicle
4. Heavy Vehicle
0. Back
1
Enter phone_number: 9812113911
**Password must be atleast 5 characters in length**
Enter Password: ruchit
Confirm Password: ruchit
Enter your name: ruchit
Your registration number is: REG9812113911
```

When the admin opts to add user, the vehicle type, phone number of the user and password and name are asked to create a FASTag account. The user is given a FASTag with a unique registration number. We enter the registration number of the user manually in the program.

```
Command Prompt - python Run.py
Enter registration number: REG9812113911
Enter password: ruchit
1. Add balance
2. View balance
3. Back1
Enter amount: 500
```

We enter some balance in the user account. In this scenario, we enter 500 rupees in the user's FASTag account.

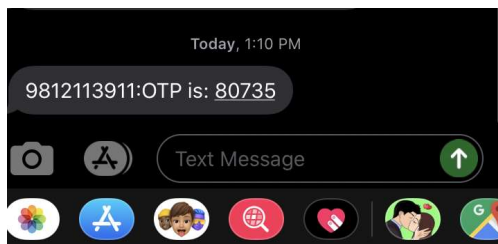


The user gets the message on his/her phone about the updated balance.

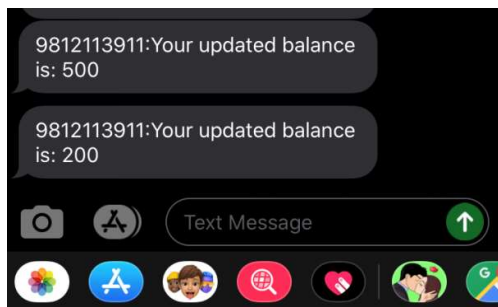
Now if the user wants to do a petrol pump payment, the petrol pump executive will Scan the FASTag and enter the amount of petrol to be filled.

```
Command Prompt - python Run.py
Scan Fastag
REG9812113911
Enter amount: 300
Enter OTP:
```

If the balance in the user's account is greater than the balance to be deducted, then an OTP is sent to the number for verification.



After the OTP has been verified, the amount is deducted and the message of the remaining balance is sent to the mobile number to the user. i.e  $500 - 300 = 200$ .





## **VII. CONCLUSION & FUTURE PLAN**

The project has enhanced the FasTag concept extending its use for challans and fuel payments. The application provides faster transactions and saves time for both the executive and the customer. There is a scope for improvement on the security measures of the application and many new features can be added.

### **BENEFITS**

**TOLL :** There will be less congestion at toll booths due to faster working of FASTag system when compared with manual transaction. Currently there is an average waiting time of 5 minutes which can be significantly be reduced to less than 10 seconds (3000% faster).

**POLICE :** The time taken to collect challan will be reduced. If the violator doesn't have the money to pay the challan, the amount will be deducted from the FASTag even if there is no balance thus updating the balance to negative. The user can add balance in its FASTag account later to make it zero (Within limited time frame of 10 days).

**PETROL PUMP :** The user won't have to get down of the vehicle or even roll down the windows to make payment which is convenient and safe in many ways.

### **FUTURE EXTENTION**

Over speeding vehicles could be easily caught without manual interception of Police having to take down violator which can be risky at times for Police as well. Violators won't be able to flee fines.

We can use AI for enhancing it more by doing all the work automatically without the need of an Petrol Pump executive/Policemen to be present.

This can further be enhanced by collecting fines for no seat belt/helmet by determining if the user has violated the law using cameras and AI.

## VIII. REFERENCES

- [1] *Python 3.3.7 Documentation*, Python Software Foundation, 19 Sept. 2017, [docs.python.org/3.3/tutorial/modules.html](https://docs.python.org/3.3/tutorial/modules.html)
- [2] Parmar, Nayan, and Ajay Vatukiya. "A Comparative Study of Toll Collection Systems in India." *IJRESM*, International Journal of Research in Engineering, Science and Management, Apr. 2018, [www.ijresm.com/vol1,iss4,April18/IJRESM14\\_23.pdf](http://www.ijresm.com/vol1,iss4,April18/IJRESM14_23.pdf)
- [3] Joshi, Bharavi, and Kajal Bhagat. "A Comparative Study of Toll Collection Systems in India." *IJERD*, International Journal Of Engineering Research And Development, Nov. 2017, [www.researchgate.net/profile/Jekishan\\_Parmar/publication/325712923\\_A\\_Comparative\\_Study\\_of\\_Toll\\_Collection\\_Systems\\_in\\_India/links/5b1f9c5ea6fdcc69745c6a76/A-Comparative-Study-of-Toll-Collection-Systems-in-India.pdf](https://www.researchgate.net/profile/Jekishan_Parmar/publication/325712923_A_Comparative_Study_of_Toll_Collection_Systems_in_India/links/5b1f9c5ea6fdcc69745c6a76/A-Comparative-Study-of-Toll-Collection-Systems-in-India.pdf)