Automated Toll Using NFC Framework

Akanksha Ovhale
Department of Computer Engineering Modern Education Society College of Engineering Pune

Saundarya Nakka
Department of Computer Engineering Modern Education Society College of Engineering Pune
saundaryanakka1995@gmail.com

Komal Patil
Department of Computer Engineering Modern Education Society College of Engineering Pune

Lakshmi Dayanandan
Department of Computer Engineering Modern Education Society College of Engineering Pune

Sagar.B.Shinde
Department of Computer Engineering Modern Education Society College of Engineering Pune
sagar.shinde@mescoepune.org

Abstract — **Automated toll Collection system is considered as a reasonable method remembering the finished objective to assuage development blockage and jams, redesign the solace and security of voyagers, and minimize fuel utilization and air contamination for natural insurance need. The paper proposes Architecture for gathering toll utilizing Near Field Communication (NFC) innovation. In this framework blob discovery system is being utilized to have the straightforwardness with the data of which vehicles passed the toll territory. This framework is important to enhance road administration. Trial assessment and investigation demonstrates that NFC is utilized to improve things and speedier work at the toll computerization territory.**
Keyword: NFC (Near Field Communication), RFID (Radio Frequency Identifier), ETC (Electronic Toll Collection).

I. INTRODUCTION

Time is being more valuable in today's world. So, things are being computerized. Yet at the same time in India we hold up in the long line at the toll plazas to pay the toll charge. The fundamental thought behind this paper is to mechanize the toll gathering in toll plazas of Indian streets. Framework utilized here is remote sensor system i.e NFC.

Electronic Toll Collection (ETC), generally called electronic portion and evaluating structure, is one of the huge investigation subjects in insightful transportation system. Thus an execution of a road evaluating thought with a particular final objective to make points of interest, for instance, diminishing toll paying time, overhauling the solace and security of pioneers, and minimizing air defilement and fuel use? As we probably am aware typical toll accumulation takes a great deal of time and there is likewise congested roads and won't get the straightforwardness in toll sum gathering. For this firstly the prologue to RFID was finished. RFID is shortening of Radio Frequency Identifier which assumes indispensable part in electronic toll gathering. RFID is additionally utilized for following of the vehicles. The downside of RFID is that it doesn't work appropriately in the overcast and unrestricted atmosphere. Along these lines, to overcome from this disadvantage we presented NFC i.e. Near Field Communication. NFC's full-frame itself tells that it is a correspondence convention that works inside 10cm range (close field) for information exchange.

This paper contains Client server convention. At customer side, the customer speaks with server through a NFC Android portable Application which can store the data of client and its one of a kind individual NFC ID produced and given by server. For this the client ought to contain the NFC empowered versatile and enlistment ought to be done on the web. Furthermore, we are additionally utilizing the blob discovery framework to have a thought what vehicles were gone through the toll zone.

II. OBJECTIVE

The principle targets of proposed pattern are listed below

A. *Faster move of vehicle at toll territory*

Vehicles need not stop at toll plaza for longer time to pay the toll fee, the toll fee get's deducted from the NFC phone linked to bank account when the vehicle taps the phone and move. This makes the vehicle quicker at the toll zone, less conjunction.

B. *Time Saving*

Since there is no conjunction or activity because of proposed framework, the vehicles need not hold up in long line to pay the toll charge and there is no traffic. This spares the valuable time of numerous individuals who drive the vehicles.

C. *Faster transmission of data*

The innovation utilized here is NFC equipment, after tapping the NFC phone at toll booth the accumulated data are transmitted to the sink utilizing compressive detecting.

III. RELATED WORK

Nikhil Mohan .O.K. et.al [1] has proposed system first acknowledges vehicles those are passing toll court and if bona fide then charges electronically the records or the entirety in the IC card of the enlisted vehicles without meddling with them. Creators attempted to create

32

framework having highlights like programmed challan and reporting strategies to enlisted proprietor of the vehicles. Additionally, there was commonly overabundance carriage of NFC IC incorporated into a card as weight to the purchaser.

Jayapriyaa. CT et.al [2] has proposed typical about the cameras which were being utilized to catch vehicle number plates and vehicle numbers are recovered. Utilizing the recovered vehicular id the points of interest of the proprietor and connected bank records are gathered from database. The toll charge is concluded from financial balance if sum is accessible else physically paid. In the event that more than one vehicle having a place with a specific association is show close-by toll then these vehicles are grouped to lessen the number of exchanges made. One vehicle is chosen as a bunch head and this vehicle speaks to all the bunch individuals and an ID based multi signature plan is utilized for validation.
Exploratory assessment and investigation demonstrates that the group based plan performs better contrasted with non group approaches.

Shin Kamada1 et.al [3] has proposed the creators attempted to make an Attendance administration framework in view of NFC personality cards which when swiped on relating advanced cell or tab (having Android application) will include participation into the participation record present onto the cloud framework. Further these participation records can be seen and dissected by powers at whatever time and anyplace.

Wei-Hsun Lee et.al [4] has proposed a decent model for toll accumulation however concentrates just on gathering and henceforth needs in security, to overcome security issues we proposed our model which concentrates on straight forward ness and security issues by knowing the individual who is going to cross toll station. Supplant DSRC-based innovation utilized as a part of ETC frameworks by Vehicle position innovation. The instrument used as a piece of this VPS at nearby toll stations relies on upon joint effort amidst OBU and backend structure through flexible framework. [4] consolidates a few innovations including vehicle situating, versatile correspondence, vehicle location and order, and auto tag acknowledgment. The primary favorable circumstances of framework are the aggregate expense of VPS is much less expensive than DSRC based ETC framework, it's anything but difficult to setup another toll region or expel the old ones, exchange time won't be the issue. Impairments joins High precision essential for vehicle arranging in ETC applications, issues connected with GPS signal blackouts, it is more troublesome in the coordinating procedure between the charge and implementation data, so the VPS framework needs more post-preparing employments keeping in mind the end goal to decrease the jumble disappointment.

Wern-Yarng Shieh et al. [5] has proposed the distinction between without multilane stream and single-path frameworks is overcome with help of millimetre–wave reach correspondence technique. In without multilane stream frameworks, the vehicle going through the information correspondence district in the ETC square may change travel paths amid information transmission between its OBU and the RSU on the past travel path. In view of this, the information transmission between the OBU and the RSU on the past travel path may regularly be inadequate and must be performed successively by the RSU mounted on the present travel path, into which the vehicle

has entered. The [5] engineering consolidates methods like recurrence multiplexing, beat running and fine target-course determination. Recurrence multiplexing represents the utilization of particular discharging radio wires for every activity path, however one and only regular accepting reception apparatus for gathering all arrival signals. The recurrence groups used in various activity paths are recognizable. Additionally the framework will actuate some ensuing implementation exercises against the disregarding vehicles. The exhibited model is helpful in the event that for long separation correspondence amongst OBU and RSU.

Yi Zhao [6] has proposed the ETC framework utilizing RFID innovation. It for the most part comprises of toll-entryway, management system of toll station, management center, and bank and transmission system. The arrangement of toll-entryway control predominantly is in charge of controlling and overseeing electronic gear introduced in toll door and RFID labels introduced in vehicles. It distinguishes and records constant data of vehicles through RFID labels that are put on vehicles as OBU and sends them to management system of toll station, and management system of toll station will prepare this data. Management system is the top oversee layer of ETC framework. It procedures and trades charge information. Model uses abnormal state of security as it uses 2-stage security, first is through watermarking for sending signal from OBU and second is use of hearty encryption calculation to send information from nearby server to worldwide server.

João Dias [7] has proposed the structure which rises up out of the expectable enthusiasm for adaptable applications and NFC development to pay bills. The structure recommendation breaks the present perfect models, exhibiting the probability of versatile portion consequent to bringing about on tolls. The proposed C2S is constituted by two portions/devices, one is prepared of the vehicle, named OBU, and another, acts in an adaptable application, in a propelled cell telephone with a NFC highlight. It starts with the principal portion, the OBU, that is not saw by the common DSRC tolling system, when it goes on tollbooths, the approval structure is initiated and the Automatic License Plate Recognition (ALPR) takes a photograph and OBU saved the toll and it gives the probability to pay in a legitimate time period. To assemble the toll logs, the customer should use a flexible application, which will get the logs by method for NFC, thusly after the customer "touches" the OBU with his Smartphone. Finally the adaptable application gives a direct customer interface where the customer should show all the toll aggregations to the relating toll supplier, by method for Internet affiliation. The proposed framework has moved back like client ought to have mandatory net association and NFC versatile record. It utilizes both gadgets like OBU and NFC empowered gadget to finish the technique which is costlier.

IV. METHODOLOGY

In this framework, NFC is utilized for capacity of the data of the client and every client has an individual NFC ID. For this the client ought to contain the NFC portable and enlistment ought to be done on the web. Enlistment incorporates First Recharge process that achievement production of secured prepaid record in the database.

After enlistment there is no need of web association for the client portable at the toll range however in the event that the client needs to be overhaul as per his record as of in database then he will require the web association this might be termed as "Synchronization" (Sync-Account). At toll stations the client can utilize his NFC empowered telephone just by tapping his telephone on the toll's NFC gadget which might be advanced mobile phone or tab. On tapping of client's telephone with an opened App, the NFC correspondence station is set-up. What's more, clients NFC-id put away in application's neighbourhood DB are exchanged to toll gadget. After that the toll gadget changes over the client's NFC-id to http demand by including toll-id and current registered reasonable and forward this solicitation to the server.

The server stores, checks the information into the database and process further to finish the exchange. On effective confirmation the asked for reasonable is charged from the client's prepaid record and time-stamp of the finished exchange is put away and sent as affirmation to the toll gadget. At that point toll gadget store and sends this data to the client by means of NFC affirmation before conclusion of correspondence channel, and afterward the client continues. During this technique the blob identification is being finished by distinguishing the vehicles width and length which stores the data and the image of the vehicle in the server. The toll station are paid month to month on the premise of agreement and month to month work-out premise i.e. fundamentally the aggregate sum gathered by that specific toll in fix period or a month.

Fig 1: **Procedure Diagram**

V.   PROPOSED SYSTEM FRAMEWORK

The structure contains the NFC telephones to the toll booth and in addition to the client. After enrollment through the web the clients NFC telephone is equipped for paying the toll plaza just by tapping it on the Toll Booth's NFC telephone.
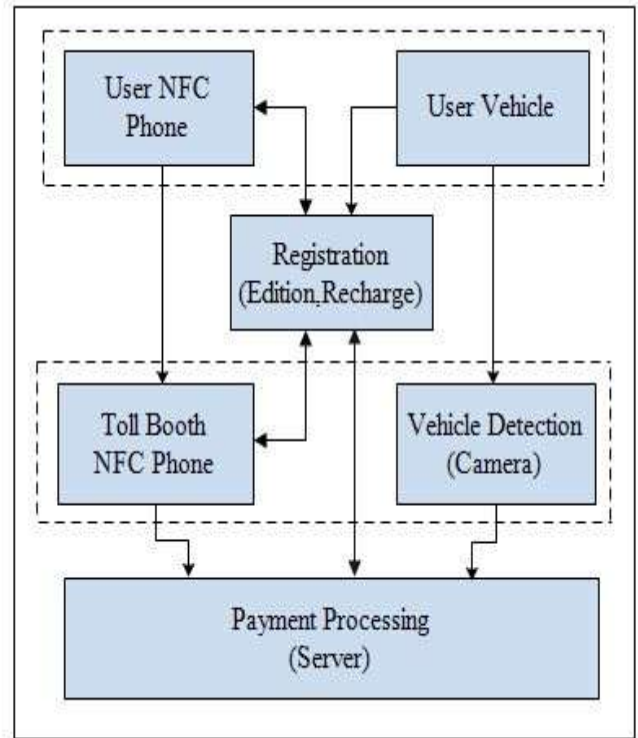

Fig 2: **Block Diagram**

The cameras are altered at the toll court ranges to screen the stream of vehicles. Database stores all the data of the considerable number of vehicles.

The last block contains server which does the exchange and illuminates the client.
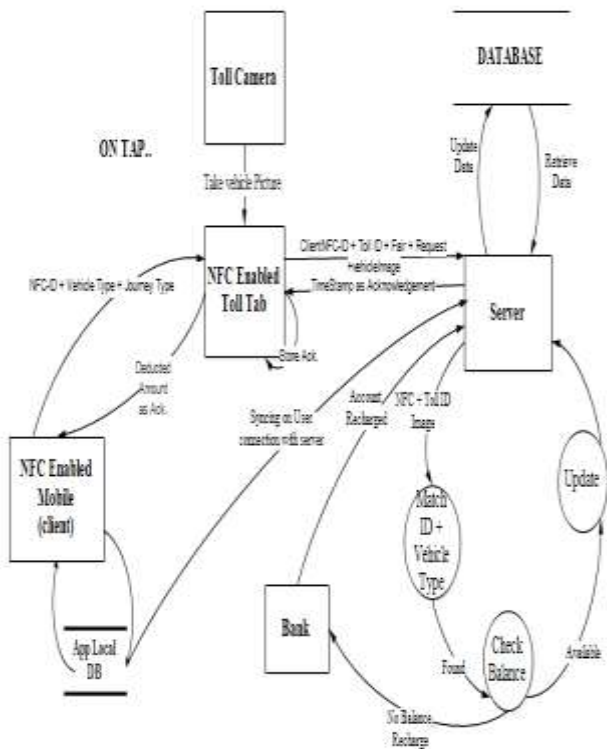a)   *The activities done by each task is shown in below flowchart*
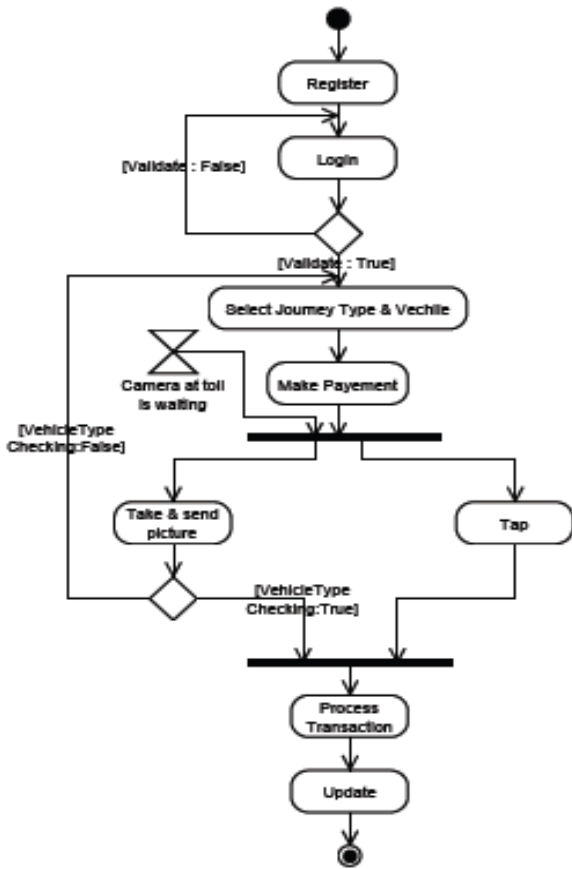
Fig 3: **Flow chart of System**

VI. SYSTEM FEATURES

A. *Interface for App Download*

Depiction and Priority: - This component will permit the client to take into consideration enrolling to the NFC App. The framework might show the required fields that are accessible for enrolment. The framework might permit the client to choose the number autos and their sorts. The framework should tell the client about the User-Id and Password.

B. *Stimulus/Response Sequences*

It will comprise of numerous fundamental fields. Work force Details, Number of vehicles and Type of vehicles, Update and pre-paid payment process.

C. *NFC App Interfacing*

Description and Priority: - This element will give the client an entrance to the NFC App where the client can do toll exchanges with the assistance of NFC empowered advanced mobile phone. It has different catches to view client's exchange points of interest, record adjust and upgrade.

Boost/Response Sequence:- It will comprise around 3-4 fundamental tabs to know your present record parity, exchange history, to redesign your staff data and so on. Every tab/catch will trigger an activity at whatever point the client will bring his/her palm over the tab/catch which is appeared on the screen.

Practical Requirements: - The most critical capacity is to just allow those clients who are enlisted and validated to pass the toll court with fruitful exchange section at client, toll square and at server station.

VII. EXPERIMENT RESULTS
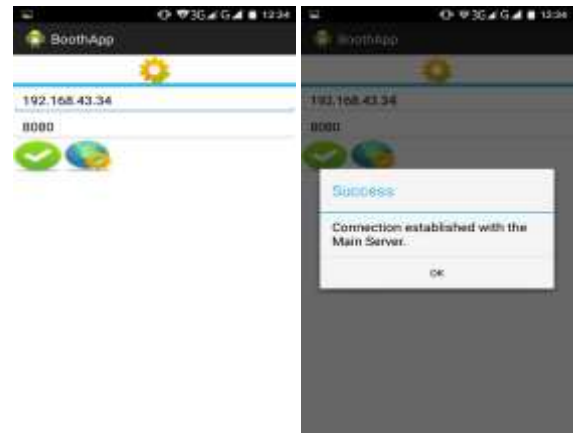
A. Toll Booth App

Fig3: (a) **Toll Booth Connecting to server**

Firstly, the toll booth NFC phone should be connected to the server. So that the information got through users NFC phone after tapping to the toll booth NFC phone should be stored in the server.
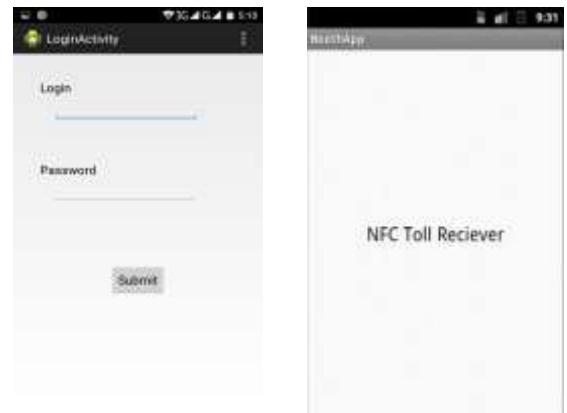
***Fig3:** (b)* **Toll Booth Login**   **(c) After receiving the toll**

The toll booth owner logins the page as shown in fig3 (b). And fig3 (c) is of the NFC toll receiver, this page is being seen when the toll is being received from the user.
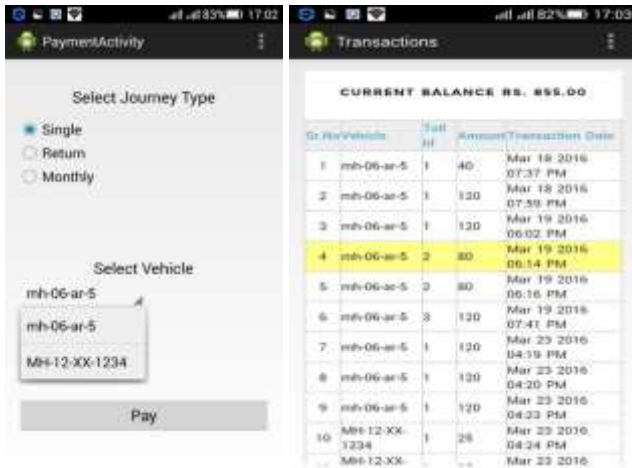
B.   Toll User App

***Fig 4:** (a)* **User app after login**   **(b) Transaction history for User**

The user app contains the payment activity as shown in fig 4(a), which contains the jouney type and selection of the vehicle. As shown in fig 4 (b) the transaction history can be seen.
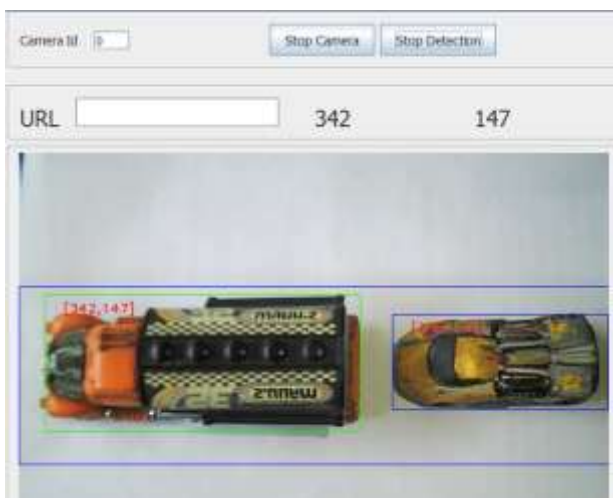
C.   Blob Detection

***Fig 5:** **Blob Detection**

This is one of the extra implementation work being done to validate:

i.   In this green bordered rectangular, the length and width parameter are send to the server to check whether the user

is using the right vehicle which is being selected by the user in the user app

ii.   While the blue bordered rectangular is for the next vehicle on the queue. Similarly the procedure is being continued.

And the user request is executed within less than time period of 4sec.

VIII.   RESULT ANALYSIS

	Result of Framework
Range of NFC(cm)	10
Speed of transaction (%)	97
Blob detection %(for identification of vehicles width and hight)	95
Complete process (<= given seconds)	5
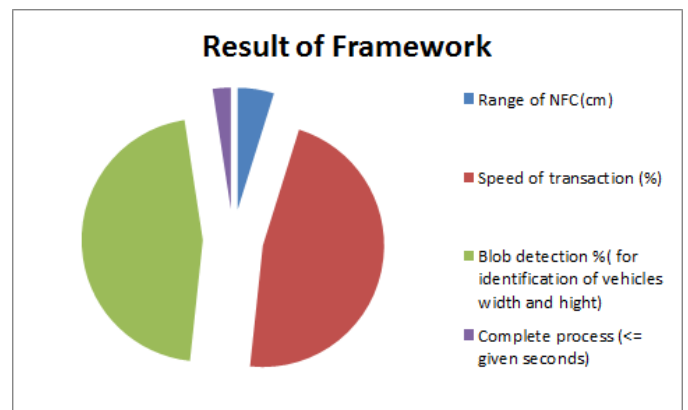
IX. CONCLUSION

The future in toll computerization expense gathering ought to be more adaptable for Indian streets. It ought to be proficient brisk and secure. The framework has NFC system which is more productive and fast. Security depends on blob recognition. This can be future upgraded by demonstrating better arrangement.

X.   REFERENCES

[1]. Nikhil Mohan .O.K, Savita Patil PG student ,ECE Dept, Associate Professor, ECE Dept, AMC Engineering College, Bangalore, "Near Field Communication (NFC) based Electronic Toll Collection System" ISSN (Online): 2347 - 2812, Volume-2, Issue - 4, 2014.

[2]. Jayapriyaa. CT, Y. Bevish Jinila, department of Information Technology, Sathyabama University, Chennai, India, "Secured Short Time Automated Toll Fee Collection for Private Group Transportation", IEEE Sponsored 2nd International Conference on Innovations in Information, Embedded and Communication systems (ICIIECS)2015.

[3]. Shin Kamada1, Takumi Ichimura, Tetsuya Shigeyasu and Yasuhiko Takemoto2, "Registration system of cloud campus by using android smart tablet" Kamada *et al. SpringerPlus* 2014.

[4]. Wei-Hsun Lee, Shian-Shyong Tseng, Ching-Hung Wang, "Design and implementation of electronic toll collection system based on vehicle positioning system techniques," 29 May 2008.

[5]. Wern-Yarng Shieh, Wei-Hsun Lee, Shen-Lung Tung, and Chung-Ding Ho, "A Novel Architecture for Multilane-Free-FlowElectronic-Toll-Collection Systems in the Millimeter-Wave Range", IEEE transactions on intelligent transportation systems, vol. 6, no. 3, September 2005.

[6]. Yi Zhao, Joshua R. Smith, Alanson Sample, University of Washington, "NFC-WISP: A Sensing And Computationally Enhanced Near- Field RFID platform."

[7]. João Dias, JoãoNuno Matos and Arnaldo S. R. Oliveira"The charge collector system, A New NFC and Smartphone-based Toll Collection System", Conference On Electronics, Telecommunications and Computers – cetc 2013, November 2014.

[8]. Yuhua Guo, Hong Li, Zhao Li, "The Application of RFID-SIM in Electronic Toll Collection System", 2011 International Conference on Computational and Information Sciences.

[9]. Ahmad Zubair, Sourav Mahmood Sagar, Pran Kanai Saha, and Shaikh Anowarul Fattah. "A Design for Low Cost Electronic Toll Collection System with Secured Data Communication", 6th International Conference on Electrical and Computer Engineering ICECE 2010, 18-20 December 2010, Dhaka, Bangladesh.

[10]. Zhai Feng, YU Chengbo, CUI Shihai, "The design of rfid thruway no stop electronicToll collection system on the basis of tcp/ipProtocol", International Technology and Innvocation Conference 2007.

[11]. Wern-Yarng Shieh, Member, IEEE, Chen-Chien (James) Hsu, Member, IEEE, Shen-Lung Tung, Member, IEEE,Po-Wen Lu, Ti-Ho Wang, and Shyang-Lih Chang, "Design of Infrared Electronic-Toll-Collection Systems With Extended Communication Areas And Performance of Data Transmission", IEEE transactions on intelligent transportation systems, vol. 12, no. 1, March 2011 25.

[12]. Mohamed Maher Mahmoud Ibrahim, "Design & Implementation of Electronic Vehicle Identification (Evi) System", 2009.

[13]. Anne Kaspers, "Blob Detection", Biomedical Image Sciences, Image Sciences Institute & UMC Utrecht.