E-WALLET FOR TOLL COLLECTION IN HIGHWAYS USING UDOO PROCESSOR

G. Sudhakar Babu[1],
Assistant Professor,
Department of physics,
S.V.I.T Engineering College, Anantapur, Andhra Pradesh, India.

K. Chandra sekhar Reddy[2],
Professor,
S.S.B.N.Degree College ,
Anantapur.

Abstract:
Alongside the developing number of vehicles in real urban communities, Toll court is a possibility for smooth transportation. The expanding utilization of toll streets will be trailed by the expansion in expressway foundation to help ideal administration to clients. In late 90s toll courts were controlled physically. Those frameworks require two individuals for opening and shutting of the entryway and another two are for gathering of the cash and furthermore information keeping. Later on, in the time of 1995 the advancement of Express Highway Systems presented self-loader toll squares, in which information is put away in PCs and task of door is programmed. Two people are required for single toll court. The outstanding bit of leeway of this innovation is the chance to diminish the traffic blockage in toll square amid happy seasons. The manual toll gathering framework has number of downsides like unlawful toll accumulation, it require more labor, prompts vehicle clog and high wastage of powers because of long holding up time. Online Toll Payment System is an android application which is produced for decreasing the over blockage that has moved toward becoming piece of the metropolitan urban communities nowadays.

I.INTRODUCTION

A NPR system consists of two tasks: Vehicle Number Plate segmentation where the algorithm determines candidate number plate regions [Zhe 2004] and Vehicle Number Plate Character Recognition that identifies the characters in number plate of the vehicle [Rah 2003]. These two tasks are often addressed separately in the literature. In fact, the plate detection and location constitutes the most important and the most computationally intensive task because the whole image should usually be processed in order to localize the vehicle number plate.

The number plate can exist anyplace in the picture. Rather than handling each pixel in the picture, which builds the preparing time, the number plate can be recognized by its components and thus the framework prepare just the pixels that have these elements. The elements are linked from the number plate configuration and the characters constituting it. Number plate shading is one of the components since a few nations, states or regions have certain hues for their number plates. The rectangular size of the number plate limit is another element that is utilized to locate the number plate. The shading change between the characters and the number plate foundation, as surface is utilized to remove the number plate area from picture. Two or more elements can be joined to distinguish the number plate. Few existing number plate extraction methods reported in literature are discussed which are based on specified features of number plate.

A number plate recognition based methodology [Hua 2009] for checking examination status of motorcycles was proposed. Analyses yielded an extraction rate of 95.7% and 93.9% in view of roadside and assessment station test images. It has taken 654 ms on a ultra mobile personal computer and around 293 ms on a PC to extract a number plate.A boundary based extraction utilizing Hough Transform(HT) [Kam 1995] identifies straight lines in the image to find the number plate. The HT has the advntage of recognizing straight lines with up to 30^0 inclination [Dua 2004]. In any case, the HT is a period and memory consuming procedure. A boundary line-based system joining the HT and contour algorithm [Dua 2005] accomplished extraction results of 98.8%. The generalized symmetry transform(GST) [Kim 2001] is utilized to extract the number plate edges through checking the image in the specific directions to recognize corners and to form number plate areas.

Edge based strategies are simple and quick. Then again, they require the continuity of the edges [Che 2003]. At the point when consolidated with morphological steps that eliminate with undesirable edges, the extraction rate

is generally high. A hybrid technique taking into account edge measurements and morphology [Bai 2004] demonstrates a precision of 99.6%.

II. PROPOSED SYSTEM

Objectives

i. COLLECTION OF TOLL TAX: The biggest objective of the system is to collect the toll tax automatically and give the correct money to the admin by e-wallet system.

ii. EASY TO FIND OUT THEFT VEHICLES: Whenever user register the complaint about theft vehicle at that time this complaint also register on toll booth database , when stolen vehicle comes to the toll booth both barrier get closed and we can find the stolen vehicle.

iii. AUTOMATIVE SYSTEM: In that system user can register himself/herself using android application and makes entry into the database.it makes transaction very easy for automatic deduction of balance.

iv. TIME SAVING: Whenever user register the complaint about theft vehicle at that time this complaint also register on toll booth database , when stolen vehicle comes to the toll booth both barrier get closed and we can find the stolen vehicle.

Tollbooths in India generally employ a purely visual system of vehicle classification. However this causes a huge loss of revenue to the firms operating the tollbooths due to rampant malpractices and discrepancies. To keep a tab on the operators some tollbooths employ a system using fibre optic sensors to automatically classify a vehicle in the background and tally the results with the manual entries. However this system is expensive complicated and requires high maintenance. We aim to study the various systems that can be used to replace such a system with a cheaper and efficient alternative

To keep a tab on the operators some tollbooths employ a system using fibre optic sensors to automatically classify a vehicle in the background and tally the results with the manual entries. However this system is expensive complicated and requires high maintenance. We aim to study the various systems that can be used to replace such a system with a cheaper and efficient alternative. This proposed system is worked on the easiest way to pay amount using wallet.

UDOO PROCESSOR BOARD

The UDOO processor based is first of its kind used for the present research work. UDOO is a single-board computer with an integrated Arduino 2 compatible microcontroller, designed for computer science education, the world of Makers and the Internet of Things. UDOO is a development platform that merges a Dual or Quad Core ARM Freescale Cortex-A9 i.MX 6 CPU, providing optimal performance when running both Linux or Android operating systems, and an Arduino 2 compatible board with a dedicated ARM Atmel SAM3X8E CPU. It is available in three models: UDOO Dual Basic, UDOO Dual, and UDOO Quad. UDOO is a joint effort of Aidilab srl and SECO USA Inc, in collaboration with a multidisciplinary team of researchers with expertise in interaction design, embedded systems, sensor networks and cognitive science.

The i.MX 6 Dual/6 Quad application processors are the latest additions of Freescale Semiconductor to a growing family of multimedia-focused products offering high performance processing optimized for lowest power consumption. Its processors feature is an advanced implementation of the ARM Cortex™-A9 core, which can be interfaced with DDR3-1066, LV-DDR3-1066 and LPDDR2-1066 (single and dual channel) DRAM memory devices and also it is based on the i.MX 6[5] Dual/6 Quad Processor is based on the ARM Cortex A9 MPCore™ Platform, which has the following features:

i. It has ARM Cortex A9 MPCore™ Dual or Quad core CPU configurations

ii. Symmetric CPU configuration where each CPU includes: 32 Kbyte L1 InstructionCache, 32 Kbyte L1 Data Cache, Private Timer and Watchdog, Cortex-A9 NEON MPE (Media Processing Engine) Co-processor.

iii. General Interrupt Controller (GIC) with 128 interrupt support

iv. Global Timer

v. Snoop Control Unit (SCU)

vi. 1 Megabyte unified L2 cache shared by all CPU cores (Dual or Quad)

vii. Two Master AXI (64-bit) bus interfaces output of L2 cache

viii. NEON MPE coprocessor

ix. GPIO's can be accessed as Arduino pins, GPIO's or as additional S\PDIF, FlexCAN, I2S, SPI and it incorporates the following hardware accelerators.

- ✓ VPU Video Processing Unit
- ✓ Two IPUv3H -Image Processing Unit (version 3H)
- ✓ GPU3Dv4 - 3D/2D Graphics Processing Unit (OpenGL ES 5.0), version 4
- ✓ GPU2Dv2 - 2D Graphics Processing Unit (BitBlt).
- ✓ GPU VG - OpenVG 1.1 Graphics Processing Unit
- ✓ ASRC - Asynchronous Sample Rate Converter
- ✓ Three SSI that support I2S/AC97, up to 1.4 Mbit/s each
- ✓ Enhanced Serial Audio Interface (ESAI), up to 1.4 Mbit/s each channel
- ✓ Five UART, up to 4.0 Mbit/s each
- ✓ RS232 interface
- ✓ 9-bit RS485 multidrop mode
- ✓ One of the five supports 8-wire (uart1) while the other four support 4-wire.
- ✓ Five eCSPI (Enhanced CSPI).
- ✓ Three I2C, supports 400 kbit/s
- ✓ Gigabit Ethernet Controller (IEEE1588 compliant), 1Gbit/s/10/100 Mbit/s
- ✓ Four Pulse Width Modulators (PWM)
- ✓ System JTAG Controller (SJC)
- ✓ GPIO with interrupt capabilities
- ✓ 8x8 Key Pad Port (KPP)
- ✓ Sony Philips Digital Interface (SPDIF), Rx and Tx
- ✓ Two Controller Area Network (FlexCAN), 1 Mbit/s each
- ✓ Two Watchdog timers (WDOG)
- ✓ Audio MUX (AUDMUX)

a. **Atmel SAM3X**

The member of a family of Flash microcontrollers is Atmel's SAM3X/A based on the high performance 32-bit ARM Cortex-M3 RISC processor and it operates at a maximum speed of 84 MHz and features up to 512 Kbytes of Flash and up to 100 Kbytes of SRAM. The peripheral set includes a High Speed USB Host and Device port with embedded transceiver, an Ethernet MAC, 2x CANs, a High Speed MCI for SDIO/SD/MMC, an External Bus Interface with NAND Flash controller, 5x UARTs, 2x TWIs, 4x SPIs, as well as 1 PWM timer, 9x general-purpose 32- bit timers, an RTC, a 12-bit ADC and a 12-bit DAC. The SAM3X/A series is ready for capacitive touch thanks to the QTouch library, offering an easy way to implement buttons, wheels and sliders. The SAM3X/A architecture is specifically designed to sustain for high speed data transfers and includes with a multi-layer bus matrix as well as multiple SRAM banks, PDC and DMA channels that enable it to run tasks in parallel and maximize data throughput. It operates from 1.62V to 3.6V. And these devices are particularly well suited for networking applications such as industrial and home/building automation, gateways etc.

b. **Processors Connectivity**

The Freescale i.MX 6 and the Atmel SAM3X are connected through a UART Serial Port embedded on the board. It works exactly like an Arduino connected to an external computer with an USB cable. The SAM3X and Linux communicate on a two-way channel, exchanging messages with baud rate of 115200. This serial connection is also accessible from the external pins 0 and 1 of the Arduino compatible pinout. Its programming port is accessible in the same way as Arduino Due via a USB-to-serial converter or directly on the external pinout. The serial UART is connected to the iMX 6 pins KEYROW0 and KEYCOL0. On the SAM3X side it is connected to pins URXD and UTXD. The shared serial bus is also available through the micro-USB plug CN6. By removing the J18 jumper, it can communicate on the same channel, which becomes shared. Figure - 5.2 shows the UDOO processor board

The most important part of this system is the software design. The software design uses series of image processing techniques which are implemented in Android mobile platform which is supported minimum API 5 or android 5.0 (cupcake). The ANPR algorithm designed in this paper is roughly divided into four parts:

Capture vehicle number plate image

Image filtering

Segmentation of the number plate image

Recognize the numbers plate image using OCR algorithm.

The first step is the capturing of an image using the camera provided by the mobile phone. The images are captured in RGB format so it can be further process easily for the number plate segmentation.

The following step is image filtering of the number plate image. The filtering process is using two different filtering techniques. The first technique involves removing of all white patches that are connected to any border and set their pixel value to 0. The second filtering technique use pixel count method to remove the small regions in an image other than the plate region. The number of consecutive white pixels is inspected and regions that contain number of white pixels less than the predefined threshold are set to 0.

The next step of the ANPR algorithm is the segmentation of number plate in an image. It is one of the most important processes in the automatic number plate recognition, because the following step relies on it. If the segmentation fails, a character can be improperly divided into two pieces or two characters can be improperly merged together. In this process, we split up the number plate image character by character until we have each character separated [7].
The algorithm of segmentation basically finds the maximum peak in the graph of vertical projection iteratively. The peak is treated as a space between characters, if it meets some additional conditions, such as height of peak. The algorithm then zeroizes the peak and this process will repeat until no next space is found. This principle can be illustrated by the following steps [7]:
Target for the ANN are 26 elements for ANN's letter and 10 elements for ANN's number. For ANN's number, there will be 10 neurons for hidden layer and output layer. For ANN's letter, there will be 20 and 26 neurons for hidden layer and output layer respectively. The value of element of each targets are all zero except one element on specific position which represent the number or letter. The output from the network will be two dimensional matrixes with size 26 x *n* and 10 x *n* for ANN's letter and ANN's number, respectively. The value of output will be in range 0 and 1. To be recognize, output should be processed first by converted the highest value to be 1 and other will be 0. Then, the location of element which has value 1 will be founded and the result will represent number or letter. For example, output from ANN's letter which has value 1 at first element will represent the letter A.
Correlation method is used by the OCR to counterpart individual character and as a final point the number is identified and stored a variable as a string format. The string will be compared against the stored database for the vehicle authorization. The detail of the proposed software design is shown in Figure 1.

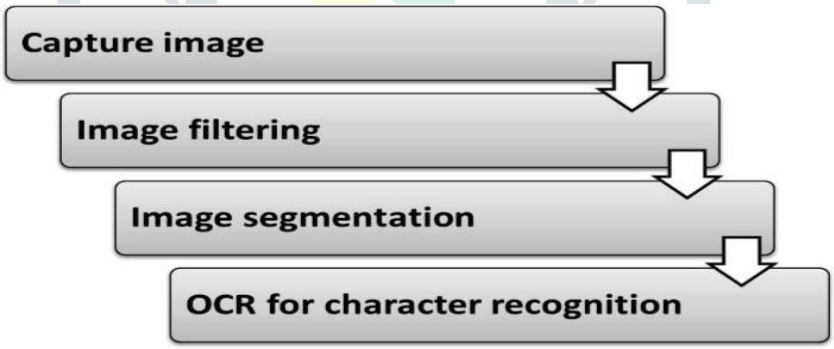
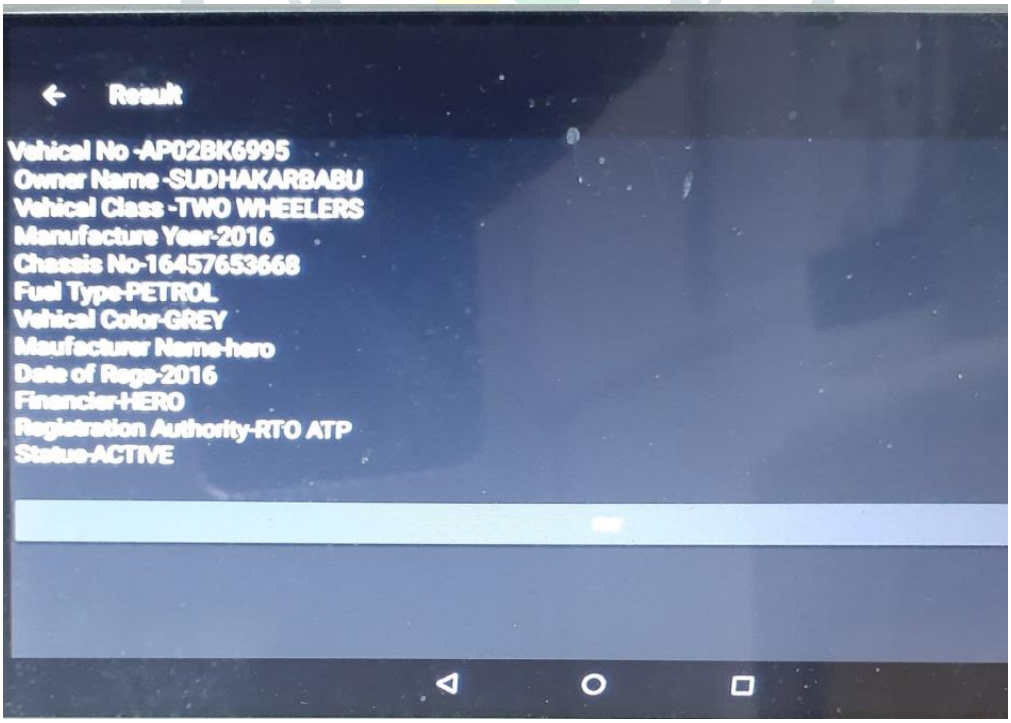


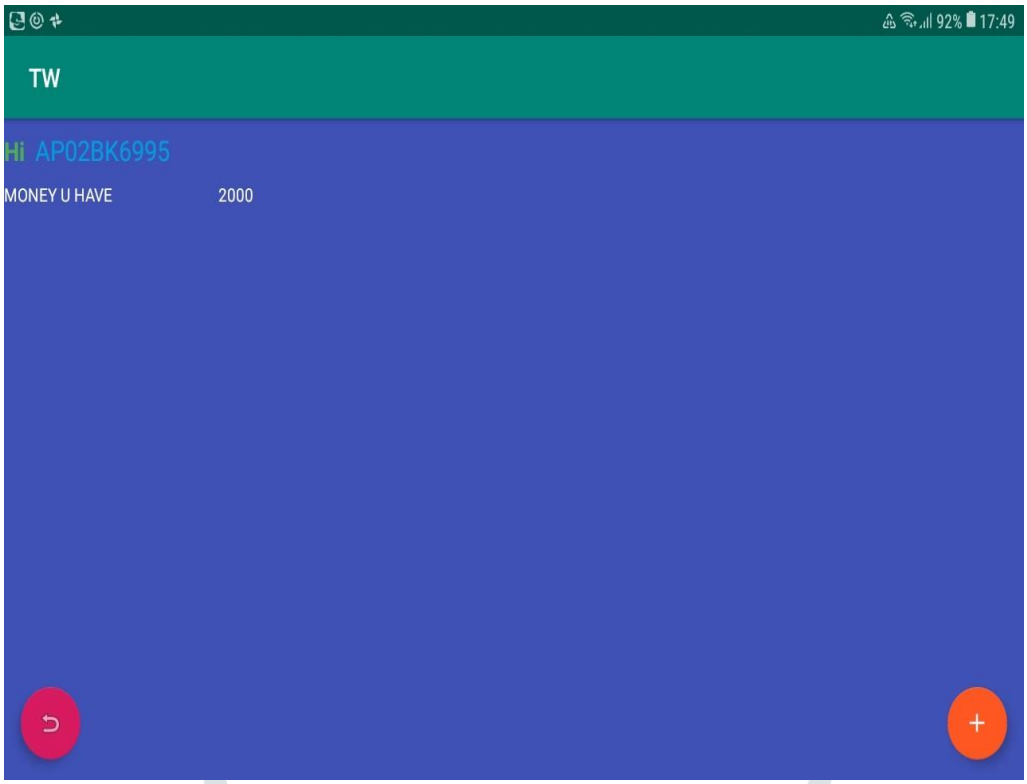
Figure 1. Steps of automatic number plate recognition.

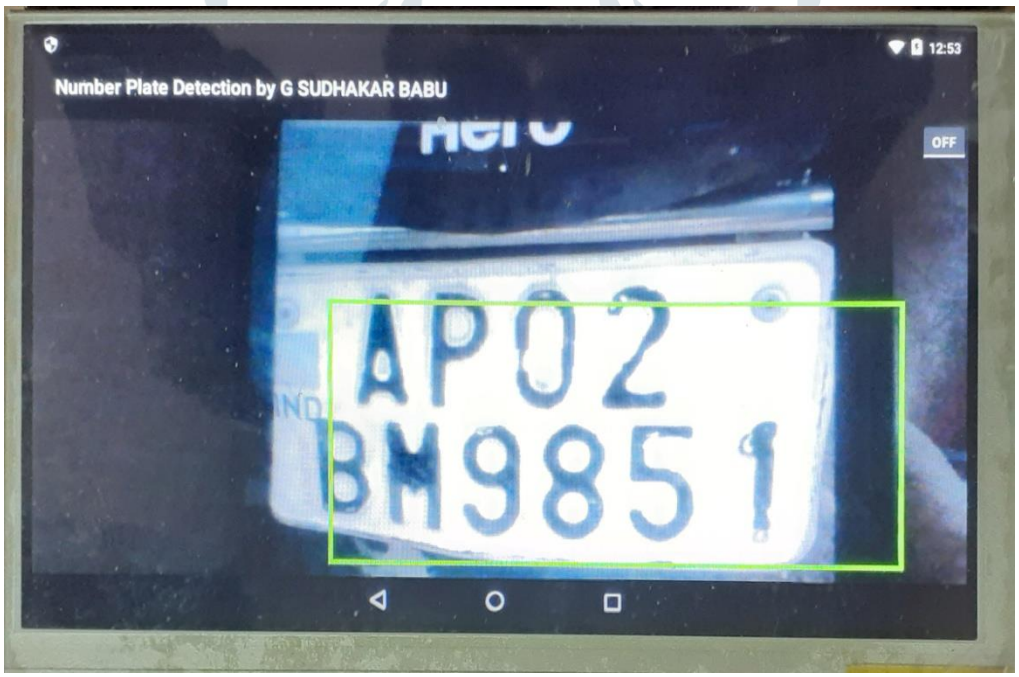
The final step is recognizing the character using Optical Character Recognition (OCR) algorithm by compared the image character that we have in second step against the alphanumerical database that we trained using artificial neural network (ANN) algorithm approach

III. RESULTS


1:41
Number Plate Detection by G SUDHAKAR BABU
OFF
IND
AP02
BK6995


Result
Vehical No -AP02BK6995
Owner Name -SUDHAKARBABU
Vehical Class -TWO WHEELERS
Manufacture Year-2016
Chassis No-16457653668
Fuel Type-PETROL
Vehical Color-GREY
Maufacturer Name-hero
Date of Rego-2016
Financier-HERO
Registration Authority-RTO ATP
Status-ACTIVE


92% 17:49
TW
Hi AP02BK6995
MONEY U HAVE 2000


12:53
Number Plate Detection by G SUDHAKAR BABU
OFF
AP02
BM9851

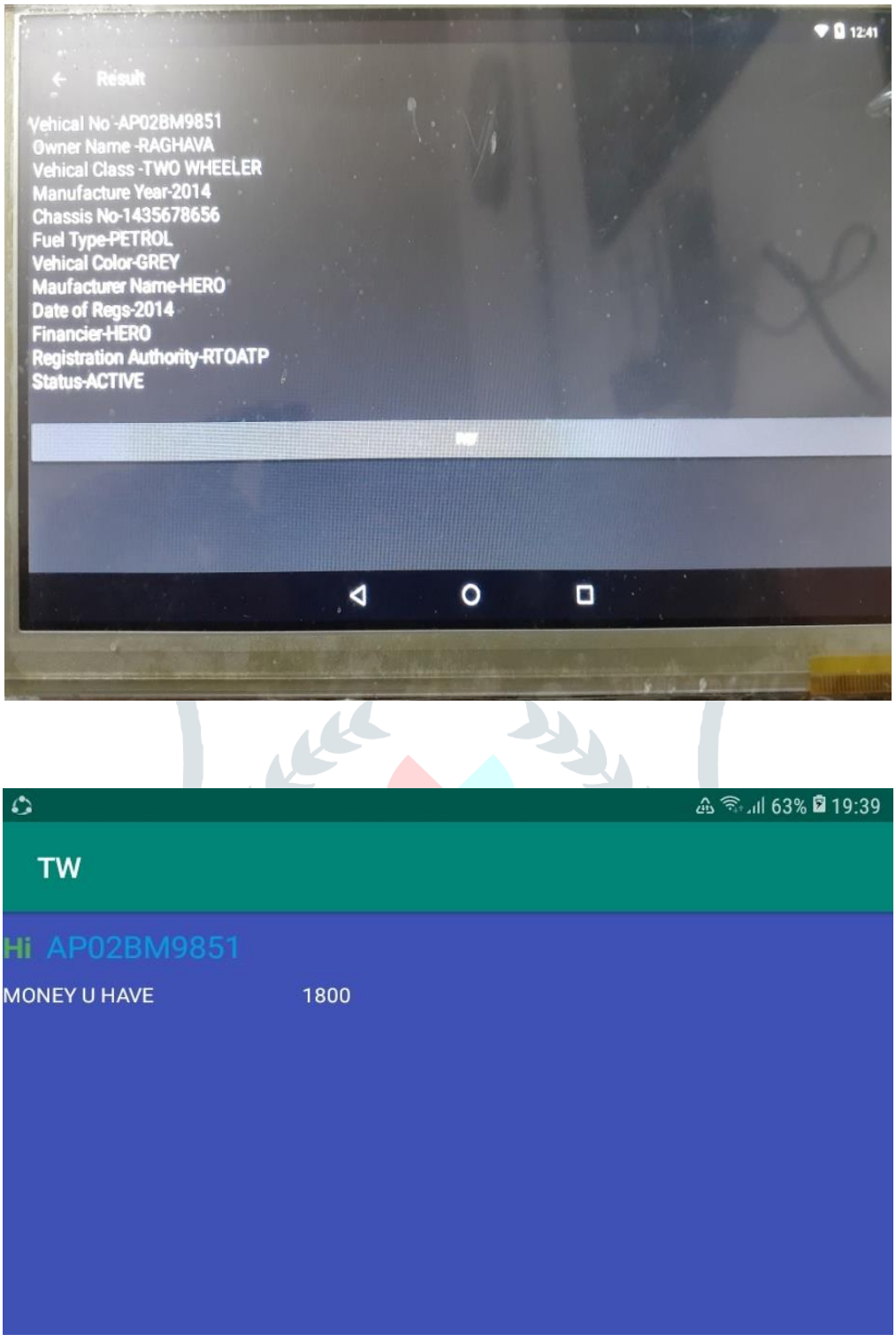


Figure 2: Various number plates testing

IV. CONCLUSION

The proposed framework we utilize programmed number plate acknowledgment system(ANPR). With the assistance of this ANPR we can diminish the human communication in the whole toll accumulation process and improves the security dimension of the framework. It diminishes the traffic clog and spare time which serves to client achieve their goal without wastage of time and fuel. It diminishes the exertion of the toll specialists and advances the framework with the reasonable arrangement of toll gathering which can be pursued. The money security level can be expanded with the assistance of online installment frameworks. This innovation will be utilized in various toll corners the nation over where the traffic can be controlled effectively and the executives of time can be viably taken care of. It helps in the digitization strategy and serves to be easy to use.

References

[1] C. Nelson Kennedy Babu, "A Novel Approach for Segmentation of Text from Compound Images", International Journal of Imaging Science and Engineering (IJISE), GA,USA,ISSN:1934-9955,VOL.2,NO.1, Jan 2008, pp: 139-141.

[2] C. Nelson Kennedy Babu, "An Efficient Geometric feature based License Plate Localization and Recognition", International Journal of Imaging Science and Engineering (IJISE), GA,USA,ISSN:1934-9955,VOL.2, NO.1, April 2008, p:1-6.

[3] C. Nelson Kennedy Babu, "A License Plate Localization and Character Segmentation with two stages Recognition", International Journal of Imaging Science and Engineering (IJISE). (Accepted for Publication)

[4] C. Nelson Kennedy Babu, "A License Plate Recognition with priori Knowledge using Neural Network", International Journal of Imaging Science and Engineering (IJISE). (Accepted for publication)

[5] C. Nelson Kennedy Babu, "A License Plate Localization using Morphololoy and Recognition", International Journal of Imaging Science and Engineering (IJISE). (Reported for Publication).

[6] Faradji, F.; Rezaie, A.H.; Ziaratban, M.;, "A Morphological-Based License Plate Location", IEEE International Conference on Image Processing, 2007, Volume 1, 2007 pp:I - 57 - I – 60.

[7] Suryanarayana, P.V.; Mitra, S.K.; Banerjee, A.; Roy, A.K.;, "A Morphology Based Approach for Car License Plate Extraction", IEEE INDICON, 2005, pp:24 – 27.

[8] Poon, J.C.H.; Ghadiali, M.; Mao, G.M.T.; Sheung, L.M.;, "A robust vision system for vehicle license plate recognition using grey-scale morphology", Proceedings of the IEEE International Symposium on Industrial Electronics, 1995, Volume 1, pp:394 – 399.

[9] Zhu Wei-gang; Hou Guo-jiang; Jia Xing;, "A study of locating vehicle license plate based on color feature and mathematical morphology", 6th International Conference on Signal Processing, 2002, Volume 1, pp:748 – 751.

[10] Zhigang Xu; Honglei Zhu;, "An Efficient Method of Locating Vehicle License Plate", Third International Conference on Natural Computation, 2007, Volume 2, pp:180 – 183.