Intelligent Mobile Vehicle Checking System Based on ARM 7

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Abstract— **With ARM 7 as the core, the new Intelligent Mobile Vehicle Checking System integrated with a lot of hardware & software module such as image capturing, number plate recognition, GSM, GPS etc. the design of the system software used the embedded software developing platform as Keil, met the traffic auditing department's needs about Mobile Vehicle Checking.**

Index Terms— ARM 7, embedded system, GPS, GSM, image capture, Keil

I. INTRODUCTION

With the development of technology, people have higher expectation of living, country has invested a huge amount of money to the capital construction, especially to roads infrastructure. In this situation, the road infrastructure is developing fast, the highway mileage has enormous increase and there is an increasing vehicle on the roads. However, the huge number of cars raises problems of its own; there are more and more car thefts, lost and violations of rules which are given serious attentions.

The time which is spent on checking on the roads by the department of traffic charge, check and police has been taken too much. Meanwhile, vehicles overload problem is getting worse around the country. Because of the merits of high capacity, large services and economy, public buses have become the main means of urban traffic. If the bus which took lots of people had a traffic accident, the result would be serious. The main cause of those serious accidents is overload; therefore, it is time to find some way to resolve this problem. However most of the departments take care of this problem in traditional way vehicle checking such as manual judgment and road checking, so it needs to find an Intelligent Mobile Vehicle Checking System to replace the traditional one. The new Intelligent Mobile Vehicle Checking System is designed to meet these needs.

II. SYSTEM FUNCTION AND COMPOSITION

This system builds a new Intelligent Mobile Vehicle Checking System based on ARM 7, image processing for vehicle number plate recognition, GSM wireless mobile tele-communication, GPS positioning technique to identify the location of the vehicle, send SMS to the mobile and check the vehicle which break the rules or owe the charge. This system has following features:

1) Image capture: The web camera takes the image of vehicle number plate; it collects the data of image automatically and save it.
2) Number plate recognition: Here collects the data of images and process it for number plate recognition using MATLAB on PC.
3) Communication function: In hardware of the system transmitter and receiver sections are considered. The transmitter is placed on toll booth or signal system and receiver is placed in vehicle, these two sections are communicated by the SMS message using GSM network.
4) GPS system: This system correctly sends the position and time of the vehicle in which string of a number clubbed with latitude and longitude coordinates from the GPS. Intelligent Mobile Vehicle Checking System is composed of ARM 7 microprocessor, peripheral equipment, image capture, GPS positioning module ROYALTEK REB- 1315S4, GSM module SIM900.

III. OVERVIEW OF SYSTEM

In the overview of the system which consist of system architecture having following modules.
1. ARM 7
2. GPS
3. GSM
4. MATLAB using PC
5. Camera
6. LCD
7. Power supply

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1) ARM 7

The circuit of ARM 7 microprocessor and peripheral equipment includes ARM 7 chip, a clock circuit, reset circuit. Here we have used LPC 2148 ARM 7 chip. LPC 2148 is a 32 bit controller. It is operates on 3.3V DC. It is having inbuilt multichannel ADC. It has two 32 bit Timer/Counter, with PWM unit. It is tiny 7mm x 7mm LQFP packaging. It is stuffed with lower power features and advanced peripherals.
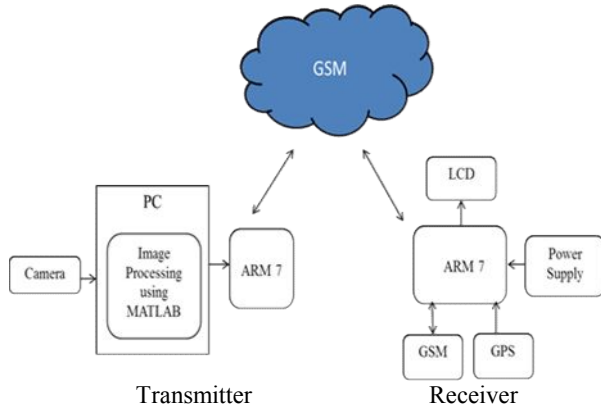

Figure 1: System Block Diagram

2) GPS

It is the global positioning system. Satellite broadcasts the signal from space that provides three dimensional location i.e. latitude, longitude and altitude Pulse precise time. GPS receiver provides reliable positioning, navigation and timing services to worldwide users on continuous basis in all weather, day and night, anywhere on or near the earth. In this system we have used ROYALTEK REB- 1315S4 GPS module. It requires 3.3V power supply. It has 48 track verification channels. Its sensitivity is 130 dBm. It has Small form factor with embedded SiRF Star IV technology.

3) GSM

GSM, the global system for mobile, is a digital communication system which has rapidly gained acceptance and market shared worldwide.GSM also pioneered low-cost implementation of the short message service (SMS), also called text messaging, allow users to send and receive point to point alphanumeric messages up to few tens of bytes. In this system we use SIMCOM make SIM900 GSM module, it is complete Quad- band GSM/GPRS 50/900/1800/1900MHZ performance for voice, SMS, Data and FAX in small form factor and with low power consumption. It is integrate with SIM holder. Control via AT commands. Supply voltage is 3.4V - 4.5V.

4) MATLAB using PC

Number plate recognition is done using MATLAB. The number plate image captured by camera is processed with MATLAB version R2010a. Here live image is taken for recognition and that database is maintained on PC.

5) Camera

The vehicle number plate image gets captured by using VG camera.

6) LCD

Here we can use 16x2 LCD. i.e. 16 characters and 2 lines, used to display the message on LCD.

7) Power supply

In this system ARM 7and GPS requires approximately3.3v power supply and GSM requires 3.4-4.5v supply.

A. WORKING OF THE SYSTEM

The project "Design of Intelligent Mobile Vehicle Checking System Based on ARM 7" contains microcontroller, alphanumeric LCD, PC, GSM, GPS, Laptop web camera or VG camera and power supply.

This system builds a new intelligent vehicle checking system based on ARM7 embedded processing technology, processing technology of digital videos, vehicle identification technology, GSM wireless mobile telecommunication technology, GPS positioning technique, implements the checking to vehicles which break the rules or owe the charge. Here we are using number plate of car as mobile vehicle checker. When the system works, the camera captures the video of number plate, collects the data automatically and saves it in the IMAGE buffer. For demo concern we are using VG camera.

The system recognizes the vehicle license by digital video data. Data from camera will be sent to the PC. In PC image processing is also done using MATLAB. The vehicle checking terminal communicates with the server center i.e. transmitter section of the system by the SMS message on the GSM net. The system can correctly send the position and time of the checking vehicle to the server center i.e. transmitter section by GPS positioning, therefore, the terminals can be coordinated properly.GPS section with GSM is called as receiver section of the system.

We can send the vehicle number to the server center in the specified format. System captured images are processed & vehicle number is identified in that image using MATLAB & the vehicle number & its GPS location is sent to the server center. In the data base if any of the vehicle number is matched means its GPS location will be send to the mobile number who has send the vehicle number.

B. FLOW CHART OF SYSTEM

The bellow flowchart indicates the basic algorithm steps for number plate recognition and vehicle identification.

Step 1: Camera captures the image of vehicle number plate.

Step 2: The captured vehicle number plate image is processing by image processing tools in MATLAB.

Step 3: Number plate recognition in that segmentation of number, image extraction and number recognition is done by the MATLAB.

Step 4: If the vehicle number plate is recognized, then it transfer to transmitter section of module with ARM 7 via serial interface RS 232 communication.

Step 5: If the recognized vehicle number is matched with the database numbers of ARM 7 then, transmitter section send SMS of gathered information of number plate to receiver section through GSM.

Step 6: In receiver section GPS find the position of vehicle and send GPS coordinates to the registered mobile number through GSM.
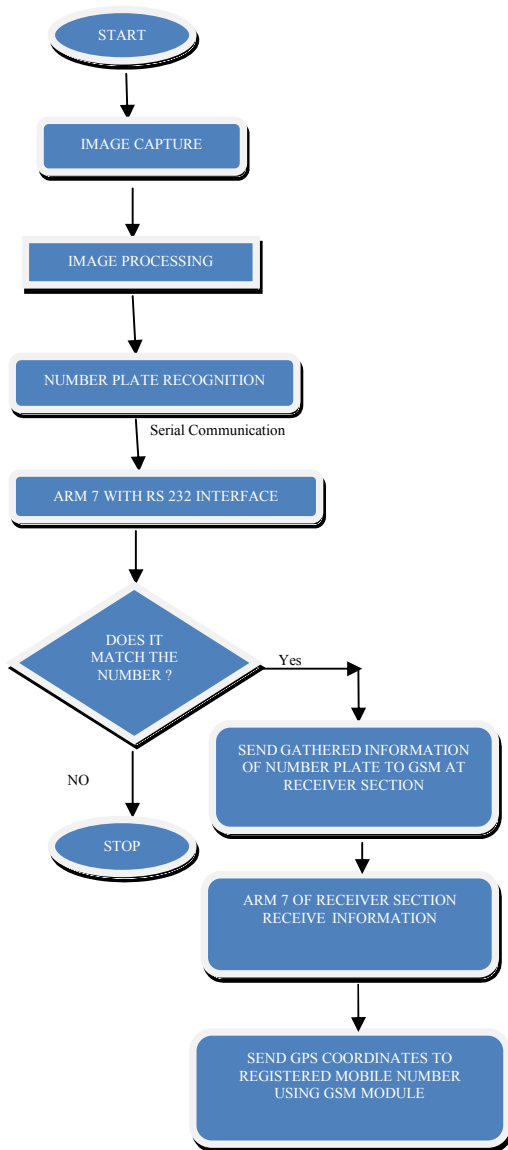
Figure 2: Flowchart of System

C. PROJECT DEMONSTRATION AND RESULT

Figure no. 3 to figure no. 9 shows the demonstration and the result of project. Final result of system shown in figure no.4, 8 and 9.
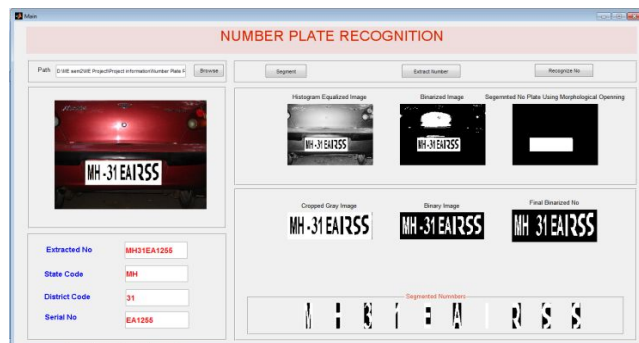

Figure 3: Number Plate Image Captured By Camera

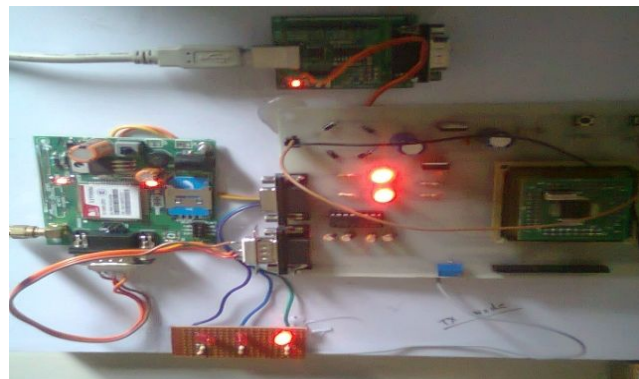
Figure 4: GUI of Number Plate Recognition

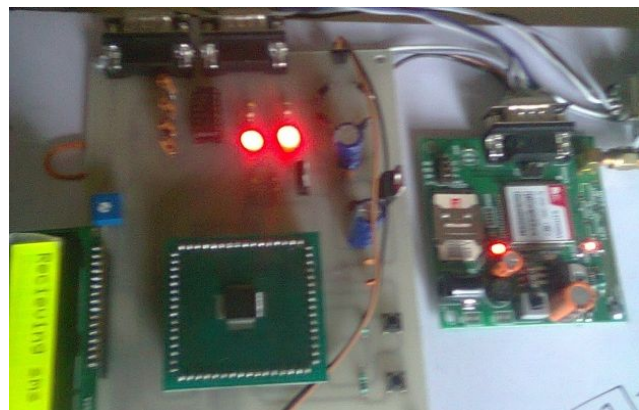**Figure 5:** Circuit of Transmitter Section

Figure 6: Circuit of Receiver Section
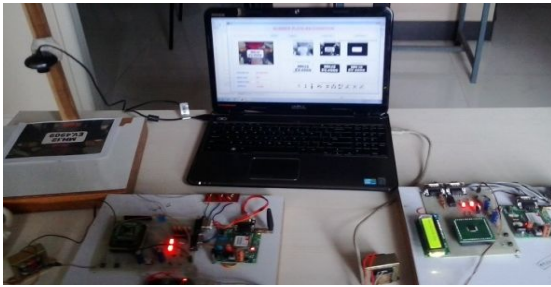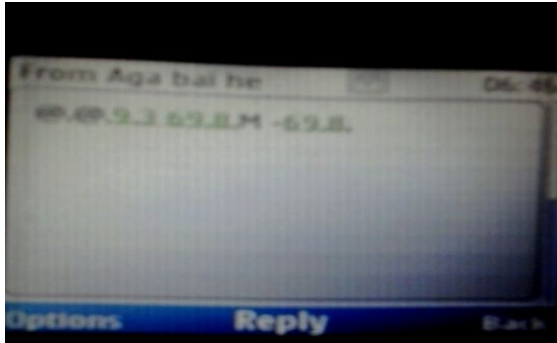
Figure 7: Final Project Module

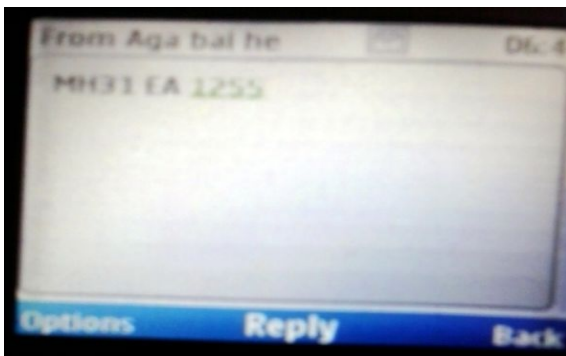**Figure 8:** SMS on Mobile of GPS coordinates

Figure 9: SMS on Mobile of Identified Number Plate

CONCLUSION AND FUTURE WORK

Employing embedded technology, based on ARM7 along with GPS, GSM module design, the new intelligent Mobile Vehicle Checking System uses the detection techniques of image capture of number plate using MATLAB. System finds the position of vehicle and sends its location. Its wireless communication techniques, meets the traffic auditing departments need about mobile vehicle checking. The system has the advantages of small size, low cost and powerful expansibility.

This system may implement of traffic departments to find the position of vehicle which are lost.

In future this system may implement with live video buffering of vehicle number plate.

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