Vehicle Tracking and Localization System Using ARM Processor

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ABSTRACT

The effectiveness, safety, and privacy of vehicle tracking can be greatly enhanced by developing an advanced tracking system, applying strong security measures to protect vehicles and cargo, and introducing innovative practices and solutions. This study takes a broad approach that involves a detailed review of existing research, the design and implementation of a new tracking system, and systematic evaluation of its impact on transportation and logistics.

The results show that the proposed tracking system delivers precise and up-to-date information about vehicle location and performance. At the same time, the integration of security features strengthens the overall protection of vehicles and their cargo. In addition, this research highlights the current status of vehicle tracking technology, points out key limitations, and suggests improvements to push the field forward.

Overall, this work contributes to the advancement of vehicle tracking by offering practical solutions, improved data privacy, and better system compatibility**,** while also providing important insights into the role and effectiveness of such systems in logistics and transportation.

Keywords: Raspberry Pi, Vehicle tracking, Face recognition, Security Measures, GPS, GSM.

INTRODUCTION

The paper describes the idea of tracking a vehicle using latest technology of GPS and GSM. The number of industry related vehicles like oil tankers (trucks), vans carrying huge amount of money for ATMs are increasing at a very fast rate and keeping a track of these vehicles is becoming difficult day by day. To keep a check on these kinds of vehicles such technologies prove to be very useful since in case of theft or missing of these vehicles, they can be easily traced on the website or cell-phones. Mobile technologies such as GSM / GPRS and GPS can be used for displaying the current position of the vehicle indicating the latitude, longitude and height from sea level. [1] This displaying of location of the vehicle can be done by a number of methods. The location can be sent via SMS to a GSM modem kept at the control station or to a cell phone. It can be indicated on LCD at the control station. The coordinates of the vehicle can also be transmitted to a static IP address by using GPRS Technology, thus linking it to Local/Google Maps. GPRS enables the introduction of packet data capabilities into the existing PCS and cellular networks using the TDMA or GSM Technology.

Relevance

The proposed vehicle tracking and localization system using ARM 7 as the core, the new intelligent mobile vehicle checking system integrated a lot of hardware modules such as video capture, GPS positioning and wireless transmission, the design of the system software used the embedded developing software platform based on ADS integrated development environment . By the hardware / software co-design, the new intelligent mobile vehicle checking system implemented the function of video capturing, recognition of driver, GPS Positioning and wireless transmission [1].

The system can be interconnected with the car alarm system and alert the owner on his mobile phone. This tracking system is composed of a GPS receiver, microcontroller and GSM modem. GPS receiver, get the information from satellites in the form of latitude and longitude. The microcontroller processes this information and this processed information is sent to the user/ owner using GSM modem [2].

The present application is low cost solution for automobile position and status, very useful in case of car theft situations, for monitoring adolescent drivers by their parents as well as in car tracking system applications [2].

Present theories and practices

With the ever increasing city holdings of cars, 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, so requirements are that Transportation needs more improvement. The key technology Of Transportation is Vehicle positioning System, while the key of which is positioning System. Now days the most widely used positioning system is the Global Positioning System of America (GPS), which is a system consisting 24 satellites whose searching area embrace the globe. It can ensure that more than 4 satellites will be observed at one time, no matter what time it is or where you are, thus making sure that they can collect the longitude and latitude of the view point, and furthermore realizing the function of navigation, positioning, and time service. The design of this Vehicle positioning System Based on ARM a combination of GPS and GSM can upload the information of the vehicle such as the position and speed to the Monitoring center in time, to make it convenient to control the traffic. Users can use the password to track vehicles, for security and anti-robbery and check the vehicle position. The new intelligent mobile vehicle location system is designed to meet this need [3].

Theoretical Analysis

This system builds a new intelligent vehicle tracking/checking system based on ARM7 embedded processing technology, processing technology of digital image, vehicle identification technology, GSM wireless mobile telecommunication technology, GPS positioning technique and anti theft mechanism [4].

This system has the following features:

1) Image capture: When the system works, the camera on the dash board of the car collects the data automatically and saves it in the buffer [5].

2) Vehicle license recognition: The system recognizes the vehicle license by digital image data and if not match with predefined values the vehicle will be locked and control unit display the message on LCD- "please register the vehicle" & indicate using buzzer & indicator and data will be sent to the PC. In PC image processing is done by using software. If driver license cannot match, then PC will display the message "Car /vehicle is stolen", and display vehicle location with help of GPS module. Also send the command to control unit to block the car [5].

3) Communication function: The vehicle checking terminal communicates with the client/user by the SMS message on the GSM.

4) GPS positioning: The system can correctly send the position and time of the checking vehicle to the client/user centre by GPS positioning, therefore, the terminals can be coordinated properly [5].
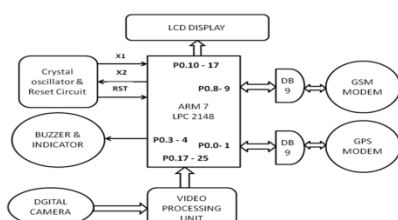
Block Diagram

Figure.1 "Vehicle Tracking and Localization Control Terminal Unit Using ARM Processor at Vehicle End"

1) Hardware Design:

The basic scheme of the proposed system was shown in Fig. 1. Mobile vehicle positioning system is composed of ARM microprocessor, peripheral equipment, combinative with GPS positioning module LR9548, GSM wireless telecommunication module SIM800 & buzzer. The circuit of ARM microprocessor and peripheral equipment includes an ARM7chip, a clock circuit, are set circuit, a 32MB flash memory, a LCD and indicator. All of these make up the control and process core of the system**.**

2) Software Design

Our software design process for this system involved python programming Language for designing and programming. Code verification and analysis will be done using tony software. For visualization of vehicle data ThingSpeak IOT platform is used.

Flow-Chart:
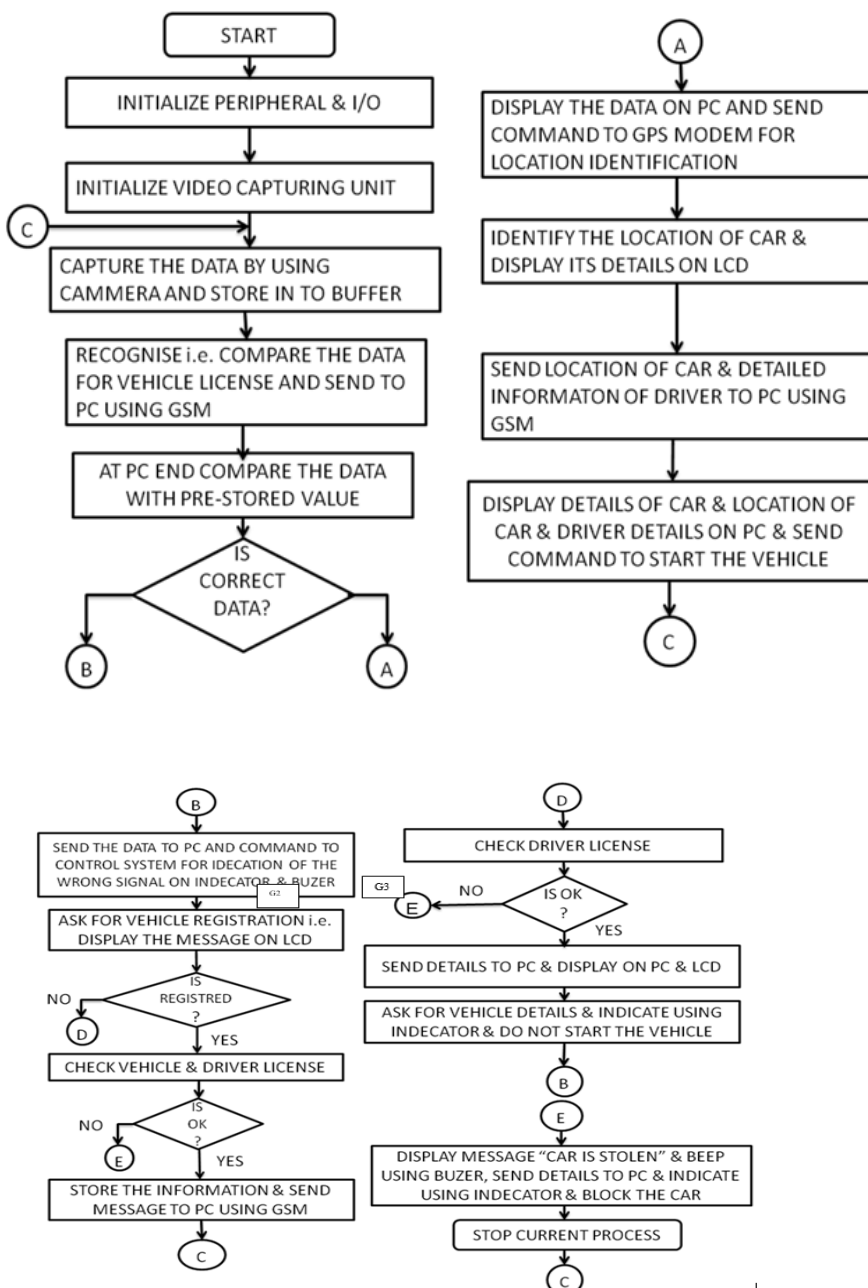
CONCLUSION

The proposed Real-Time Vehicle Tracking System offers a comprehensive and efficient solution to challenges faced in the automobile industry. By integrating advanced hardware components such as the **ARM microcontroller, SIM900A GSM/GPRS module, GY-NE06MV2 GPS module, and LCD display**, the system establishes a strong foundation for reliable real-time tracking and communication. On the software side, the use of the **GPS library** for GPS data processing and **GSM AT commands** for SMS transmission ensures accurate data management and dependable communication.

This approach, with its focus on **scalability, interoperability, security, and ease of use**, addresses the limitations of existing in-vehicle monitoring systems and provides a more robust and user-friendly tracking solution.

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