

Anti-Theft Security System for the Money Transfer Vehicles between Banks

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Abstract

As a result of the increase in the level of crime and thefts over the years, it became necessary to achieve a smart and sophisticated security system compatible with the evolution of the information technology (IT) services. The system of transferring currency and precious jewels between banks by using armored vehicles is one of the important systems that may be subject to a high degree of thefts. Therefore, the intelligent transportation system is the golden key to achieving safety for this type of systems. In this research paper, we will discuss in particular the important elements that are used in the design and implementation of anti-theft monitoring and controlling system of the armored vehicles allocated for the transferring of cash currency and gold jewelry between banks, by using embedded microcontroller, sensing unit (e.g. GPS tracker, fuel and speed sensors), and wireless communication unit (e.g. GSM, and Wi-Fi). In addition, we will discuss the graphical user interface of the administration page, in order to monitor and control the overall system operation.

Keywords: IT, Intelligent Transportation Systems (ITS), Vehicular Ad-hoc Network (VANET), Armored Vehicles, Embedded Microcontrollers, Arduino, Global Positioning System (GPS), Sensors, Biometric Identification Systems, Biometric Finger Print, Wireless Communication, Global System for Mobile Communication (GSM), SMS messages, Wi-Fi, Graphical User Interface (GUI), Google API Map.

INTRODUCTION

The armored vehicles that specialized in the transferring of cash currency and precious jewels between banks are considered valuable targets for theft by the bandits and criminals individuals, so it became an important of achieving a smart and advanced transportation system that provides full protection for this type of vehicles. The term "intelligent transportation system" is used to name the integration of control, information and communication technologies within the transportation infrastructure. A transportation system can be considered effective if it is capable of linking all sources of data in the system to produce valuable information. This information represents a basis of the controlling and managing decisions that are made by transportation users and operators. The Intelligent Transportation Systems lies in their wide variety of applications in different modes of transport [1]. VANET is an example of ITS protocols that applying on vehicles, and created by using the principles of MANET. VANET is the one-to-one application of MANET. MANET in originally consists of collection group of mobile, wireless

nodes that cooperative for forwarding the packets [2]. Therefore, this research paper would like to present a designing plan to protect those vehicles from any theft attempt. Fig.1. shows the general idea of the anti-theft security system for the armored vehicles that specializes in currency transfer between banks.

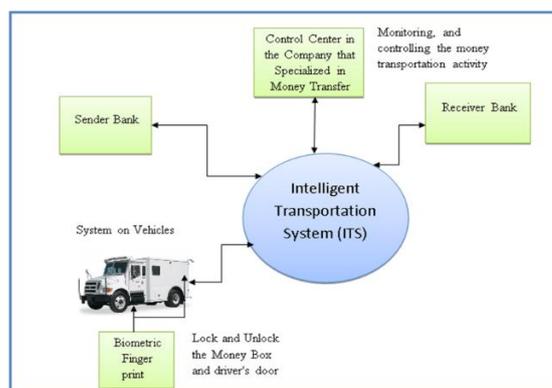


Figure 1. the general idea of the system.

As clear in the above Figure, our system focusing on physical transferring of currency and gold bullion between banks. On the other hand there are various systems focusing on electronic money transferring between personal accounts and banks and vice versa, such as a Secure Mobile Banking using Kerberos Protocol [3].

The PROPOSAL SYSTEM

The proposal system consists of two cooperative parts. The first part is the hardware components, which include embedded microcontroller, sensing and actuating units and communication units. The second part is the System GUI for controlling the overall system as shown in Fig.2.

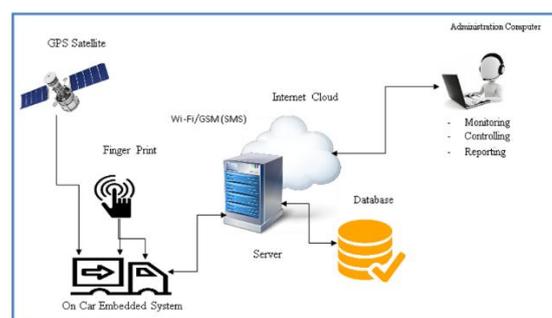


Figure 2. Proposal Model

A. The System Hardware Part

The tracking, monitoring and controlling system is complete coordinately by the hardware circuit system and software system. The hardware system has mainly complete embedded microcontroller, GPS tracker, biometric finger print, variety of other sensor signals (e.g. fuel, speed sensors), and communication units (e.g. GSM and Wi-Fi) as shown in Fig.3.

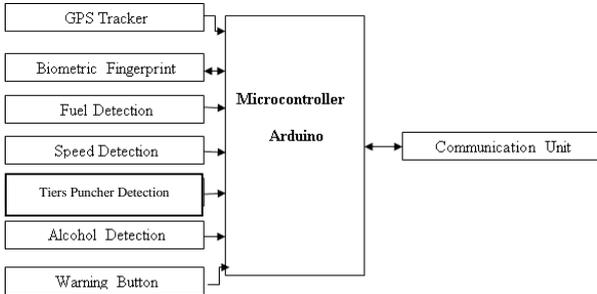


Figure 3. Block diagram of system hardware

1. Embedded Microcontroller System

A microcontroller (or MCU for microcontroller unit) is a mini computer on an integrated circuit. MCU is similar to but less sophisticated than, a system on a chip or SoC, a SoC may include one microcontroller. A microcontroller contains one or more CPUs (processor cores) with memory and programmable input/output peripherals. Microcontrollers are designed for embedded applications, using in personal computers or other general purpose applications consisting of various discrete chips. Microcontrollers are used in automatically controlled products and devices, such as automobile engine control systems, remote controls, office machines, appliances, power tools, and other embedded systems. The type of microcontroller used in

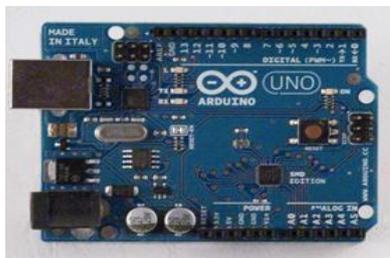


Figure 4. Arduino Uno Microcontroller

2. GPS Technology

GPS is a system composed of a network of 24 satellites of the United States, which are originally used in military services, and later allowed for commercial use. The satellites periodically emit radio signal of short pulses to GPS receivers. A GPS receiver receives the signal from at least three satellites to calculate distance and uses a triangulation technique to compute its two-dimension (latitude and longitude) position or at least four satellites to compute its three-dimension (latitude, longitude, and altitude) position. Once a location is computed, it can calculate an average speed and direction of traveling. Therefore, GPS is a key technology for giving device its

position [5]. In this research we have been used is GPS Module NEO-M8N with Shell for APM & Pixhawk.



Figure 4. Ublox NEO M8 GPS Module

3. Biometric FingerPrint

In the system, we have been used the fingerprint sensor, in order to open the driver's door with the fingerprint of a driver, not another person. Also the money box door will open according to the fingerprint of the trusted employe from a bank.

4. Fuel Detection

The main benefits of the fuel sensor is to sense the fuel level of the vehicle. When the level of the fuel is below the normal limit or at zero level, as a result the system will send an alert notification to the control center, in order to take the necessary precautions.

5. Speed Detection

By using speed detection sensor can sense the speed of the vehicle according some eqautions. When the vehicle exceeds the allowing speed limit the indication alert will send to the control center.

6. Tires Beet Detection

By using vibration sensor we can detect if their any beet in the vehicle tires, which is one of the main reasons for the sudden vehicle stop.

7. Smoking Detection

By using a smoke sensor, we can see if there is any possibility of a fire, that affects the transfer of money. If there any smoke smell a smoke sensor will send a warning message directly to the control room to take the necessary safety measures.

8. Warning Button

The important benefit of the warning button is when the vehicle is threatened with theft or any problem inside the vehicle, the driver presses this button to inform the control center, in order to tacke rhe nessasry procedures.

9. Global System For Mobile Communications (GSM)

GSM uses a process called circuit switching. This method of communication allows a path to be established between two devices. Once the two devices are connected, a constant stream of digital data is relayed. This allows the receiving end to hear the data being sent before the whole message or data was finished. The advantage to this is there's no wait time [6].



Figure 5. SIM900A

10. Wi-Fi

By using the Wi-Fi device we can send all vehicle sensing data over the internet to the server and control center.

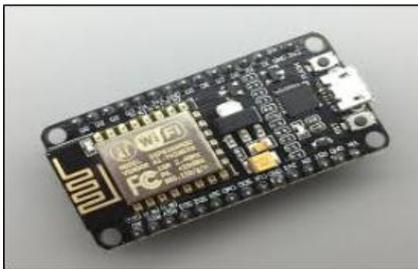
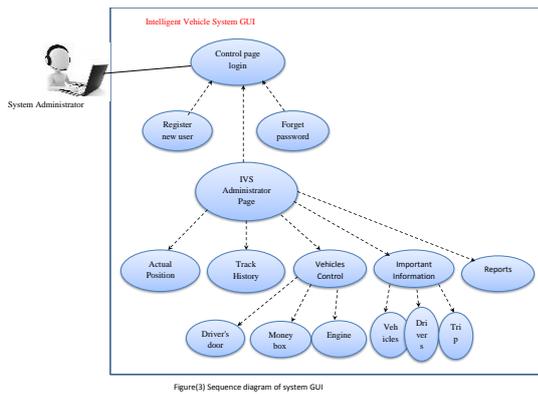


Figure 6. MCU Wi-Fi

B- System GUI and Database Part

The main function of the system administration page is monitoring and controlling the vehicles and money box through trips and give reports. The administration page is designed by using responsive bootstrap ASP.NET web application with C# language by using Microsoft Visual Studio 2015. The data base is designed by using SQL server manager 2012.



Figure(9) Sequence diagram of system GUI

Figure 7. Intelligent Vehicle GU

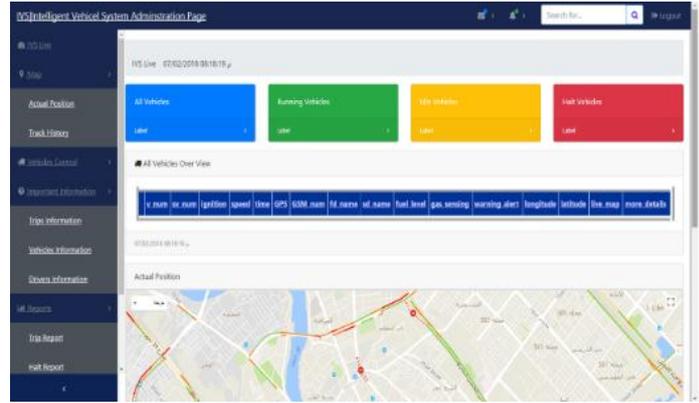


Figure 8. System Administration Page

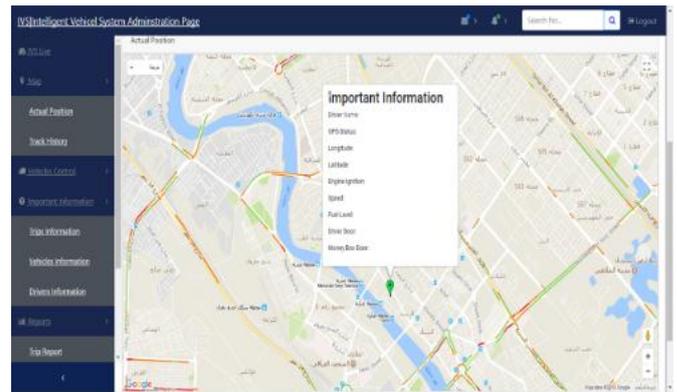


Figure 9. Google API Map with Driver's Information

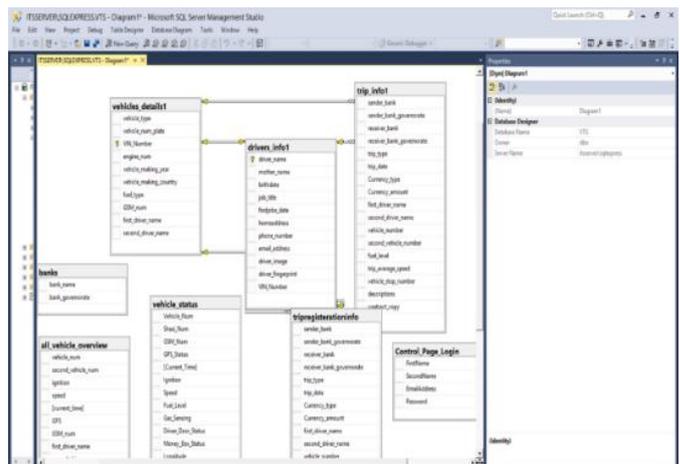


Figure 10. System Database

CONCLUSION

The intelligent transport system that is using in currency transfer between banks is an important system to achieve the preservation of cash money from thefts during the transfer process. As a result, this has led us to build a system that achieves the safe transfer of cash currency through the tracking, monitoring and controlling of vehicles designed for the purpose of currency transfer between banks. The GPS technology was

used to determine the trajectory of the vehicle and to ensure that the vehicle does not become out the specified trajectory. On another hand, the sensors were used to detect the condition of the vehicle such as speed sensor, fuel, etc. This system improves the availability and continuity of data by using two communication devices MCU Wi-Fi if there a connection service else the GSM SIM900A will be used by sending SMS to a receiver.

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