INVESTIGATION STUDY ABOUT THE INTELLIGENT ANTI-THEFT AND TRACKING SYSTEM FOR ARMoured VEHICLES

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Abstract—The development of information technology (IT) has brought about significant changes in transportation infrastructures, increasing the need for more intelligent and safety of mobility with in or outside the cities. In this paper, we will show the investigation study about the tracking and controlling of armoured vehicles navigations for currency transferring between banks in Iraq including the study of anti theft vehicle tracking and controlling systems, such as by using microcontroller, GPS, GSM and GPRS, additionally we will study the types of biometrics to get more secure system.

Keywords—Microcontroller; Global Position System(GPS); Global System for Mobile Communications(GSM); General Packet Radio Service (GPRS); IT; Armoured Vehicles; Currency Transfer between Banks in Iraq;

1. INTRODUCTION

An intelligent transportation system (ITS) is an advanced application which, without embodying intelligence as such, aims to provide innovative services relating to different modes of transport and traffic management and enable various users to be better informed and make safer, more coordinated, and 'smarter' use of transport networks. Although ITS may refer to all modes of transport, the directive of the European Union 2010/40/EU, made on the 7 July 2010, defined ITS as systems in which information and communication technologies are applied in the field of road transport, including infrastructure, vehicles and users, and in traffic management and mobility management, as well as for interfaces with other modes of transport [1]. ITS may improve the efficiency of transport in a number of situations, i.e. road transport, traffic management, mobility, etc.[2].
Many of the proposed ITS systems also involve surveillance of the roadways, which is a priority of homeland security [3]. Further ITS can play a role in the rapid mass evacuation of people in urban centers after large casualty events such as a result of a natural disaster or threat. Much of the infrastructure and planning involved with ITS parallels the need for homeland security systems. Intelligent transport systems vary in technologies applied, from basic management systems such as car navigation, traffic signal control systems, container management systems, variable message signs, automatic number plate recognition or speed cameras to monitor applications, such as security CCTV systems, and to more advanced applications that integrate live data and feedback from a number of other sources, such as parking guidance and information systems, weather information, bridge de-icing (US deciding) systems and the like. Additionally, predictive techniques are being developed to allow advanced modelling and comparison with historical baseline data. Some of these technologies are described in the following section [4].

II. WIRELESS COMMUNICATIONS

Various forms of wireless communications technologies have been proposed for Intelligent Transportation Systems. Radio modem communication on VHF and UHF Frequencies are widely used for short and long range communication within ITS. Short-range communications VHF of 350 m can be accomplished using IEEE 802.11 Protocols, specifically WAVE or the Dedicated Short Range Communications Standard being promoted by the Intelligent Transportation Society of America and The United States Department of Transportation. Theoretically, the range of these protocols can be extended using Mobile ad hoc networks or Mesh networking. Longer range communications UHF have been proposed using infrastructure networks such as WiMAX (IEEE 802.16), Global System for Mobile Communications (GSM) or 3G. Long-range communications using these methods are well established, but, unlike the short-range protocols, these methods require extensive and very expensive infrastructure deployment. There is lack of consensus as to what business model should support this infrastructure.

Figure 1: Intelligent Transportation Systems

Figure 2: The microwave spectrum.
III. WIRELESS SENSOR NETWORK

Sensing is a technique to gather information about physical objects or areas. Sensor (transducer): object performing a sensing task, converting one form of energy in the physical world into electrical energy.

Figure 3: Communications range of wireless communications.

Sensors capture phenomena in the physical world (process, system, plant). Signal conditioning prepares captured signals for further use (amplification, attenuation, filtering of unwanted frequencies, etc.). Analog-to-digital conversion (ADC) translates analog signal into digital signal. Digital signal is processed and output is often given (via digital-analog converter and signal conditioner) to an actuator (device able to control the physical world).

Figure 4: Sensing (Data Acquisition)

Figure 5: Wireless Sensor Network (WSN).
IV. CHALLENGES IN WSNS

4.1. Energy
Energy efficiency is affected by various aspects of sensor node/network design: Physical layer, Medium access control layer, Network layer, Operating system, Security, Middleware

4.2. Self-Management
- Self-organization is the ability to adapt configuration parameters based on system and environmental state.
- Self-optimization is the ability to monitor and optimize the use of the limited system resources.
- Self-protection is the ability to recognize and protect from intrusions and attacks.
- Self-healing is the ability to discover, identify, and react to network disruptions.

4.3. Wireless Networks
Wireless communication faces a variety of challenges: Attenuation (limits radio range), Decentralization, and Security.

V. WSNS PERFORMANCE METRICS

5.1. System lifetime:
- The duration of time until some node depletes all its energy.
- The duration of time until the QoS of applications cannot be guaranteed.
- The duration of time until the network has been disjoined.

5.2. Energy efficiency:
Energy efficiency means the number of packets that can be transmitted successfully using a unit of energy.

5.3. Reliability:
In WSNs: the event reliability is used as a measure to show how reliable the sensed event can be reported to the sink.

5.4. Coverage:
Full coverage by a sensor network means the entire space that can be monitored by the sensor nodes.

5.5. Connectivity:
For multi-hop WSNs, it is possible that the network becomes disjointed because some nodes become dysfunctional.

VI. CURRENCY TRANSFER IN IRAQ

For the first of all we will discuss the mechanism of currency transfer in Iraq, whether cash or relying on electronic payment and what is the difference between them. And then in particularly we will study the mechanism of physical currency transfer based on cash in transit armoured vehicles. Currency payment systems in Iraq. As is known, the official currency of the day for sale and purchase is the Iraqi dinar, as well as dealing with the US dollar, euro and gold bullion.

Payment methods are made in cash, using the credit card, master card or visa card. the most of the banks in Iraq deals with the cash currency or electronic payment, so here is the question what is the difference between cash payment and electronic payment. A payment is the trade of value from one party (such as a person or company) to another for goods, services or to fulfil a legal obligation. Payment can take a variety of forms. Barter, the exchange of one good or service for another, is a form of payment. The most common means of payment involve use of money, cheque, or debit, credit or bank transfers. Payments may also take complicated forms, such as stock issues or the transfer of anything of value or benefit to the parties. There are two types of payment methods: exchanging and provisioning. Exchanging involves the use of money, comprising banknotes and coins. Provisioning involves the transfer of money from one account to another, and involves a third party.
Credit card, debit card, cheque, money transfers, and recurring cash or ACH (Automated Clearing House) disbursements are all electronic payments methods. Electronic payments technologies include magnetic stripe cards, smartcards, contactless cards, and mobile payments.[5]

**VII. ARMORED VEHICLES**

Millions or more banks around the world need to transfer currency physically between banks, companies or government institutions. Therefore, the need for a mechanism of transport with the specifications of security and safety is an important and a basis for the success of the transfer, so the use of armoured vehicles was a successful and optimized solution. An armoured vehicles: are specially designed vehicles equipped to provide protection and safety for both the driver and the cargo loaded, where they are made of armoured resistance materials against bullets, and this type of vehicles consists of cabin of the driver and another cabin of a larger size dedicated to the load, such as storage of coins or bullion gold, where the door of the court is open and closed in isolation Driver compartment door. Examples of companies’ sites that provide armoured vehicles around the world: http://www.harrow-security.com, https://inkasarmored.com, http://www.armored-trucks.com/, http://www.armoredmotors.com/, https://www.internationalarmouredvehicles.com/, http://www.armoredcarssale.com, etc... 

![Armoured Vehicle](image)

**Figure 7: Armoured Vehicle**

**VIII. VEHICLE TRACKING AND ANTI-THEFT TRACKING SYSTEMS**

<table>
<thead>
<tr>
<th>Author(s) (Year)</th>
<th>Research Area Covered</th>
<th>Research Outcome</th>
</tr>
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<tbody>
<tr>
<td>S.S. Aher and K. R. D., 2012 [7].</td>
<td>Fuel Monitoring and Vehicle Tracking.</td>
<td>Optimized fleet utilization, operational enhancements, dynamically remote-managed fleets, avoid delaying traffic conditions by either, combining deliveries and reconfiguring routes or rescheduling timetables.</td>
</tr>
<tr>
<td>P.H. Dat et al., 2013 [8].</td>
<td>Development of Vehicle Tracking System.</td>
<td>Positioning accuracy, demonstrates the feasibility of near real-time tracking of vehicles, The reliability of the system can be improved and additional features can also be added.</td>
</tr>
<tr>
<td>S. Lee et al., 2014 [9].</td>
<td>Design and Implementation of Vehicle Tracking System Using GPS/GSM/GPRS Technology and Smartphone Application.</td>
<td>Effective performance to track a vehicle’s location anytime from anywhere, low-cost that is based on easily accessible off-the-shelf electronic modules.</td>
</tr>
<tr>
<td>Qin Xu*, Ningli Liang, 2017 [12].</td>
<td>Design of Intelligent Logistics System Based on GPS and Internet of Things.</td>
<td>Convenient maintenance, reliability and convenient operation.</td>
</tr>
<tr>
<td>Vinoth Kumar Sadagopan et al., 2011 [14].</td>
<td>Anti Theft Control System Design Using Embedded System.</td>
<td>Low cost and effective vehicle theft control system.</td>
</tr>
</tbody>
</table>
Emergency responders with crucial information, reducing the time between when an accident takes place and when it is detected can reduce mortality rates and conventional in-vehicle, effective in reducing the time gap before first responders are sent to the scene.

| Design and Implementation of a Fingerprint Based Lock System for Driver's door and Money Box door. Most of the major door lock security systems have several drawbacks which could be broken down to gain access to the desired places, and it creates a concern for a secure lifestyle and proper working environment. Additionally, terrorism and unauthorized access to places have become a major issue now-a-days, and there is a need for a secure system to prevent unauthorized access. This investigation study has analysed current lock systems that are used. It has been found that although. Below is a discussion on the pros and cons of the existing systems.

<table>
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<th>FIGURE 8: BIOMETRIC CHARACTERISTIC</th>
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| **9.1. Deadbolt System** | Security protocol followed in this system was “Single key for a single lock”. For a few days, it was satisfactory but at one time it was proved wrong by the fact that multiple keys can be easily made for a single lock.

**9.2. Password-Authentication**
This system stores the password of authenticated users for the purpose of validation which provides considerable security to the users. Power consumption is efficient and usage is user-friendly. However, unauthorized users can easily acquire passwords through different methods (hacking, guessing and so on).

**9.3. RFID reader authentication**
Radio Frequency Identification (RFID) is a fundamental and inexpensive technology that enables wireless data transmission [18]. With RFID, wireless automatic identification takes a very specific form: the object, location, or individual is marked with a unique identifier code contained with an RFID tag, which is in some way attached to or embedded in the target [18]. This system has some advantage like the data on a RFID card is readable only with special equipment, keeping the data recorded on the chip secure. RFID systems can be easily duplicated or cards can fall into the wrong hands.

**9.4. Face detector lock**
These systems have difficulty in recognizing a face from images captured from two drastically different views and under different illumination conditions. It is questionable whether the face itself, without any contextual information, is a sufficient basis for recognizing a person from a large number of identities with an extremely high level of confidence [19].

**9.5. Retinal scanner**
The retinal vasculature is rich in structure and is supposed to be a characteristic of each individual and each eye. The image acquisition requires a person to peep into an eyepiece and focus on a specific spot in the visual field so that a predetermined part of the retinal vasculature could be imaged [20]. This device is frequently used for security purpose. The false acceptance and rejection rates are lower in this device. But the problem of this device is, it is not user-friendly and the equipment cost is very high.

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**IX. BIOMETRICS**

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**Figure 8: Biometric Characteristic**

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<tr>
<th><strong>Physiological</strong></th>
<th><strong>Behavioral</strong></th>
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<tr>
<td>Fingerprint</td>
<td>Voice Pitch</td>
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<td>Face Recognition</td>
<td>Speaking Style</td>
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<td>IRIS Scan</td>
<td>Typing Rhythm</td>
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<td>Hand Geometry</td>
<td>Signature</td>
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<tr>
<td>DNA</td>
<td>Autoregulated</td>
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</table>
9.6. Iris scanner

Iris recognition is a method of biometric authentication, based on extraction features of the iris of an individual’s eyes. Each individual has a unique iris; the variation even exists between identical twins and between the left and right eye of the same person [21]. The advantage of using iris scanner is, it has very high accuracy and the accuracy of iris scanners can be affected by changes in lighting. As iris is a small target and a scanner cannot be performed properly for multiple people of different heights. The main shortcomings with iris recognition technology, is that the iris scanners are very expensive and requires a lot of memory to store data.

9.7. Voice recognition

Voice recognition or speaker recognition is the problem of identifying a speaker from a short utterance [22]. This biometric technology uses the acoustic features of speech that have been found to differ between individuals. These acoustic patterns reflect both anatomy (e.g., size and shape of the throat and mouth) and learned behavioural patterns (e.g., voice pitch, speaking style) [23].

X. CONCLUSION

In this investigation paper we made a study about Intelligent Anti-Theft and Tracking System for Armoured Vehicles including the tracking systems and bio-metric systems that will benefit in the future design of our system of making more intelligent and secure anti theft tracking and controlling of armoured vehicles that are using for currency transfer between banks in Iraq.

REFERENCES


