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Use of IOT for Goods Transportation

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Abstract: Special materials (weapons, dangerous goods, valuables, financial, etc.) lack of safety supervision in the transport and distribution process, blind spot in the transportation process, we propose a transport vehicle monitoring system based on Internet of Things technology designed to solve the above business needs. The system uses a transport fleet Command System by wireless ad hoc network, to provide effective protection for the transport fleet; comprehensive utilization of things sensing technology to master the comprehensive information of the transport vehicles and supplies for the safe transport of the materials escort; transport vehicle as a mobile warehouse, the use of RFID and bar code technology to build mobile warehouse management system, a comprehensive collection the entire warehouse business aspects of the operation data, to the meticulous management of the target has taken firm steps.

Keywords: Internet of Things; goods transport; wireless ad hoc network; use of IOT

1 Introduction

The transport of emergency supplies, valuables transportation, banking escort dangerous explosive goods transport, blind spot monitoring, often face during transport vehicles and supplies in a state of lack of supervision, the practical issues and business needs, we propose special materials transportation vehicle management Internet of Things system. The system uses the fleet from networking technology to build transport fleet command system to provide effective protection for the communication of the transport fleet; comprehensive sensing technology to master the use of the Internet of Things transport vehicles and supplies comprehensive information for the safe transport of the materials escort transport vehicles; as a mobile warehouse, RFID and barcode technology to build mobile warehouse management system, a comprehensive collection the entire warehouse business aspects of the operation data to take solid steps to fine management objectives.

2 System Solutions

The system consists of three subsystems: special materials transportation fleet Ad hoc communication and command subsystem, the integrated sensing system of special materials transportation vehicles, and mobile houses business management system.

Self-organizing communication and command subsystem is composed of various transport vehicles and chief vehicle through a wireless ad hoc communication network shared perception of each truck, the chief car communication and command.

Special materials transportation vehicles comprehensive sensing subsystem is fully aware single-vehicle truck driver, the vehicle itself and other information for automatic communication and command system to provide bicycles data source.

The mobile warehouse business management subsystem provides material management for per vehicle.

The relationships between the three subsystems are shown in Figure 1.

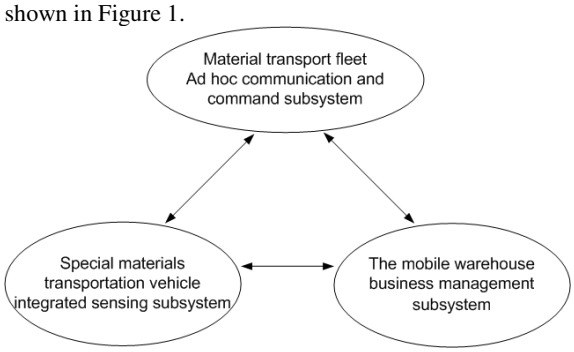

Fig.1 Three subsystems architecture of IOT for Special Materials Transportation Vehicles

Special materials transportation fleet Ad hoc communication and command subsystem

Vehicular ad hoc networks is a very special mobile ad hoc networks, there are also problems inherent in general wireless ad hoc network, such as the hidden point, exposed, channel acquisition problems, but also with its own unique characteristics. The VANET (Vehicular ad hoc networks) includes main features: (1) Since the node moving at high speed (speed of roughly between 5-42m/s), resulting in fast changes in the network topology structure, the path a short life, such as the average speed of l00km/h on the road, if the node coverage radius of 250m, the link 15s probability of only

57%. (2) The quality of the radio channel is unstable, affected by many factors, including the side of the road construction, road conditions, vehicle type, and vehicle relative speed. (3) By the engine, the node can provide a steady stream of power to support the vehicle carrying space can also ensure that the size of the antenna and the additional communication device, but also has a powerful computing power and storage capacity. (4) Mobile node with certain regularity, only along the lane single/two-way mobile one-dimensional. (5) The static shape of the road such that the vehicle movement is restricted, and the vehicle track generally predictable. (6) GPS node can provide precise positioning and accurate clock information to facilitate access to its own location information and clock synchronization. (7)The combination GPS and electronic map, path planning easier by the realization of the strategy, will make the car Ad Hoc Network.

When the vehicles special materials transport vehicles and escort vehicles fleet, the system resolves the fleet network between ad hoc information sharing and communication command.

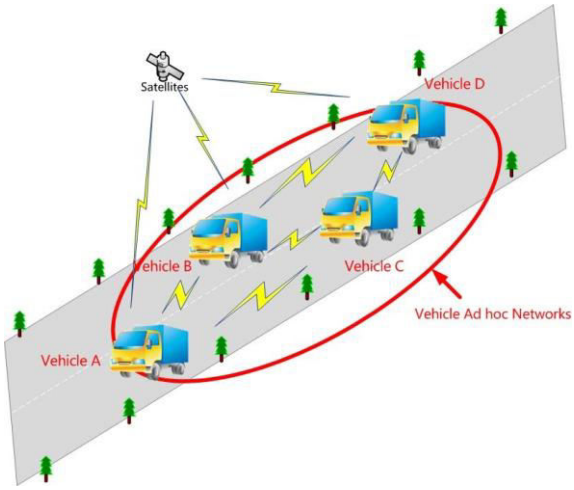

Fig.2 Fleet ad hoc network structure

Fleet builds up a mobile ad hoc network through broadband networking, shared perception of the driver, truck and supplies state elements. Fleet truck (in special materials transport operations, generally have escort vehicles, so the logic on top of the car is to master the operation of the entire fleet in real time from the network control center), when the event of an emergency, the fleet of trucks can quickly obtain alarm information, for the first time respond to emergency situations. Figure 2 shows the fleet ad hoc network structure.

The satellite communication system for vehicular ad hoc networks is to provide global positioning services. The communication between vehicles automatically interconnects through a multi-hop manner. Vehicle unit mainly includes positioning module, vehicle state parameters acquisition module, vehicle communication module, as well as input and output devices. The positioning module GPS/COMPASS receiver via satellite is to obtain the location information of the vehicle. Vehicle state parameters acquisition module by the various sensors installed in the vehicle real-time acquisition vehicle in various states, such as: speed, acceleration, direction. Vehicle communication module is responsible for the information exchange between the vehicle and the vehicle. IO devices for the vehicle networking platform, you can enter the information in the network, and access to information through an audio output device, video output device can also intuitive access to vehicle driving conditions vehicle ad hoc networks.

Special materials transportation vehicle integrated sensing subsystem

The system is based on the Internet of Things, including five elements human beings, vehicles, objects, events and environment. The core is a server, comprehensive utilization of RFID, GPS/Compass, video technology and to establish a comprehensive monitoring system for special transport vehicles, mainly to address special driver of the vehicle information and status in real-time acquisition, real-time access to the special position of the vehicle information, real-time status of the transport of goods access, real-time access to transport car environment. The system architecture is shown as Figure 3.

Integrated sensing system awareness information in accordance with the Internet of Things perception of the classification of the five elements including:

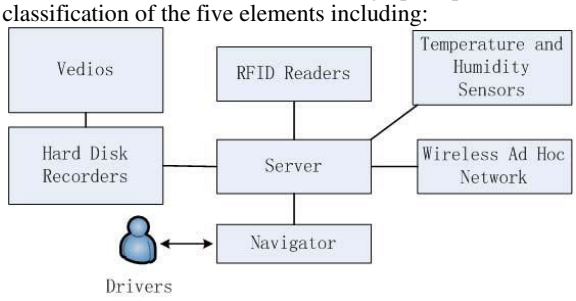

Fig.3 Special materials transportation vehicle integrated perceptual system architecture

(1) Staff sensing

Authentication of the identity of the driver improves driver management efforts. Verification driver authentication electronic ID card can be used or a combination of fingerprints and other biometric multi-factor.

System to the level of early warning and notification strategy of driver fatigue, driver driving fatigue characteristics of continuous driving over set time threshold, initiate an alarm to alert the driver to concentrate and early rest stop, and events reported to the command center.

(2) The vehicle sensing

Through the COMPASS/GPS navigation technology, real-time access to the location information of special vehicles, timely synchronized with the command center, and presented in the command center of the GIS system, so that decision-makers to grasp the special position of the vehicle, running track, running speed, empty/full load status information.

(3) Transport of goods sensing

Through RFID and bar code technology, the vehicle RFID reader polling interior material is present. Tight connection is between RFID and goods with the electronic seal. Any unpacking of goods will damage the RFID tags, in order to prevent theft. With 3G video surveillance, we can capture real-time vehicle supplies video data, and selectively uploaded to the command center. RFID and video technology combine to achieve in the transportation of materials and dual-aware data authentication, thus further ensuring the safety of the transport of goods.

(4) Environment sensing

Transport vehicles internal environmental information such as temperature, humidity over the goods is collected anytime. And the system sets the alarm threshold to play a supervisory role in order to ensure the safety and quality of the environment of the transport of goods and this event was reported to the command center.

(5) Alarm event sensing

Alarm events including driver fatigue alarm, cargo unauthorized motion alarm, environmental acquisition exceeds a threshold alarm. Alarm event will be immediately reported to the command center, and shared in the fleet. Command centers, fleet truck or driver activation of the plan can be customized strategy for timely disposal.

Mobile warehouse business management subsystem

Mobile warehouse business management subsystem is mainly to solve the business data acquisition in the transporting business, including:

(1)Mobile warehouse loading storage: acquisition of storage, handling people, the number of types of storage equipment, equipment quality, destination information;

(2)Mobile warehouse unloading storage: collection storage time, the person in charge of the escort, the transfer of people, number of types of equipment out of the library, the number of equipment and other information;

(3)Mobile warehouse distribution: collection of distributed object information, the distribution of time, the number of types of distribution equipment.

Mobile warehouse business management subsystem has two operating modes: between special materials for the warehouse and for special materials from the warehouse to a distribution site.

The model diagram of the subsystem is shown in Figure 4:

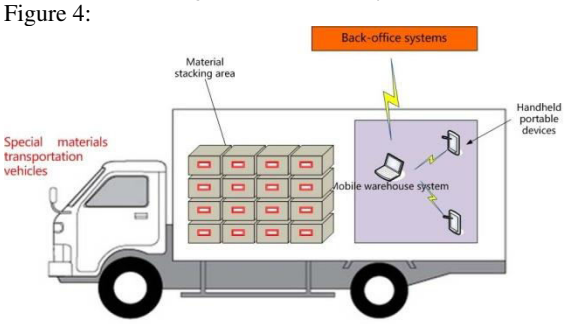

Fig.4 The model diagram of mobile warehouse

business management subsystem

Mobile warehouse management subsystem is the use of technologies such as RFID, barcode, and other wireless data communications, to connect goods and information system. Mobile warehouse management system hierarchy diagram from the bottom to the high divided into the five-story structure.

In the layered architecture, the application layers is mainly responsible for the storage information of the storehouse, providing data storage and user interface. With the use access control, only authorized operator can access in the system which coupling of various functional modules, integrated and convenient, easy to expand.

The middleware layer is divided into two sub-layers: The logic middleware layer for applications, services and interfaces. The heterogeneous device middleware is for sensing equipment, safety equipment or other devices of different structures.

The network layer connects both wired and wireless networks, making handset and mobile warehouse system between goods to establish a connection, and mobile warehouse system able to transmit their own data to back-office systems at a higher level.

The sensing layer using portable RFID devices to identify RFID tags and barcode collection items obtain barcode. The handset can support the RFID tag reading and the barcode scanning.

The object layer is affixed with RFID tags (bar codes) materials, and different operators different permissions management.

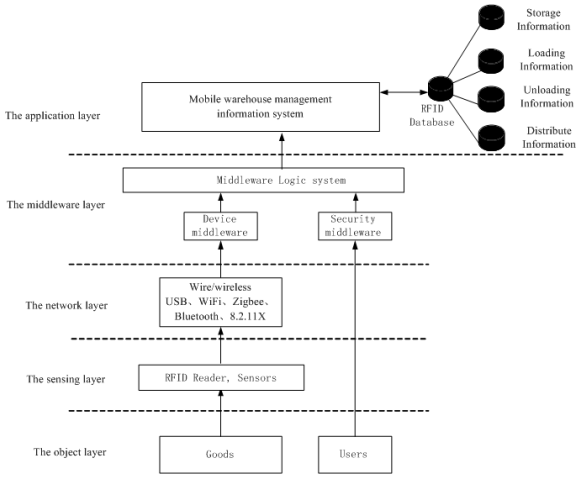

Fig.5 Mobile warehouse business system layered graph

3 Internet of Vehicles

Through the connections of Vehicle electronic sensors, mobile communication technology, navigation systems, smart terminal equipment and the information network platform, all of the elements such as cars, people, material, road, location intelligent monitoring, scheduling, and network management system will be a whole. Specific studies include electronic license plate, electronic vehicle ID card, driver's license, electronic signs, vehicle second

generation COMPASS navigation system, smart checkpoints system, traffic congestion warning systems. The specific objectives are to raise the overall urban traffic management and service levels; effectively improve road traffic safety and travel reliability; significantly promote the effective convergence of multi-modal transport; significantly improve the ability of technological innovation; promote the formation of intelligent transportation industry.

4 Summary

Special materials transportation vehicles of Things can be used for special materials transport management to make up of the lack of supervision in the process of transporting through the GPS positioning + GIS map. The vehicle transport industry is of great significance, resulting in huge economic and social influence.

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