Design of Traffic Emergency Response System Based on Internet of Things and Data Mining Emergencies

1MS.S.Priyadharshini, 2 Mrs. K. Kaythiri Devi
1Assistant Professor, Department of Electronics and Communication Engineering, Tamilnadu College of Engineering Karumathampatti, Coimbatore, priyamaha891@gmail.com
2Assistant Professor, Department of Electronics and Communication Engineering, KPRIET Coimbatore, kayathiridevi.k@kpriet.ac.in

Abstract- Urban emergencies are hard to avoid. Traffic emergency response after an incident plays an important role in reducing losses and is a key link in urban emergency management. The introduction of Internet of Things and data mining technology to establish a traffic emergency response system under urban emergencies can significantly improve the level of urban emergency response and realize efficient intensive management. The system mainly includes subsystems, such as personnel evacuation data collection system, vehicle operation data collection system, rescue material distribution data collection system, personnel settlement place data collection system, traffic bayonet intelligent identification system, etc. It also devises the working programs for command management, personnel evacuation and disaster disposal in case of emergency, and improves the urban emergency support management system. With the support of Internet of Things and the data mining technology, the traffic emergency response system can timely and accurately control the flowing information of personnel and vehicles, quickly and conveniently resettle personnel and vehicles, effectively carry out follow-up rescue work, effectively improve rescue efficiency and improve the level of urban management.

Keywords: Internet of Things, Data Mining, Vehicles

I. INTRODUCTION

With the continuous improvement of urbanization level, the problem of loss of personnel and property caused by natural disasters, safety accidents, terrorist attacks and other unexpected incidents has become increasingly prominent. In the process of urbanization, the urban population and the number of motor vehicles have greatly increased, which puts forward new requirements for urban managers. But the growth rate of vehicles is much faster than that of new roads. If an emergency occurs, the road network is extremely broken, resulting in problems, such as personnel being unable to evacuate quickly, rescue forces being unable to come in time, rescue materials being unable to arrive at the accident site, and disorders in resettlement sites, thus causing greater losses. The key component of the emergency traffic response plan is the selection of flow paths for personnel, vehicles and materials. On the premise of safety and short time, transferring as many people and vehicles in the affected site as possible is one of the intuitive standards to measure the feasibility of the plan. With the aid of emergency evacuation paths, those who are in dangerous or affected sites can be evacuated to safe sites or resettlement places as soon as possible, thus minimizing the losses caused by emergencies. At the same time, rescue staff need to rush to the accident site for rescue, and rescue materials need to be transported to the designated place in time. Therefore, under the emergency traffic condition, how to use the existing traffic facilities and other emergency rescue and evacuation resources to carry out scientific and effective traffic organization and carry out rapid and effective evacuation and rescue work is of great significance to protect the safety of people’s lives and property.

The underdevelopment of information collection technology and the inconvenience of information transmission and distribution will all lead that organizers of emergency response are unable to take correct counter measures; travelers are unable to obtain timely, correct and useful information to select the optimal path for evacuation; rescue forces are unable to deliver relief supplies to the scene in time.

The increasingly severe situation of urban emergencies puts forward higher requirements for modern urban traffic emergency response system. It is of great significance to study the introduction of Internet of Things technology into the design of traffic emergency response system under urban emergencies to improve the level of emergency response.
II. PROPOSED WORK

First of all, the evacuation of trapped personnel and vehicles in emergencies is very important. On the one hand, it is to better rescue the injured, at the same time, it can also prevent more people from being injured, minimize the adverse impact of the incident, and create good external conditions for the successful disposal of the incident. By distributing radio frequency identification bracelet to evacuees and configuring radio frequency identification tags on vehicles, the flow information of personnel and vehicles can be accurately and quickly collected.

Secondly, besides collecting the information of the evacuated vehicles, it is also necessary to collect the information of the vehicles participating in the rescue. This part of information is sent to the command center of the rescue system after big data processing to provide help for the rescue organizers to allocate vehicles.

This system plays a key role in improving the urban emergency security management system by using advanced technologies. The traffic emergency response system adopts real-time and dynamic collection and analysis of the flow data of personnel, vehicles and materials under emergencies by using the Internet of Things technology and data mining technology.

III. METHODOLOGY


Configuring frequency identification tags on vehicles, the flow information of personnel and vehicles can be accurately and quickly collected.

Emergency Assistant Decision Support System.

After an emergency occurs, emergency response must be carried out as soon as possible. Emergency rescue decision-making involves a wide range of aspects, many influencing factors, and complex field conditions. The establishment of the decision tree includes two processes: the growth of the decision tree and the pruning of the decision tree. Different decision tree algorithms have different ways to deal with the problem. The differences between the commonly used C5.0, CART and CHAID algorithms

Table 1: Main differences of decision tree algorithms.

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IV. ANALYSIS OF METHODOLOGY

A. Collection and Analysis of Evacuation Data

After an emergency occurs, the flow of personnel should be grasped in a timely manner, mainly including the number of people evacuated, evacuation methods, evacuation routes and other information. The information collected by the sense layer of the Internet of Things is submitted to the back-end cloud processing system for analysis and processing, and the processing results are supplied to the organizers of emergency disposal.

B. Data Collection and Analysis of Vehicle Operation

Based on the Internet of Things technologies, such as RFID technology, sensor technology, ubiquitous communication and network, the vehicle operation data is connected to the Internet to realize the interconnection and intercommunication among various elements of the traffic emergency response.
system, such as personnel, vehicles, materials. Vehicle operation data collection mainly includes data collection of evacuated vehicles and data collection of vehicles participating in rescue.

![Fig2: Data collection and Analysis process for evacuated vehicles.](https://ijrtte.com/)

**Processing of Vehicle data information**

Under the condition of emergency, traffic congestions can easily occur. Through comparing the common path planning algorithms such as A* algorithm, ant colony algorithm, Dijkstra algorithm and Floyd algorithm, it is found that these algorithms can hardly meet the requirements of traffic emergency response system under emergencies.

**C. Data Collection and Analysis of Personnel Settlement and Rescue material distribution**

Data collection of Personnel Settlement sites. The sorted information is then sent to the organizer of the emergency response and transmitted to the mobile equipment of the evacuated personnel.

**D. Collection and Analysis of Emergency data in Traffic Bayonet**

The traffic bayonet system adopts advanced photoelectric technology, image processing technology and pattern recognition technology to take clear images of every passing car and automatically recognize the license plate and driver characteristics. The collected vehicle information data are stored in the server data base in real time. The emergency data information of the traffic bayonet is uploaded to the “traffic bayonet information processing system” for analysis, then transmitted to the organizer of emergency disposal and sent to the mobile police system of the police personnel on site.

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**V. ANALYSIS OF RESULT**

![Fig 3: Hierarchical structure of material allocation and distribution system based on internet of things technology](https://ijrtte.com/)

After the occurrence of an emergency, the organizer of the emergency response shall dispatch relevant personnel to the site at the first time, cooperate with each other and jointly implement the emergency response in accordance with the pre-plan and disposal procedures to fully control the incident situation and prevent the incident from expanding.

**A. On-Site Rescue**

Before the medical staff arrive at the site, the emergency rescue force who arrive in advance shall, in accordance with the first aid procedures, carry out on-site classification and examination of the injured in the incident, and carry out onsite first aid for the critically ill; Organizers equip evacuated personnel and vehicles with Internet of Things signs and guide them to evacuate according to the emergency response plan; After the traffic police rush to the site, they should immediately take effective measures to divert vehicles, divert traffic, protect the site trace evidence and fix the relevant evidence; The fire department is responsible for dismantling vehicles and rescuing people trapped in the vehicles due to overturning and deformation of the vehicles; Other police personnel are responsible for the maintenance of public order in the site; In case of special incidents, the organizer of emergency response shall be responsible for mobilizing professionals and tools for rescue.

**B. Data collection, Uploading And Analysis**

Using various Internet of Things sensing technologies, relevant data are collected and uploaded to the emergency response system. The organizer of emergency disposal shall, according to the data obtained, quickly and comprehensively grasp the specific situation of the incident, define the necessary measures for personnel safety protection, determine the scope, methods and procedures for evacuation of personnel and vehicles under
emergencies, and organize their implementation. The organizer shall also coordinate medical, police and rescue personnel to quickly arrive at the site for rescue to prevent the incident from spreading or causing secondary injuries.

C. Opening of Emergency Resettlement Sites and Distribution of Rescue Materials

At the same time of on-site rescue, it is decided whether to use the resettlement site according to the severity of the incident. When the organizer of emergency response decides to use these places, it should immediately do a good job in rescue work, such as personnel receiving and resettlement. In particular, it is necessary to do a good job in the digital management of personnel and materials, and submit the specific resettlement situation to organizers of emergency disposal.

D. Incident Recovery

After an emergency occurs, the organizer of the emergency response shall, according to the needs of the response, issue prevention and response tips to the public through radio, television, newspapers, websites, outdoor display screens, short messages, etc., and mobilize all social forces to assist in the rescue and response work. After the rescue on site is completed, the site shall be cleaned up in time to repair the damaged traffic facilities and restore normal traffic order. After the emergency respond is completed and the elimination of hazardous factors is confirmed, the graded response initiating unit shall decide and announce the end of the emergency disposal. Relevant departments carry out post-disaster recovery and reconstruction, such as allocating rescue funds and materials, investigating the causes of the incident, and resuming production and living plans.

VI. CONCLUSION AND FUTURE SCOPE

Internet of Things technology has many advantages, such as high efficiency, large capacity, accuracy and efficiency, saving manpower, etc.

It has been widely used in various fields. The author comprehensively analyzed the demand for traffic emergency response in emergencies, discussed the data collection methods under specific circumstances, introduced the Internet of Things technology in a targeted way, constructed a traffic emergency response system under urban emergencies based on the Internet of Things technology, including sub systems, such as personnel evacuation data collection system, vehicle operation data collection system, rescue material allocation and distribution data collection system, resettlement site data collection system, traffic bayonet intelligent identification system, etc. The system design scheme has good data coordination ability and emergency response capability, and can effectively solve the problem that the rescue organization in the traditional rescue system cannot obtain the accurate information of the accident scene in time. The implementation of this program will greatly improve the traffic emergency response speed under emergencies, thus substantially improving rescue efficiency and rescue quality using Internet of Things data collection technology to comprehensively obtain on-site emergency information and organizing rescue work is the first application at the level of urban emergency management, which can provide some reference for the intelligent management of modern large cities. In addition, the method can also be applied to other types of disaster prevention and avoidance management function design in order to establish a more intelligent and safer urban disaster prevention and avoidance management system.

REFERENCES


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