

Web-based and PDA-based chemical hazard query system for chemical incidents

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Abstract

The aim of this study is to provide a quick query system for hazardous material of fixed facilities during a Hazmat incident. The hazardous materials of fixed facilities in Taichung city were investigated. The characteristics, methods handling the hazardous materials were also collected from papers review. A query system using the combination of the characteristics and where the hazardous material was spilled out was built to decrease the numbers of possible hazardous materials. This database system was built up in either PDA-based or web-based system. The system has been tested during a disaster rehearsal. Seventy-six percents of the user agreed that it is useful for enhancing the identification of hazardous materials. To make the system more efficient, integrations of the database about hazardous materials in various government authorities must ensue.

Keyword: Hazmat; Database system; GIS

1. Introduction

Chemical disasters have the characteristics of being fast- extended as well as being widespread. Chances are that accidents happen and cause disasters if the emergency personnel are short of sufficient protection facilities and enough rescue knowledge. As many papers pointed out that the largest proportion of hazmat incidents occurred at fixed

facilities.¹⁻¹⁰ Once hazmat incidents occurred, the hazardous material could be identified by using the database about which hazardous material that the fixed facilities dealing with. This study is aimed to build up query tool via PDA and web pages in order to speed up the process of recognizing chemical hazard materials and thus to reduce the mortality and morbidity of hazmat incidents.

2. Method

The data about the relationship between hazmat and fixed facilities were collected from environmental protection bureau and fire agency and purged in order to build up the database about the hazardous materials at fixed facilities in Taichung city. A hazmat knowledge database containing chemical characteristics and their response methods were established by papers review. Both PDA-based and web-based chemical toxics database management system were constructed. A geographic information system (GIS) about the fixed facilities that dealing with hazmat was built to enhance quick search of the facilities. A questionnaire was designed for evaluating the accessibility of the system.

3. Results

Totally, the database contained 65 hazmat related fixed facilities. Response methods and characteristics of 134 hazardous materials were included in the knowledge database. A query system work in the WIN-CE operating system was developed using

eMbedded visual basic. The database was constructed with Pocket access software. The web-based query system was built on Windows 2000 Server operating system. The MapGuide server 5.0 software was used to serve the GIS interface. HTML, ASP and JavaScript were used to develop the system. A MapView object was embedded for showing the map on the homepage at client site. A combination of characteristics of hazardous material and location of the fixed facilities was used to specify the hazardous material. The flowchart of query system was shown in figure 1. The figure 2 to figure 5 demonstrates how this system works while hezmat incident occurred. By using the known facility and the characteristics of the hazmat such as smell or physcial status, the caused hazmat could be identified (Figure 2,3,4). Thus, the method to deal with the hazmat could be accessed.

After the system has built up, the PDA-based and Web-based were demonstrated in a regional disaster rehearsal. Thirty users have filled out the questionnaire. Totally, 76% of users considered that the system could enhance the identification of hazardous materials.

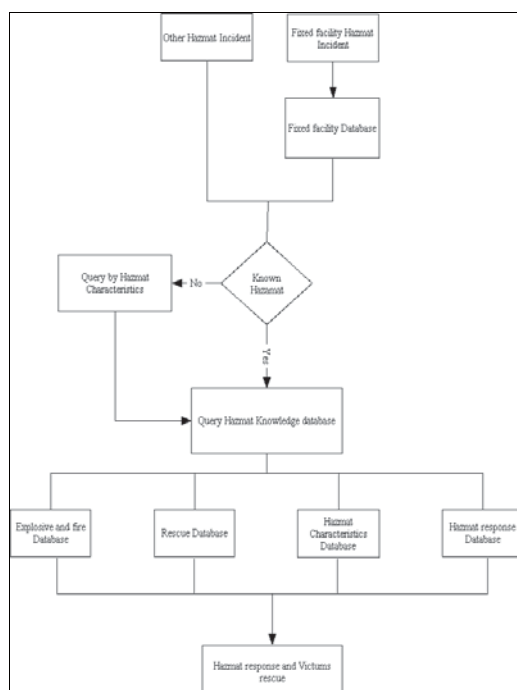


Figure 1 Flow chart of the Hazmat query system.

Figure 2: Demonstration of query with factory's position

Figure 3. Query with the characteristics of the Hazmat.

Figure 4. Query with the known hazmat.

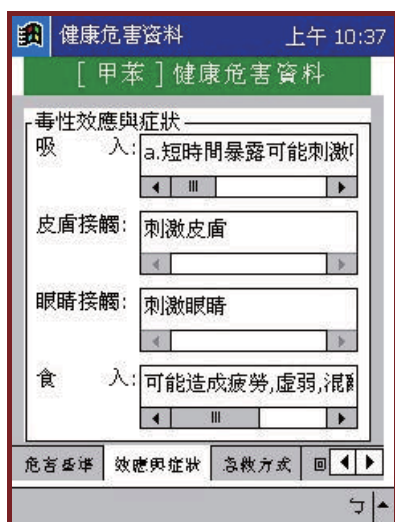


Figure 5. The results of query with the term of Benzene.

4. Discussion

PDA has the characteristics of light-weight and portability. However, its memory capacity is limited. Due to the input method, it is not suitable for large quantity of data input. In our system, the query system was designed with no data input but choosing the preloaded data. It is suitable for the field rescue and first line data search.

As the Geographic information system provides visualized effect, the user could localize the fixed facility quickly by identifying the map on the screen. However, it needs lots of memory and larger screen. In our system, GIS was not implemented in the PDA but in the web-based system. Using the web-based query system, users could identify the fixed facility and thus find the possible Hazmat. In the future version, with more memory and better screen performance, we may consider to build up a GIS plus GPS which can locate the fixed facilities without choosing.^{18,19}

There were many marketed software about Hazmat and their handling procedures, either PC-based or PDA-based. However, they could be searched only by using the known Hazmat name.¹¹⁻¹⁷ In our system, we use the characteristics of the hazmat and the location of the fixed facilities to narrow the spectrum

of possible hazmat. Most users considered it help to enhance identification of hazardous materials. However, hazardous materials could be classified as six categories, i.e. irritant gases, cholinergics, corrosives, asphyxiants, hydrocarbons & halogenated hydrocarbons and others.²⁰ More effort should be aimed to classify the hazmat materials.

Currently, the data about which hazmat the fixed facilities dealing with were localized at various government authorities. The data was stored with the form of computerized database. However, they are neither organized together nor easily accessible. In the future, we should aim to design a real-time system which could join all the databases together and thus provide real-time changes about the relationship of the hazmat and the fixed facilities.

5. Reference

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