SPATIAL APPLICATION OF DISASTER INVESTIGATION AND DECISION SUPPORT WITH MOBILE DEVICE

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ABSTRACT: In recent years, Taiwan had suffered serious disasters, like typhoons earthquakes, and landslides, which resulted in serious damages and casualties. Therefore, it is important for people to handle and control the situations immediately and make correct decisions in response to the hazards. The system described in this paper includes a mobile device equipped with GPS, and provides a platform to display disaster information and GIS map overlay (e.g., prone-debris-flow layer and evacuation route map) for decision making. The system also performs calculation and analysis using the web service and can instantly synchronizes the results with the Emergency Response Center. In summary, the system and its applications can obtain real-time information and successfully assist the decision makers for disaster response.

1. PURPOSE

The World Bank in 2005, according to national population density, and the people exposed to droughts, floods, typhoons (hurricanes), earthquakes, volcanic eruptions, land slide and other various types of natural disasters risk, made high-risk areas report. The latest reports indicate, there are more than 90% population has suffered the threat of typhoons and earthquakes in Taiwan, are attributed in high-risk disasters areas. Therefore, it is main goal to keep the safety of hillside, prevent debris disaster occurs efficiently, create high-quality and safe and eco-catchment environment, to achieve conservation of soil and water resources. In order to effectively prevent and reduce the key areas of disaster prevention, and building the business of supporting mechanisms of disaster prevention, so that, collect the information of main disaster areas and investigation work. To build disaster prevention information management function and mobile platform, and assist related business work executed well. In order to improve efficiency of emergent adaption and control disaster condition immediately, to build disaster information and transfer it in time with a mobile device (PDA Phone). It can integrate real-time disaster information to provide people of Response-Center to use.

2. SOFTWARE AND HARDWARE STRUCTURE

2.1 Device

This plan work out based on Windows Mobile operation system, it develop application with .Net framework, and its database adopt SQLCE. About server database connection, it links through TCP/IP protocol and exchange data with web service structure from Spatial Information System of Soil and Water Conservation Branch. Shortly to say, the plan is a PAD platform of MIS and GIS system.

2.2 Graphical User Interface, GUI

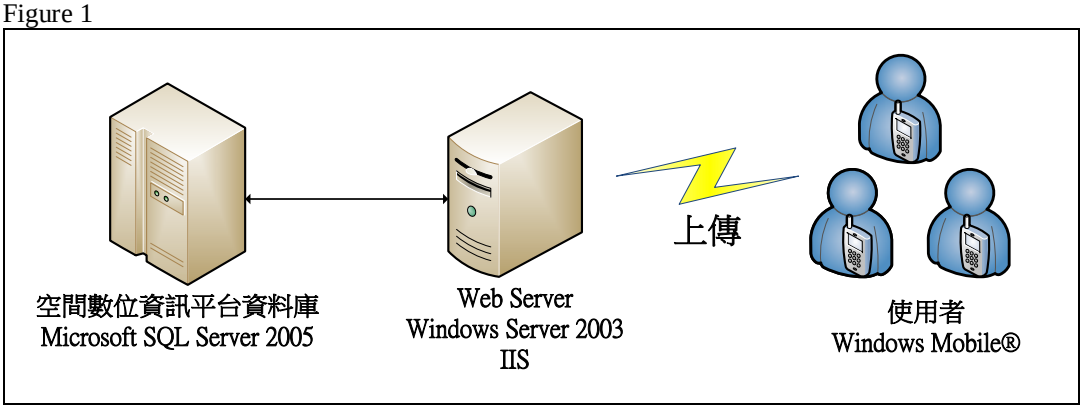
For most users, it can improve the convenience to use GUI interface to access the database. Through the GUI interface, users can click the mouse buttons, menus, etc., to reduce the keyboard input commands or text, complete information or visit.

2.3 Software and hardware environment

On the Internet as a server-side of the host, the client is responsible for implementing all the proposed data access requirements (request), and the implementation of the results returned to the client computer, so the server-side host hardware's and software's equipment has full impact on the effectiveness of the system software and overall system

operation. The plan adopt Microsoft Windows Server operating system server, using its Internet Information Services (IIS) of these functions, and with the Internet GIS server software. All made by the client requirements (request), through the space of digital information platform database (SQL Server2005) link, the results of data exchange through Web Service interfaces for client access of data and feedback. The figure 1 is structure of software and hardware.

Figure 1



3. THE DEVELOP COMPONENT OF PDA

3.1 The map layer component

It controls to load spatial data, include file name, layer name, visible attributes, layer priority, color etc. It control all the accessing action through setup file of layer.

3.2 Map control component

It is a map control component center, provide an interface to be called, it can call map layer component and draw component.

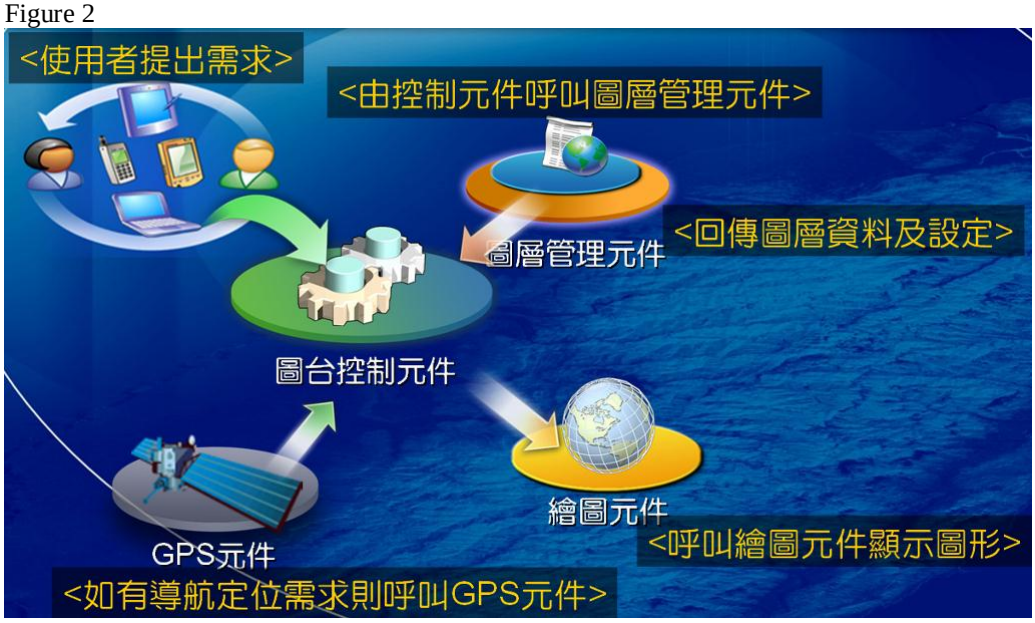
3.3 Drawing component

It use Windows .NET Compact Framework to develop drawing component, draw image on screen with display graphic chip.

3.4 GPS component

It is belong to autonomy component, turn on/off by users, it will analyze GPS signal and get current locations and send to Map control component. Figure 2 is relation picture about map develop component.

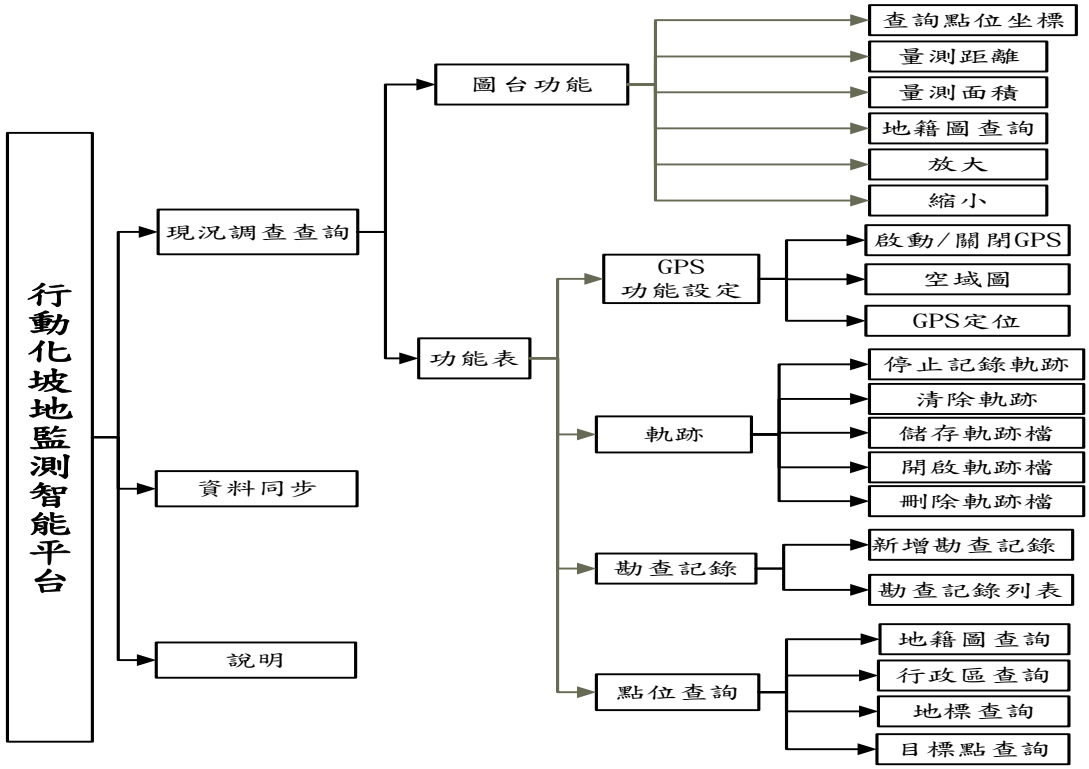
Figure 2



4. SYSTEM FUNCTIONS

The plan of system environment is structured on smart mobile device, it will send disaster data from disaster areas to server platform, and provide decision maker to realize all information. Figure 3 is a function structure of smart mobile device platform.

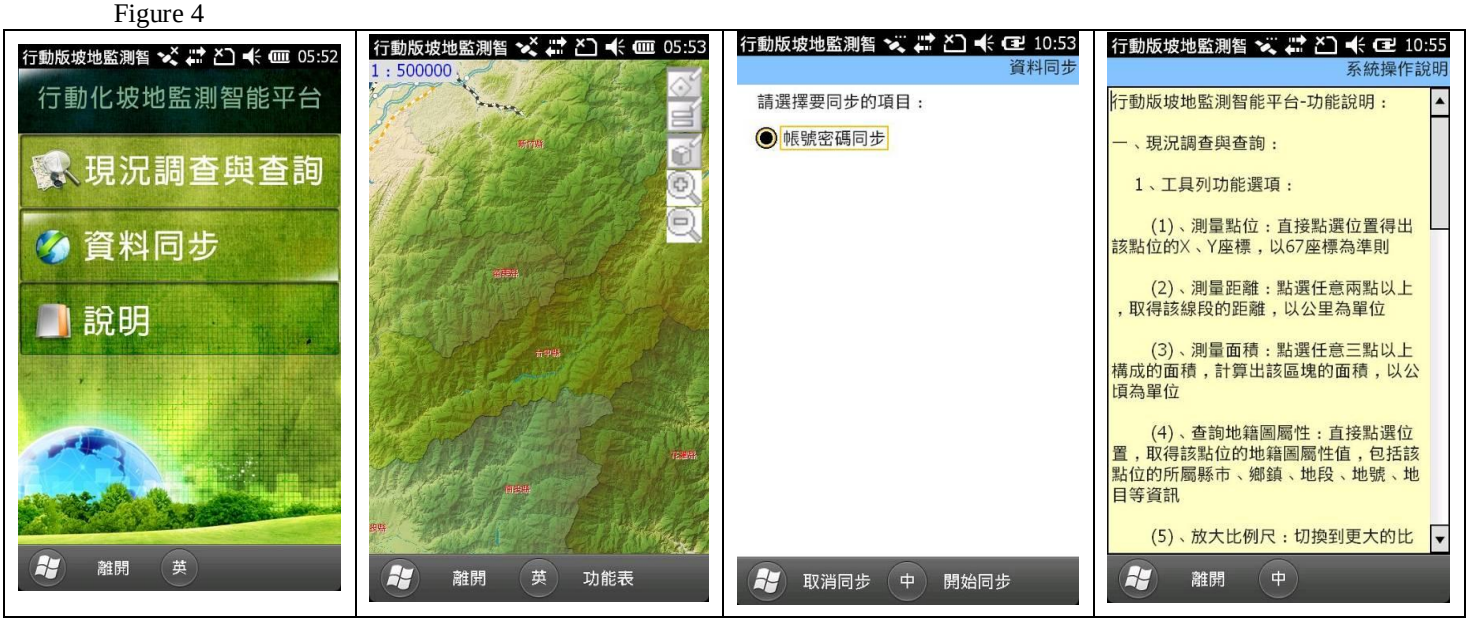
Figure 3



4.1 System index

The system include three functions, current situation investigation is main function. Synchronization is sync data between mobile device and server. Figure 4 are pictures of index pages.

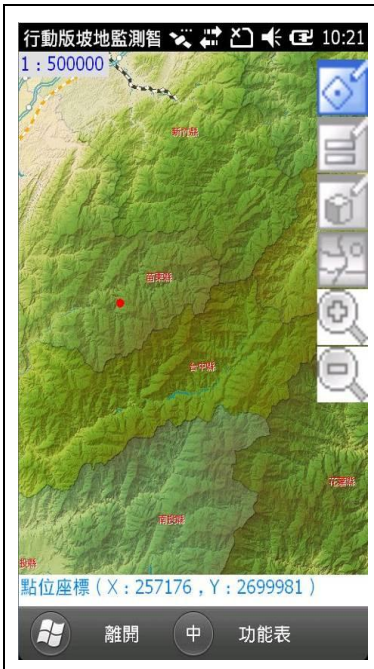
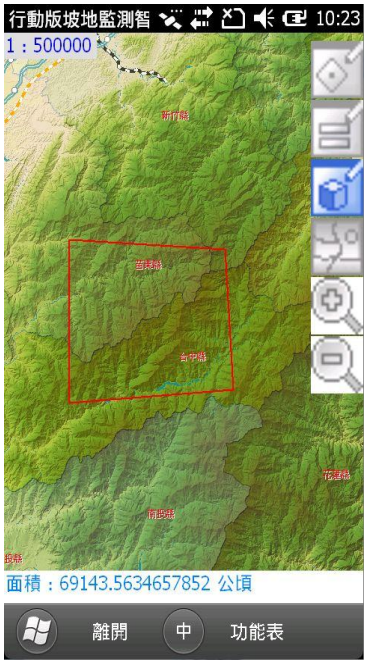
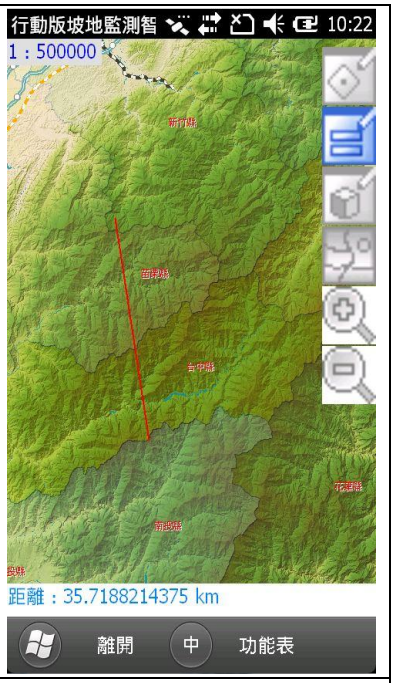
Figure 4



Index	Map platform	Synchronization	Description

4.2 Map functions

Figure 5

			
Measuring point position	Inquiry cadaster data	Area of measurement	Distance of measurement

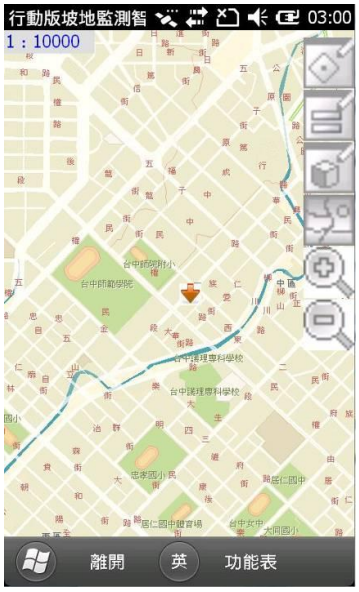
4.3 Search functions

Figure 6

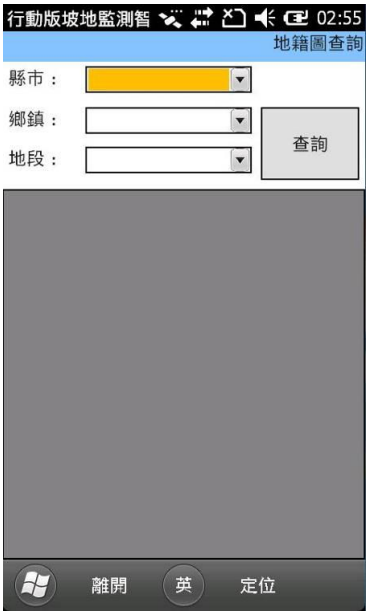
Location searching	Select region and category	Searching result	Map location result

Figure 7

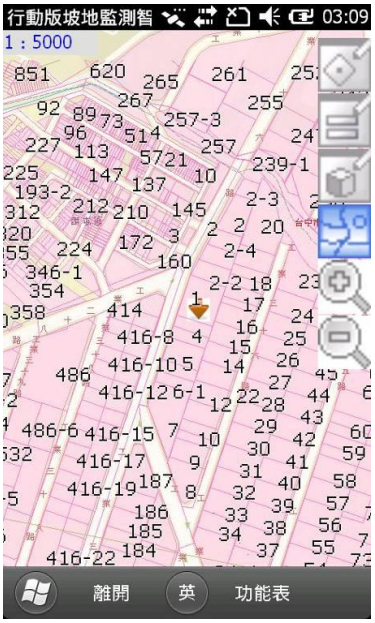
Region Search



Searching result



Cadaster search



Search result

Figure 8

Input coordinates information

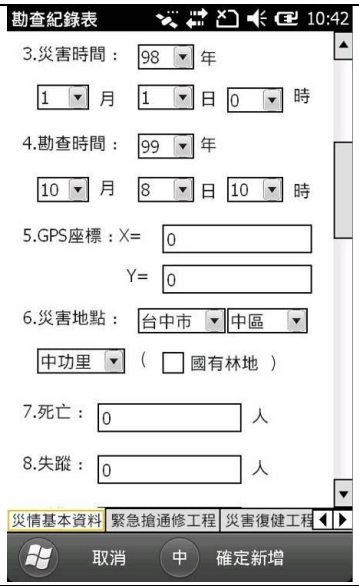
Searching result

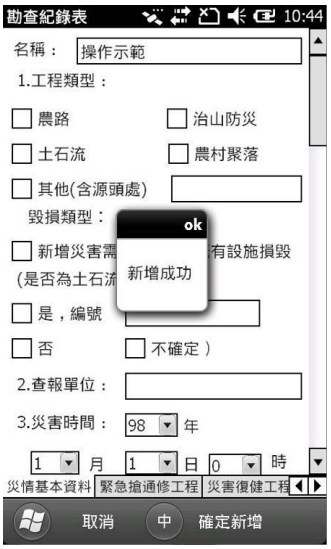
Tracking list

Tracking file

4.4 Investigation

Figure 9





Add new investigation doc	Write down information	Add new done	Investigation list

4.5 Synchronization

It can upload data to database on server through three ways, first is use 3.5G wire-less that use a SIM-card through 3.5G signal, second is use WIFI network to upload data, last is link pc with USB line.

Figure 10

5. CONCLUSION

Building smart mobile device can assist Soil and Water Conservation Branch to investigate real-time disaster information, and through analyze data and send information immediately, it will not only provide decision maker to make decisions and also strong its functions of disaster emergency response system.