

GIS Application Management for Disabled People

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Abstract. This research aimed to develop and design Geographical Information Systems (GIS) for facilitating disabled people by presenting some useful disabled information on the Google Map. The map could provide information about disabled types of people such as blind, deaf and physical movement. This research employed the Multiview 2 theory and method to plan and find out the problems in real world situation. This research used many designing data structure methods such as Data Flow Diagram, and ER-Diagram. The research focused into two parts: server site and client site which included the interface for Web-based application. The clear information of disabled people on the map was useful for facilitating disabled people to find some useful information. In addition, it provided specialized data for company and government officers for managing and planning local facilities for disabled people in the cities. The disabled could access the system through the Internet access at any time by using mobile or portable devices.

1. Introduction

Disabled people with limitations in daily activities or social involvements due to impaired vision, hearing, movement, difficulty to communicate with mental damage, emotional, intellectual and behavioral learning impairments or other aspects, needs to be assisted in one side so that they can practice or participate in daily society [1]. Current technologies play an important role in various uses, every day. Whether if it's a computer technology, smart phone technology both is gaining popularity.

There are many applications for disabled people those are prevalent today such as the development of a new travel aid for route planning and navigation. The application provided the users with general information, orientation and navigation assistance [2]. For effective use, most of the applications run on smartphones which employ Android operating system [3]. For the efficient use, disabled people data is stored on a regulated use protected by the government. However, for effective use, we are not only concerned about speed of retrieving data but also the security concerned when communicating through networks. The advantage of the networks is people in different locations. They could communicate with each other. Also, exchanging information with each other is very crucial. These systems have to work fast, which made the lives of people more convenient and the storage should be easy, fast and secure.

The labor of Geographic Information System: GIS, is related to the storage and display of spatial data in a form of computer system [4]. Data and information collected are represented in the form that is related to the spatial data. The data was stored in the form of relational database tables that are related to spatial data geographically linked, which forms a relationship with the data and areas that can be used to display geographical information.



This research is made up in order to collect the data of the disabled people which are found on the Android operating system and are managed by using a web-based system through a website. The objective of this research is to collect information for current status of disabled people, a specific area that can show type of disabled people and the number of disabled people. Today, there are currently unanswered questions on either how many disabled people in any area or what is the current amount of specific people with specific disabilities. This database is used to store information in a systematic order including, a navigation system of the network. This enables data collection to be faster and more thorough. Another alternative would be to help facilitate the retention of people with disabilities. Another option for people who do not have smart phones, the data can be saved through a personal computer with Internet Access.

The web-based site is the same system also that can show the location coordinates and captured data of disabled people to be seen on the Google map. The system can be linked to Google API to display both applications that are on Android or on the web site.

2. Related Works

There are many related research focusing on the current technology for locating or identifying with the GPS, which has been developing continuously. For example, currently, the technology has the potential to specify a location on the earth's surface, or forecast the weather anywhere.

Spatial data in the form of an object or feature on any ground surface and must be rated directly to identify the exact address and can calculate relationships between locations in different coordinate systems, commonly used in the city [5]. Thailand has two systems, which includes geographic coordinates and UTM (Universal Transverse Mercator).

It is likely that the GPS technology will play a key role in the future. This is why there has been an effort to adopt the GPS technology. Current GSM phone has an extensive distribution of network throughout the country [6]. Users have easy access at any location, with any type of multiple services and applications, integrated into a new model. Moreover, the Internet connection fee is declining steadily. In contrast, maps application for location sold in the current have a relatively high price and will focus on a GPS Navigator device, a program that works with GPS Tracker, which are mostly paid to use. Users must also complete the specified coordinates. However, in the real condition, this might have led to a mistaken data and the results can be inaccurate.

The study found that in many related researches. A system that shows the positioning of itself are used to select the information that is moving in the vicinity. Users can choose to receive information on the extent. Based on the location of the user in mind. The system relies on the HTML5 API to identify geographic location of the user themselves [7]. This will include Global Positioning System, GPS, and data networking equipment used to identify the location of devices, such as IP Address, RFID, WiFi, Bluetooth, MAC addresses, GSM / CDMA Cell Ids.

3. Research Method

The scope of the problem, the cause of the problem as well as a strategy to resolve the issue, the analysts required the current system with the following five goals. This research employed the Multiview 2 theory and method [8], to plan and find out the problems in real world situation for sustainable developing information systems. The key finding may support the decision making of the education manager in their organization. The clarity of the various operators brings understandable computer situation in various parts of the system.

The problem in each situation is unique and complex with actors in each situation and it needs to improve behavioral change include a way to resolve specific issues each time [9].

Basic Concepts of Multiview must be a relationship between the designer and developer of information systems. It needs to concern about how to develop a system and system status by design and development systems. Generally, they do not take into account all three parts simultaneously. This concept corresponds to multi-perspective theory [10]. The multi-perspective theory looks at the

following three aspects: Technical perspective (T), Organizational or social perspective (O), Personal or individual perspective (P) and all three aspects need to consider together.

Sampling inquiries requires for interviews, questionnaires, observing user behaviour and search for environment, and data collection requirements of the system. The user (P) needs to set measurable objectives, as well as the scope of the development. The technical needs to implement the system followed the user requirements. Moreover, the organizational needs to understand the implementation and plan the future work.

1. System Design, (T) the step after analysing the system, this step is required the structure of the system, both general and specific in nature to fix the problem. The exact details of this process, which is designed to purpose system output, Input, E-R model and database to provide a complete system.

2. Analysis System, (T) is to get data from Step 1, which is the Data Flow Diagram (DFD), data dictionary and the structured decision, in order to analyse the problem correctly and systems analysts need to work with the system to be satisfied by the real needs of user's requirement specification.

3. Development, (T, P) this process is collaboration between programmers and system analysts (T). To develop the software, which will be a part on the analysis in step 2 and the third step, and design to be used by a programmer to write a program to monitor errors and set system security testing program and the documentation program for the system.

4. Test (T, P) before bringing the system up to the fact that it has to be detected, which is sometimes a test could be ran by a programmer or in some cases, a systems analyst that runs the systems testing. The test has three ways Module test, Component test and Final test.

5. Implement, (T,O) after completion of the test system that was installed to the user system, the trial must be tested. This is the final stage of analysts who are responsible.

6. Maintenance (T,O,P) follows the introduction of the new system that was installed to the user system. System users are not familiar with the functioning of the new system. So, it must be advised to monitor the database maintenance continuously and user assistance systems should be in the operation.

The system is the storage of information of the people with disabilities within a country that has specific kind of disabilities, in Southern part of Thailand. The system will be demonstrated on Google map, which can divide the work into two parts: the application on the Android operating system and a web browser. Both the Android operating system and web browser will use the same database.

System operations are real-time job recordings the coordinates of the disabled. The system will automatically generate the coordinates of the position taken by the mobile device to determine the accurate position. In addition, if the user knows the coordinate value, he could enter it directly through the web based system.

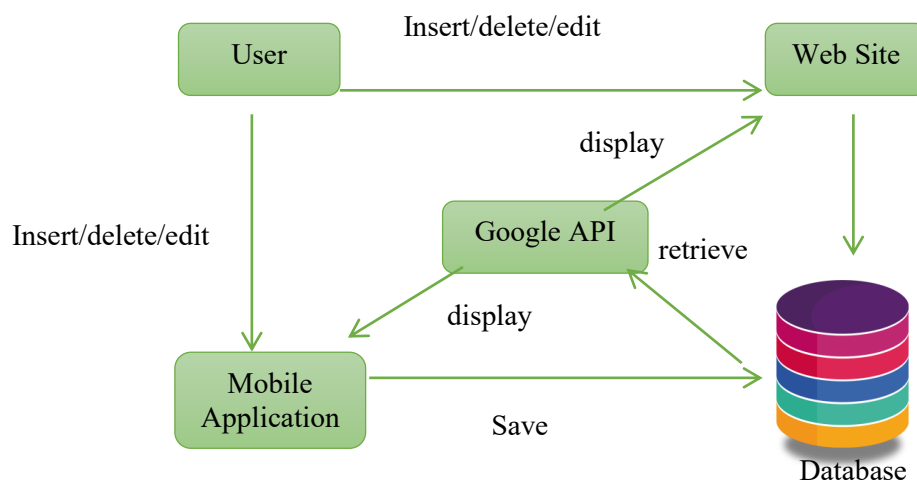


Figure 1. System Process

Figure 1 described the process of the systems. The data of the disabled people must be regarded to the privacy. General users cannot see any other users details except the officer of the disabled, and the administrator. The administrator can view and edit disabled people data. However, this system allows users who are not disabled or the officer to see an overview of the types of disabilities by Google Application Programming Interface (Google API) or specific types of disabilities, but they cannot see the name, age of particular disabled people. The process is divided into four parts as follows.

1. Administrators can manage through the web browser such which includes the functions as edit, managing the basis information of disabled people, managing the categories of disabled people, determining the latitude longitude of their house and workplace location, managing staff information, and seeing the summary view of the disabled condition such as city, province, or the type of disability.

2. Staff can manage through the web browser as well, they can sign in by using staff official passwords, view the disabled people information such as name, address, age, gender, address, home coordinates, workplace coordinates and manage disabled people.

3. Users (disabled people) can interact through the web browser and the application they can sign in by using their own account and review their own basic information, record basic information such as name, age, disability, gender, disability, addresses and photos at work, overview of the disability on the map, and viewing the overview of the disabled by searching by type of disability on the map.

4. General user, can use this application through the web browser and the application such as overview of the overall position disabled people on a map via websites and applications, overview of the disabled people by searching by type of disability on the map.

4. Results and Discussions

Figure 2 showed Multiview 2 framework [11] for GIS development which included five main components. *The organizational analysis* provided the objectives of this research. The research found that the Ministry of Social Development and Human Security, Thailand, needed to optimize time to search disabled people information in visualization view. The officers gave the current home of disabled people information to test the application. After implement the systems, they suggested that the system should have the guiding route and navigation to the public facilities.

The technical analysis of the socio-technical system analysis is the viewpoint of the organization or society, as well as the design, taking into account information such as sociology, regardless of user-oriented society. This research found that the implement of the GIS for the disabled people needed to understand all three perspectives, Technical perspective (T), Organizational or social perspective (O), Personal or individual perspective (P). Designing information systems is a technical perspective to design and present technical information system, for example, object-oriented design, diagram or writing activities within the organization. The research suggested that the system should be designed taking into account most of all processes including: System Design, (T), Analysis System, (T), Development, (T, P), Test (T, P), Implement, (T,O) and Maintenance (T,O,P).

Information system format referred to the GIS application management on the web-based platform and on the Android operating system. The platform of the system was developed by JAVA and PHP, the server should be installed JRE (Java Runtime Environment) and PHP installed with the support JSON, can also run the program. The longitude and Latitude coordinates on the map may be inaccurate by some 20 meters from the actual location.

The software development is a technical (Technical perspective) as a means of programming by computer scientist to be involved with the design of the hardware, software and communication technologies. The interior design program will involve the design function and data structures throughout the class and object-oriented programming models. In order to make the program work, the design must relate to the user (Personal perspective). The research found that the development of a GIS for disabled people to be reckoned with many factors. Those include the problems with the database of system capacity should reach quality and credibility of the program. Features and benefits add content creation could increase the visibility and audio of the disabled people. Moreover, enhanced tools for navigation should be considered.

Finally, *mediator factor* is a human (Personal or individual perspective), the binder relations. During the work on the computer system in the human social reality, sometimes it will come with unsuccessful to use [12], so the views of the staff, so it is necessary to develop information systems.

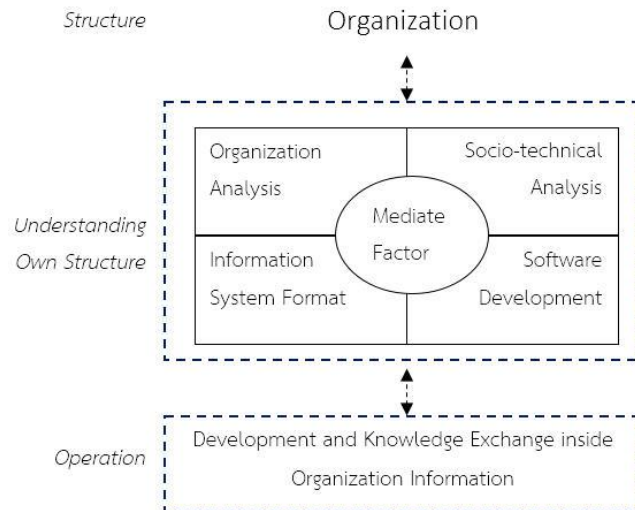


Figure 2. Multiview 2 Framework [11] for GIS development

After implemented the application on the mobile phone (Android), the user could see as the figure 3 below.

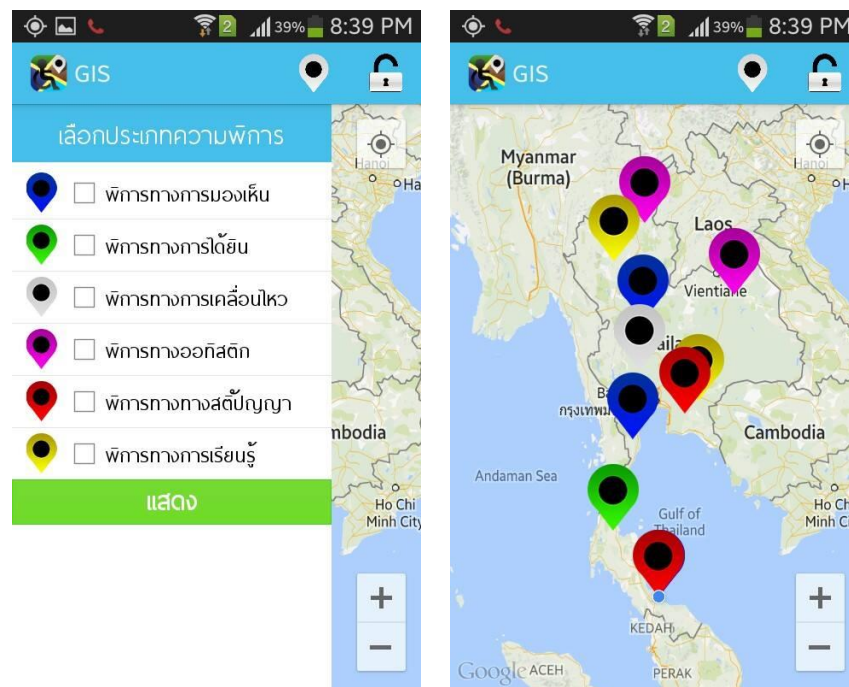


Figure 3. Interface on Mobile Phone (Android)

5. Conclusion

This research showed that the introduction of Multiview 2 as a theory analyzing information systems are possible and can lead to conclusions that can be utilized in planning the development of a GIS application implementation. The Multiview 2 framework provide the GIS development and implementation including five main components including : *the organizational analysis, the technical analysis, information system format, the software development and mediator factor*. The design system of information system format needed to understand all three perspectives, Technical perspective (T), Organizational or social perspective (O), Personal or individual perspective (P). For further work, this research should include the audio guide and navigation to the public facility point for the disabled people. It needs to collect accurate disabled people area from the real situation and the position of the public area. The application should provide the route from their current position to the specific area such as public library or disabled restroom.

References

- [1] M. C. Domingo, "An overview of the Internet of Things for people with disabilities," *J. Netw. Comput. Appl.*, vol. 35, no. 2, pp. 584–596, Mar. 2012.
- [2] D. Karimanzira, P. Otto, and J. Wernstedt, "Application of Machine Learning Methods to Route Planning and Navigation for Disabled People," presented at the Modelling, Identification, and Control.
- [3] "A Study on Smartphone based Operating System - ProQuest." [Online]. Available: <http://search.proquest.com/openview/a76909d6c1f9f5c9b45574760c321ceb/1?pq-origsite=gscholar&cbl=136216>. [Accessed: 29-Mar-2017].
- [4] B. E. Mennecke and M. D. Crossland, "Geographic information systems: applications and research opportunities for information systems researchers," in *Proceedings of HICSS-29: 29th Hawaii International Conference on System Sciences*, 1996, vol. 3, pp. 537–546 vol.3.
- [5] A. Voisard and B. David, "A database perspective on geospatial data modeling," *IEEE Trans. Knowl. Data Eng.*, vol. 14, no. 2, pp. 226–243, Mar. 2002.
- [6] M. Rahnema, "Overview of the GSM System and Protocol Architecture," *Comm Mag*, vol. 31, no. 4, pp. 92–100, Apr. 1993.
- [7] W.-C. Hu, N. Kaabouch, H.-J. Yang, and X. Wang, "Location Based Services Using HTML5 Geolocation and Google Maps APIs," in *Proceedings of the Midwest Instruction and Computing Symposium (MICS 2013)*, 2013.
- [8] David E. Avison, A. Trevor Wood-Harper, R. T. Vidgen, and J. R.G. Wood, "A further exploration into information systems development: The evolution of Multiview 2," *Inf. Technol. People*, vol. 11, p. 124, 1998.
- [9] D. A. Schon and V. DeSanctis, *The reflective practitioner: How professionals think in action*. Taylor & Francis, 1986.
- [10] H. A. Linstone, "The multiple perspective concept: With applications to technology assessment and other decision areas," *Technol. Forecast. Soc. Change*, vol. 20, no. 4, pp. 275–325, 1981.
- [11] S. Tongkaw, C. Tharnrak, and J. Olarikachat, "Using Multi-view to Identify Factors that Affect Their Use in Electronic Learning Course," presented at The 1st International Conference on Electronics, Electrical Engineering, Computer Science : Innovation and Convergence (EEECSS 2016), Phuket, Thailand, 2016.
- [12] F. Fui-Hoon Nah, J. Lee-Shang Lau, and J. Kuang, "Critical factors for successful implementation of enterprise systems," *Bus. Process Manag. J.*, vol. 7, no. 3, pp. 285–296, 2001.