COM Component Extraction for Building Surveying System Using GPS Satellites.

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Abstract

The necessity of a short period of software development with lower cost came out. The reason of making the component based development is that it can improve the software development , productivity maintenance , and software quality innovatively. Following these advantages of component based application development methods, we found the COM based components effective to Window platform in the satellite surveying.

In this paper, we can obtain many precious engineering experiences. Software system development and maintenance will take much shorter time with higher reusability if satellite surveying system is constructed with component extraction proposed by us.

Key words : COM, Surveying system, GPS

1. Introduction

As development of satellite and communication techniques, each department of society demands new application techniques applied to obtain information quickly and exactly from satellite[1,2].

In the field of each country GPS infra construction, such information and applied technique are required, thus, not only a solution to GPS satellite surveying system construction of new conception needs to be found, but also utility and effectiveness are considered very important[1,2].

The reason of GPS satellite surveying is to improve the possibility of high precise and long range surveying, not affected by severe weather and night work, and easy surveying by computation management[2].

The purpose of this paper is to get component extraction through domain analysis of satellite surveying system for building GPS surveying system. Generally, many components are defined as software packages with high cohesive modules that are able to be developed and distributed[3].

Now, the relevant software for satellite surveying system exist but there is no component-based software. Component-based software can improve hugely reusability of software because components made by uniform standardization and regulation can be applied conveniently for other applications. In ad-

dition, the development and maintenance don't need excessive efforts such as manpower and time. So to GPS surveying system development , the adapting component-based software development can benefit from CBSD. This paper presents the scheme of component extraction based on COM to create components supporting the system for digital map making system in surveying parts.

COM is component architecture technique which has received strong support of window operating system, with binary standard independent from programming language, and convenient version management. So COM is chosen undoubtedly in this paper.

This paper consists of four sections. Section 2 describes the process of component extraction. Section 3 presents use case modeling from section 2 that component extraction process and truth specific. Section 4 presents the conclusion and research issues.

2. Component Extraction Process

The purpose of the paper is to extract COM components from digital map making system based on received data to GPS receiver.

In this paper the components to be extracted will be obtained from digital map making system through general component extracting process, Figure 1 shows up general component extracting process, Table 1 explains each process.
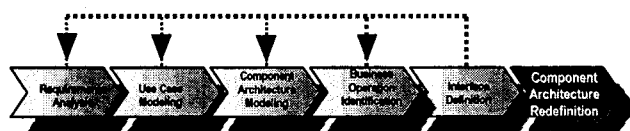

Figure 1 Component Extraction Process

Table 1 Component Extract Process

Process	Work
Requirement Analysis	Analysis the details of requirement about application domain
Use case Modeling	Presentation of interaction between external actor of system and use case provided by system through

	the communication with user
Component Architecture Modeling	With due regard to cohesive force and unifying force, searching for the initial components and presentation of its responsibility and reliance
Business Operation Identification	Discriminating interfaces associated to business operation with expressing interaction among the components
Interface Definition	The whole detail definition of each interface provided by component associated with component architecture
Component Architecture Redefinition	The final component architecture redefinition by repeated practice

3. Component Extraction for digital map making system

Briefly, digital map making system is a map making system used to draw map structural objects[5] presented by spot, line, face at the window canvas. Information received by the GPS receiver through the satellite process will be presented in spot, line and face information at the window canvas.

In this section, components will be extracted by component extracting process described in section 2.

3.1 Use case Modeling

By component extracting process of Figure 1, it is extracted into use case after going through the digital map making domain analysis of the field of surveying as follow.

- Receiving data and extracting information from the GPS receiver : receiving data in the form of NMEA format from the receiver, and extracting necessary information to application domain among the received data.
- Transforming the latitude, longitude, and altitude data of WGS84 oval figure received in the form of NMEA into TM coordinates.

- Creating object information : creating object information witch has information of spot, line, face make map structural elements based on transformed TM coordinates

- Storing the DB with object information : storing the database with created information.

- Map making : map making based on information from the database

- Transforming TM coordinates into window coordinates : transforming TM coordinates which stored in database into window canvas coordinates

- present object at window : present object information at the window canvas

The whole system is composed of 2 actors and 7 use case. Client application actor uses each function (use case), and GPS receiver actor provides GPS satellite surveying data in the form of NMEA to the system. Figure 2 is use case diagram.
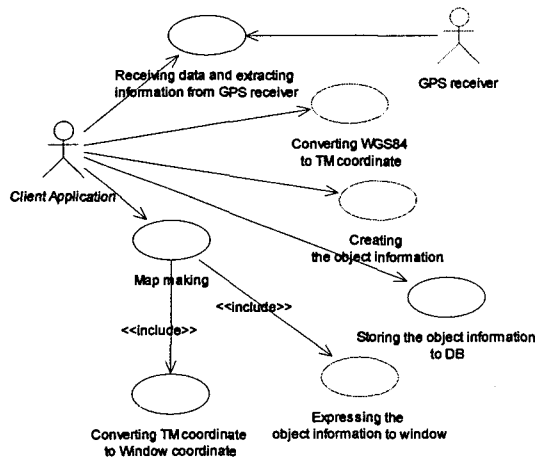

Figure 2 Use case Diagram

3.2 Component Extraction

Figure 5 shows up discriminated component in due consideration of independence, combination, cohesion that modeled use case diagram and component in the preceding chapter must have.
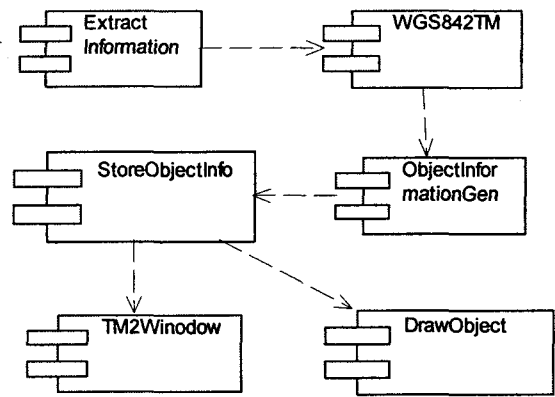

Figure 3 Component Diagram

Table 2 Function of component

component	explain
ExtractInform ation	Reiving data in the form of NMEA from the GPS receiver, and extracting necessary information
WGS842TM	Transforming the latitude, longitude, and altitude data of WGS84 oval figure into TM, X, Y coordinates
ObjectInfor-mationGen	Creating spot, line, face make map structural object based on TM coordinates
StoreObject-Info	Storing the DB with object information
TM2Window	Transforming coordinates of map structural object into window canvas coordinates
DrawObject	Present map structural object at the window canvas

Look into WGS842TM component detail specification in component of Table 2. The signiture of business operation that in public of WGS842TM component interface is like that.

wgs842Tm([in] double latitude, [in] double longitude, [in] double altitude, [out] double tm_xposition, [out] double tm_yposition)

Input parameters have the value of the latitude, the longitude, the altitude of WGS84 an ellipse, and output paremeters return form of TM X, Y coordinates.

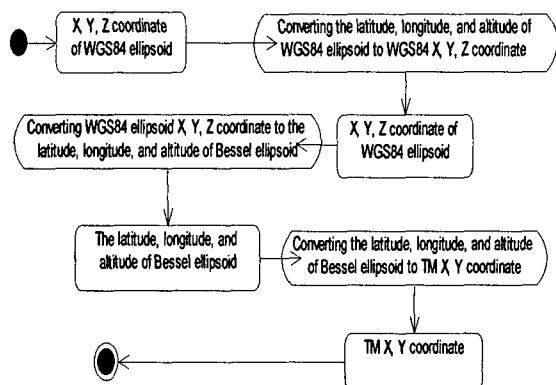Figure 4 presents these business logics[5,6] with activity diagram.

Figure 4 Coordinate conversion process

Figure 5 is a picture about the coordinate conversion to test the component the input value of drive client that latitude, longitude, and altitude of NMEA format[6,7].
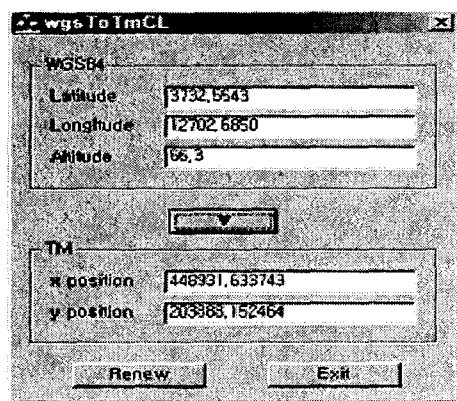

Figure 5 Coordinate conversion process result

This paper provided components extraction for digital map making system by using GPS, and one of them realized and tested follow details.

The meaning of the component extraction is to create common components which can be reused and contributed for system development time and cost reduction.

4. Conclusion and Future Work

The necessity of software that requires low cost for the application security rising constantly. The reason of raising component based development is to improve the maintenance productivity and software quality.

Being driven by these advantages, we extracted the COM based components, which has the effect on the window platform, to obtain the advantage, which is technical in terms of developing the digitale map making system preparation application using the GPS satellite.

In this study, it is much faster and correct and take advantage of engineering for development time and maintenance that implements and constructs the extracted components and then builds application. In the future, we will classify the components in the commonality for many domains

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