A Study of Survey Method using Information Technologies

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1 Introduction

Rapid progress of IT technology gives us global positioning with negligible errors and plotting these locations on the electronic maps. On the other hand, continuous works on database system are capable of new type of transaction processing which allows us to get appropriate information on that position at real time. KNSO has produced various kinds of statistics included in Population and Housing census and attempted to improve the quality of statistics through the innovation of survey method. As a result of these efforts, it has introduced IT of CAPI for its statistical survey.

In this paper, we will propose the survey method using position information by GPS and GIS with ECA rules. These are also part of the present IT and we will notice how these can be adapted to the data collection of the statistical survey.

This paper is organized as follows: In the next section, we will address the theoretical background and in section 3, we present our works on survey method. We will conclude our work in section 4 and end with future works in section 5.

2 Theoretical Backgrounds

2.1 Positioning and Geometric Information

GPS is the system that measures the position of observation by receiving the electronic waves from the known orbiting satellite and by surveying the elasped time to the position of observation at the same time. It has been used for military purpose.

GPS uses only single receiver for measuring the location and therefore our range of error is 5 to 15 meters raised from factors such as delay by ionosphere, the distribution of satellites, satellite orbit and so on.

In spite of these error factors, there is no serious problems using this method for our statistical sample survey because the sample size can be affected by the survey scale.

We can get the necessary information for this study using the transformation of coordinates or topological operation which are the basic functions of GIS database.

2.2 ECA rules

The ECA rule paradigm is mainly based on that of production rules and on the event concepts of real-time processing. The event is specified as an event-algebra expression. An algebra is defined as a set of simple events in connection with constructors allowing to build complex events. The condition specification is given as a database query which may take the database state before the event and after the event into account. The rule-ordering problem, i.e. the execution sequence of actions if rules fire 'at the same time', is mostly left to the user through the introduction of some sort of priorities.

A novelty of the ECA-rule paradigm in DBMS are so-called 'coupling modes' which allows one to specify the execution of the parts of an ECA rule. Such coupling modes are defined between event and condition and action separately and each defines a time-coupling, i.e. whether the following part should be executed immediately or should be differed. Transaction coupling defines whether or not the following part of the rule should be executed within the same transaction.

For the purpose of this paper, we will use ECA rules in the widest sense possible to discuss whether or not such a paradigm is convenient within the development. Hence, we will not propose a specific language for the rules but we will use intuitive expressions for events, conditions and actions. Furthermore, we will not elaborate on the problem of detecting complex events, testing non-trivial conditions and executing complicated action.

ON *Received Researcher's location*
IF $distance(Researcher, Objectofsurvey) \leq 500$
DO *Common items of the object of survey, Retrieval of surveyed data and send*

Figure 1: Example of ECA rule

3 The method of survey with location information and ECA rules

In the previous section, we reviewed the connection between GPS and GIS, as well as ECA rules. Now, we will discuss how to apply these technologies for statistical survey.

This study has the following assumptions;

First, there is no measurement errors of receiver. Secondly, the object of the survey has already been recorded on the GIS database. In the case of sample survey, the size of sample is not large and it is not so difficult to record on the GIS database. Thirdly, in terms of hardware, both wireless transceiver and GPS receiver have been attached to the terminal device of the researcher. On the basis of these assumptions, when it comes to survey cycle, the researcher should visit his objects of survey. On the way to his object of Survey, the researcher's location will be transmit into the data center terminal by operation of GPS receiver. On the other hand, a series of processes, such as investigating GIS information, calculating the distance between the research and the object of survey, checking whether or not the calculated distance is within permitted limit. etc will be executed.

The acquired information about his object of survey will be transmitted to the researcher's terminal. He can use these information about survey questions during the interview and also transmit what he gained through the interview into the data center. This process can be carried out with the ECA rules of Figure 1.

From Figure 1, for example, when the researcher reaches within 500 meters from one of his objects of survey, data about previous month of that object will be transmitted to him through handheld PC.

4 Conclusion

In the previous section, we described how to get the necessary information for researchers using these technologies.

The advantage of this system is to improve the accuracy of survey data using acquired statistical data and to prevent the deterioration of data quality due to research's exchange by sustaining the quality of data at a constant level at the same time.

On the mean time, to implement this system, the infrastructure of GIS database and of network should be established and the overhead of computer server should also be taken into account due to concurrent connection. The problem can arise whether or not the effect of cost in using both handheld PC and wireless network will be beneficial.

5 Future Works

We need precise theoretical consideration, study of the data for transmission and factors of cost-down for the system implementation. We also need the study of methodologies for applying large scale surveys.

References

[1] J. Reinert, N. Ritter, Applying ECA Rules in DB-based Design Environment, in *Tagungsband CAD '98*, 1998, Informatik Xpress9, pp 188-201

[2] http://www.opengis.org/

[3] http://skyscraper.fortunecity.com/