PROFILE MANAGEMENT FOR MOVING OBJECTS

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ABSTRACT : In this research, we will accomplish the investigation of the devices and data models which are used in the existing indoor and outdoor systems. Based on the investigation, we will seize the additional requirements for the integration of the legacy system and then we will propose the various methods which support the additional requirements. By applying the various methods in the heterogeneous environments, we will solve the legacy problems and propose the methods for the final goal that is to provide the seamless moving object tracking. The scope of this research is to propose the integration methods, developing the actual location tracking system model without modifying the legacy infrastructures.

KEY WORDS: Moving object, Tracking, Profile, LBS

1. INTRODUCTION

With the increasing of geographical information, the importance of the location aware service is increasing today (Y. Zhao, 2002). The research of the seamless moving object tracking plays a base technology of the location aware service and is used as the core technology of the location based service. By achieving the tracking of the moving object seamlessly, we are able to secure our footing in the location based service.

2. PROPOSED SEAMLESS LOCATION TRACKING SYSTEM

In this paper, we propose the approach which is new for the location tracking of the seamless moving object. This does as the bottom-up method for problem solving based on the existing location tracking system environment. And it considers the various integrated environment in which this global positioning system is together applied. The approach for the problem resolution can divide into the system approach and application service approach.

2.1 System Approach

In the system approach, the technique for integrating these systems through the analysis of the existing indoor / outdoor location tracking system (RoyWant, 1992; J. Hightower, 2000; Andy Ward, 1997) is proposed. The technique for the system integration is comprised of two branch portions of a lot, the moving object identifier association technique, and data integration technique.

2.1.1 Identifier Correlator Method of Indoor/Outdoor Moving Object: The moving object can be distinguished the moving object of an indoor and outdoor is identical so that the continued locating service can be possible between the indoor / outdoor environment. Each location tracking system prepares the identifier which is inherent in order to recognize clearly the moving object and manages. The identifier of the moving object is classified into the electronic serial number (ESN) which the location tracking system of the GPS equipment within the terminal and mobile radio communications network base use and the culture medium identifier which it uses in order to recognize clearly the moving object in the indoor location tracking system.

2.1.2 Integration of Data Type: The indoor location tracking system altogether uses the other data type. By using the integration data type altogether including data types which each indoor location tracking system uses the service provider altogether can support the various data type of the indoor location tracking system. Here, it looks into about data type which the indoor / outdoor location tracking system uses and data type model uniting these is proposed.

2.1.2.1 Outdoor Location Data Integration: As shown in front, outdoor position data can find through the Cell-ID of the mobile radio communications network and GPS. The absolute coordinate is altogether used GPS and Cell-ID mode. In the OpenLS (OGC), the standard data type was defined through GML. In this research, outdoor position data the same position data as the standard GML of a type is used.

2.1.2.2 Indoor Location data Integration: The indoor location based system is classified into the system as shown in the front expressing the location information in a semantic according to the kind of data type and the system expressed in the relative coordinate. This indoor location data makes a

communications between the indoor location server and the service provider the integrated data type possible.

2.1.2.3 Indoor/Outdoor Location Data Integration: Position data of an outdoor and each indoor is integrated in the service provider. Real, in the locating service, because it is possible to grasp the exact location of the moving object by the absolute coordinate and semantic information, it maintains in integration position data only the object identifier, the visual angle, the absolute coordinate, the semantic information. It is possible that it converts into the absolute coordinate by using the relative coordinate of the moving object positioned within the intrinsic identifier and establishment of an establishment which is the information of indoor location data. Moreover, by using the location information done with the semantic of the moving object and establishment intrinsic identifier positioned within an establishment, the precise position within the establishment in which the moving object is positioned and establishment is converted into semantic information and can be used.

As shown in Figure 1, it can express through this kind of conversion as the XML schema.

```
<?xml version="1.0" encoding="euc-kr"?>
<xsd:schema xmlns:xsd="http://www.w3.org/2001/XMLSchema">
  <xsd:import namespace="http://www.w3.org/XML/1998/namespace"/>
  <xsd:element name="location">
    <xsd:complexType>
      <xsd:sequence>
        <xsd:element ref="objectID"/>
        <xsd:element ref="position" maxOccurs="unbounded"/>
      </xsd:sequence>
    </xsd:complexType>
  </xsd:element>
  <xsd:element name="objectID" type="xsd:string"/>
  <xsd:element name="position">
    <xsd:complexType>
      <xsd:sequence>
        <xsd:element ref="information"/>
        <xsd:element name="time" type="xsd:dateTime"/>
        <xsd:element ref="absolutePosition" minOccurs="0"/>
        <xsd:element ref="address" minOccurs="0"/>
      </xsd:sequence>
    </xsd:complexType>
  </xsd:element>
  <xsd:element name="information">
    <xsd:complexType>
      <xsd:sequence>
        <xsd:element name="GPS" type="yes_no"/>
        <xsd:element name="Cell_ID" type="yes_no"/>
        <xsd:element name="Indoor" type="yes_no"/>
        <xsd:element name="User_Profile" type="yes_no"/>
      </xsd:sequence>
    </xsd:complexType>
  </xsd:element>
```

Figure 1. XML schema of integration position data.

By together using various location information the location of one moving object is expressed in integration position data generated on this of the XML schema of figure 1. For example, it converts the relative coordinate of the moving object into the absolute coordinate based on the absolute coordinate of an establishment and finally the location of the moving object located in an indoor produces integration position data. At this time, the position element has the source of position data, the location of the position time, and the absolute coordinate and semantic information to the lower element.

2.2 Application Service Approach

The object is that the integrated environment of the indoor / outdoor location tracking system brings the difficulty of the general service support under the continued service aid which is the problem of the existing locating service and the various indoor / outdoor environments to a settlement. Therefore, the various service style at this integrated system environment need to be taken into consideration of. In the application service approach, the technique which provides the existing service by preparing the integration locating service scenario in the integrated system environment of the indoor / outdoor which the system approach classifies and applying and, grasps a problem and at the same time the system approach supports the locating service with the system integration technique to be proposed is proposed.

2.2.1 Moving Object Profile: it is possible that the current locating service is very exact, it traces a location in an outdoor in case the moving object has the terminal with built-in the GPS receiver. But in an indoor, it could know while grasping the location of the moving object by the mobile radio communications network base since receiving the GPS signal that an accuracy was decreased. If it is the environment in which the system integration is made, the service provider will be able to grasp the indoor location of the moving object while the moving object is positioned in the environment in which the indoor location tracking system is ousted. But in the environment without the indoor location tracking system, it is impossible to the location of the position of the indoor moving object. A technique to be proposed uses the profile of the moving object so that this constraint can be supplemented.

2.2.2 Service semantic: The locating service has the various semantic of a form. Urgency, a service does not need the exact location information of the moving object the disaster service or the infant tracking service need the exact location of the position of the moving object, on the other hands, a friend finds. The demand of the user which uses the locating service by using the semantic of the various services, can be reflected. For example, since there is many an error in every, the location tracking of the mobile radio communications network base cannot use in case of the infant tracking service in which the exact location tracking is required. The technique which it converts into the other service as it directly calls the moving object by using the mobile radio communications network while providing the more exact location information by it uses the moving object profile in order to supplement this or introducing the GPS equipment, in case the exact location of the position of the moving object located in an indoor is difficult is applicable.

3. INTEGRATED LOCATION TRACKING SYSTEM

3.1 Integrated Location Tracking

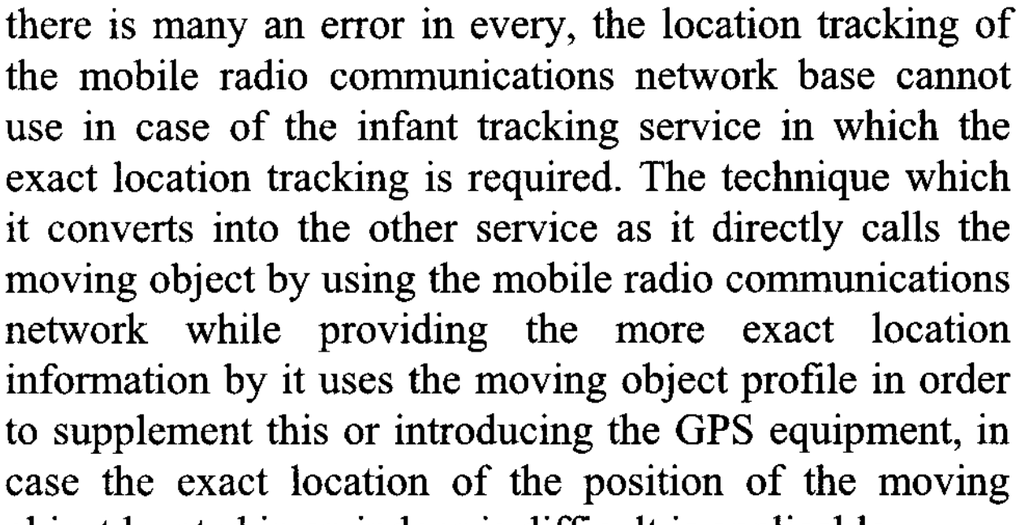

Figure 2. Procedure of integrated location tracking.

In this research, Figure 2 is the diagram expressing the integration location tracking procedure to be proposed. With altogether expressing the location tracking procedure of the case of applying a technique to be proposed in the application service approach and system approach in the integration location tracking system environment which 1 section classifies a diagram transmits the location determination result of the moving object which is most exact according to the various indoor / outdoor location tracking system environments or is predictable to the service user.

4. SIMULATION

4.1 Development environment and model design

4.1.1 Development environment: The following is the development environment of the simple simulation for the location tracking of the seamless moving object.

(1) Operating system : microsoft Windows XP Professional.
(2) Programming language for software development : javaTM 2 Runtime Environment Standard Edition ver 1.5.0.
(3) Database : oracle 9i.

4.2 Implementation Model Design

4.2.1 Simulation Model Design

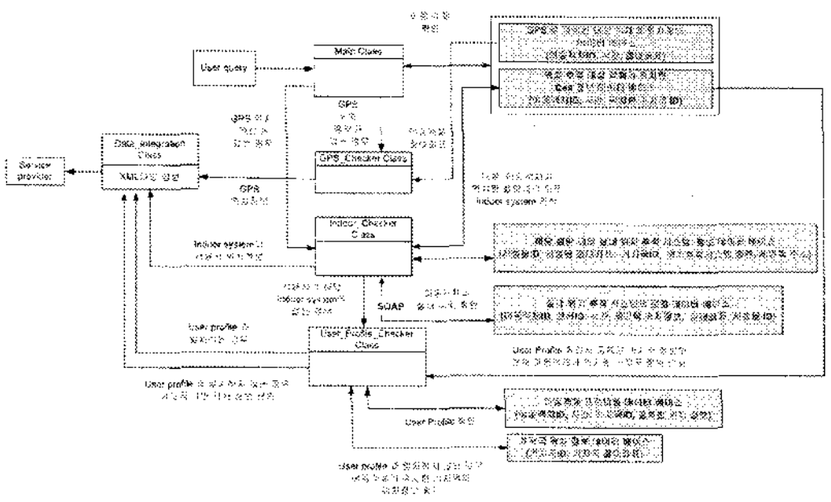

Figure 3. Simulation Model of Implementation.

Figure 3 designs the whole model of implementation for a simulation. The object moving object is positioned at an outdoor and in case a search is possible, the existing GPS location tracking method is used as GPS against the position tracking request of a user. The indoor location of the moving object is brought about through the communications of the indoor location tracking system within the base station in which the moving object is positioned in case of obtaining the GPS signal of the moving object. In case it does not have the location tracking system having the indoor location of the moving object within the corresponding base station, the location of the moving object is predicted based on the user profile. At this time, XML position data which is integrated by using the user-position information which each indoor and outdoor location tracking system maintain is produced.

4.2.2 Situational Moving Object Location Tracking:
(1) The location of the position of the moving object living in the establishment in which the indoor location tracking system is ousted

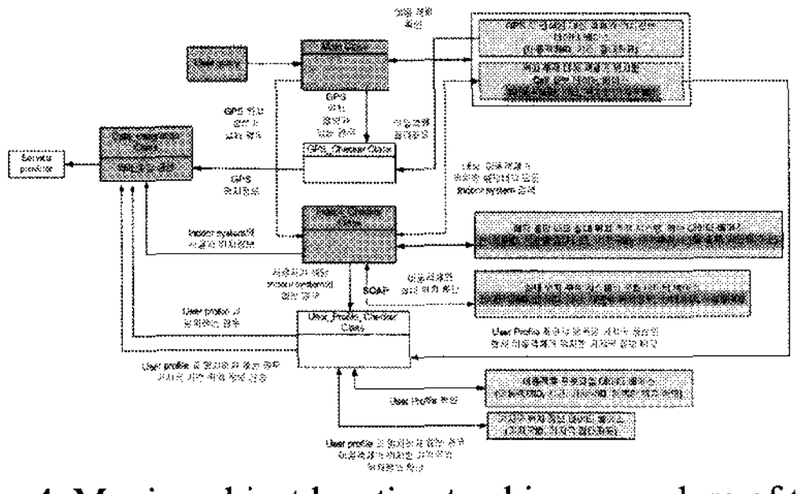

Figure 4. Moving object location tracking procedure of the establishment inside in which the indoor location tracking system is ousted.

Figure 4 shows the location tracking of the case of the moving object being positioned in the establishment in which the indoor location tracking system is ousted. According to the position tracking request of a user, the location of the object moving object is searched to GPS or the base station foundation. The location information of the base station foundation can be obtained while the GPS coordinate obtaining since the object moving object lives in an indoor. At this time, the location information of the moving object is obtained from the corresponding indoor location tracking system while grasping the establishment in which the moving object is positioned through the communications of indoor location tracking systems constructed in the base station in which the moving object is positioned. At this time, it is the location information which it does with the semantic like the room lake or the location information of the moving object can obtain from the indoor location tracking system provides with the semantic location information only the relative coordinate of the moving object. At this time, since being the location information which the service provider cannot use, the relative coordinate converts the relative coordinate of the moving object into the absolute coordinate based on the absolute coordinate of an establishment and moreover integrates with the address of an establishment with the semantic information of the moving object and finally produces integration position data. Figure 5 is the simulation screen showing the location tracking of the establishment my moving object.

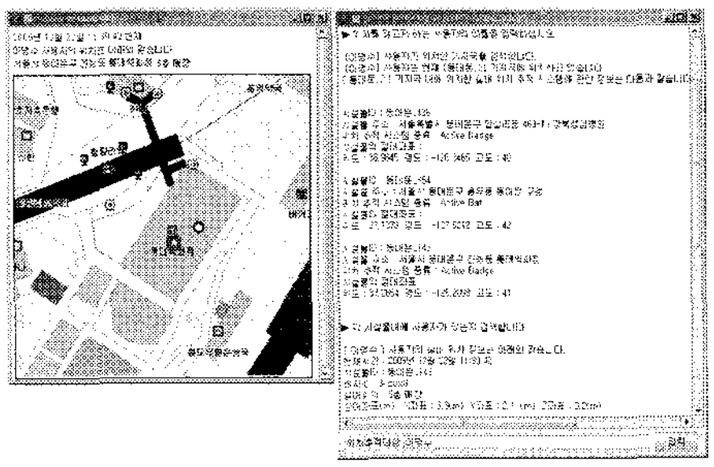

Figure 5. Moving object indoor location tracking at a simulation.

(2) The location of the position of the moving object living in the establishment without the location tracking system

In case the moving object is positioned in the establishment in which the indoor location tracking system is not ousted, the exact indoor location cannot be known. In a preexistence, because of just grasping a location by the base station foundation, it could know that it had the problem of being different in an accuracy many. By comparing the base station

information in which the moving object is positioned with the location information in which the moving object mainly lives and the user profile in which the dwell time is registered the moving object location is predicted.

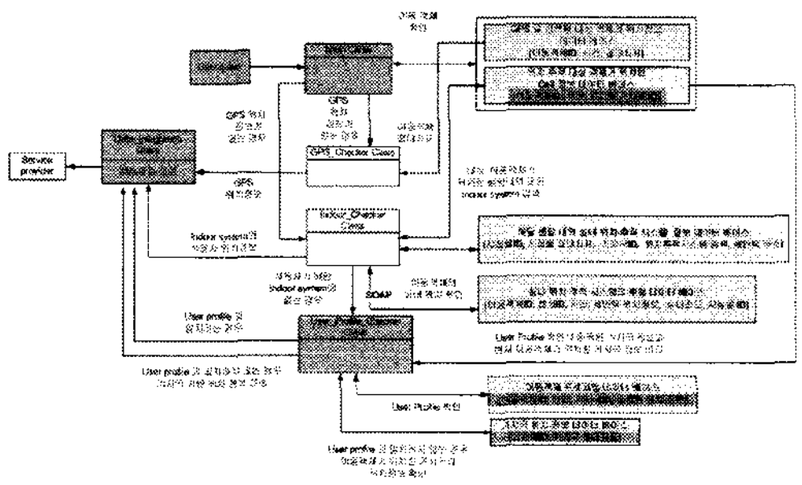

Figure 6. In case of the user profile is used.

Figure 7 is the simulation screen which shows the location of the moving object by using the user profile.

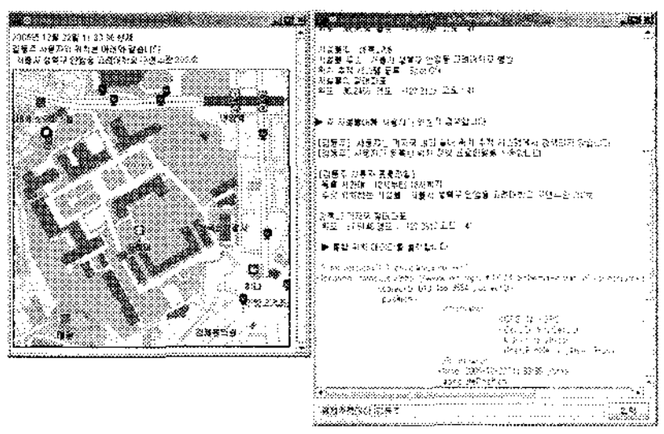

Figure 7. User profile base location tracking.

5. CONCLUSION AND FUTURE WORKS

In a research, the system approach and application service approach were proposed as the approach which grasped the problem of the locating service for the location tracking of the seamless moving object and solves this problem. In the system approach, the use of the identifier correlator method of the moving object, the integration position data type development, and the use of the merge protocol were proposed. And the application service approach proposed the application of the consideration of the use of the user profile and service semantic and data mining technique. And the environment of the integration location tracking system was classified and the virtual position tracking scenario was applied to each environment. Through this, the problem that each environment carries could be grasped. It could know to could realize the indoor / outdoor integration locating service by applying a technique to be proposed in order to overcome this problem.

Moreover, the indoor / outdoor integration location tracking procedure of the case of applying a technique to be proposed was looked into through the simple simulation. In this research, the task that actually applies data mining technique to be proposed to a simulation and it verifies is planning to be performed. And it is planning to make a study of the location tracking algorithm of the moving object using data mining technique which is various besides data mining technique to be proposed. Moreover, a research including the expression of the integration quality for the indoor / outdoor location based service and processing technique, and etc. is planning to perform.

6. REFERENCE

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