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INDOOR LOCATION OF A MOBILE DEVICE BASED ON BLUETOOTH TECHNOLOGY

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Abstract

Global Positioning System (GPS) is a commonly used system for controlling sensors and figuring out the location of devices in outdoor areas, and is very common. But because of reflections of the signals due to walls and furniture presence and various other factors causing signal attenuation within a house, it is not effective for indoor localization. WLAN, Bluetooth, RFID, Wi-Fi are therefore used to locate computer locations that are held inside a building by individuals. This paper introduces a new framework focused on Bluetooth technologies for the indoor positioning of a mobile device. For the positioning system and for accessing the network, Bluetooth network control points are used. The position is generated by means of the signal intensity obtained from certain points of entry. The signal energy is calculated by a mobile device and transmitted to a central server which calculates the position of the signal. Since the position is generated on a central server, some type of algorithm may be considered to approximate it. The positioning scheme also uses a prior study of the scene by considering a diagram of the signal strengths obtained.

Keywords: *Direct Access Object (DAO), Database Storage, eXtensile Markup Language (XML), Global Positioning System (GPS), line-of-sight (LoS)*

I. INTRODUCTION

One of the most exciting areas of mobile computing is position services. Location systems allow the creation of a new form of mobile application that is location-aware. The most popular location systems, such as the Global Positioning System (GPS or Galileo) or the Positioning System offered by mobile telephony operators, are ideal for external areas where satellites or base stations provide a direct line-of-sight view [1]. Nevertheless, they suffer from multi-path effects inside buildings, and so they exhibit low performance indoors. In indoor conditions, it is important to have multiple indoor stations to achieve successful performance. In specific, ad hoc networks have a fine-grained sensor infrastructure by using small and inexpensive stations (nodes) [2]. There exist several references to ad hoc networks to provide position, based on various technology and techniques (and references therein). A new position method for indoor conditions has been implemented in this article. The radio frequency technology provided by the Bluetooth network is used in this

framework. Although the energy of the transmitted signal decreases almost proportionally with the distance between stations and mobile terminals, we should take this relationship into account in order to calculate the distance from a given node. In the mobile terminal, since we have the signal levels from different nodes, we can apply different algorithms to approximate its position [3]. Algorithm computation is rendered in central (powerful) servers. The Bluetooth network is used in order to connect with computers. This methodology helps one to take complex algorithms into account, as the algorithm is not tested on a handheld computer that typically has minimal computing capability.

Interlinked Work:

By using distinct physical phenomena and technology, location systems estimate a mobile terminal spot. We achieve the following description based on the physical phenomena used to make the estimation:

- *Triangulation:* In order to compute mobile coordinates, this method uses geometric properties of the position of the entry point. It is possible to achieve triangulation by considering:

I. Period of propagation, where the time taken for the signal to pass from the node to the mobile terminal is considered.
II. Received signal intensity (RSS), which is known to be the attenuation produced when a signal travels a transmitter-receiver span.
III. Angulation, where the angle of signal arrival to various nodes is used to determine position. We were able to evaluate this location in a 2D system with two nodes. A classic example of the angulation technique is the VOR aircraft navigation method.

- *Scene Analysis:* Uses previously observed aspects of a scene to obtain conclusions regarding the objects' location.
- *Proximity:* The presence of the target is sensed using a limited-range spatial phenomenon. Some approaches to proximity sensing are: physical touch identification, wireless cellular access point tracking, and automated ID device observation.

Coherent Architecture:

In terms of information programs, logical design defines the structure of the scheme [4]. The logical infrastructure consists of three main components: the server, which consists of a database and application logic; the middleware, which is the interface between network providers and applications; and, ultimately, the device clients.

- *Client:* Client suits View in the MVC pattern (Model, View, and Controller). Clients must be running a small program, since they must obtain RSSI from the Bluetooth driver at any moment. For this cause, we have discarded getting smartphone access to a Network style server [5]. In our case, C (using GTK) and Symbian customers were developed for the production of notebooks and PDAs/smartphones, respectively.
- *Middleware:* It is the portion of the framework where data from mobile devices (clients) is transmitted to the server. In order to allow clear clients and server implementations, we have considered a basic protocol, based on a web service: XML-RPC. This protocol

encapsulates and sends information to XML (eXtensile Markup Language) using HTTP, providing the device with a great variety and enabling it to be used via firewalls.

- Server: The server is made up of two major components: database storage and program logic.

  I. *Storage of Databases:* where the server holds the mapping of signal strengths corresponding to the environment's coordinates. Our framework uses a topological map that is contained in Mnesia that is a database manager that provides properties of distribution and fault tolerance [6]. For telecommunications applications and those that require continuous service and soft real-time properties, Mnesia is suitable.

  II. *Application logic:* In Erlang, application logic has been programmed. Erlang is a general-purpose, functional programming language and runtime environment. Erlang has built-in competitiveness, deployment and fault tolerance assistance. Erlang is used by many large Ericsson telecommunication networks. Database entry, position node, and XML-RPC server are three modules that stand out. Second, it was created using a pattern version of the DAO (Direct Access Object) that specifies access to database objects [7]. Secondly, the prototype pattern was used to make it easier to select between multiple algorithms to execute the placing. In the MVC pattern, these first two elements validate the model. Finally, we have a module for the XML-RPC server that applies the Facade pattern and that is the agent that receives mobile requests. In this implementation of pattern MVC, this section is the Controller part.

If we can see, an appropriate range of patterns and behaviors has been used to construct the program. The following properties are given to us by this architecture:

- *Concurrence:* Erlang processes are very lightweight and they have dynamically differing memory requirements. The architecture of Erlang supports programs with a high number of processes that are concurrent.
- *Distribution:* It was planned for distributed environments to be executed. The framework requires each module in a cluster of computers to be executed and to connect via a network between them. An erlang-based framework is a network of nodes that operate like virtual machines (typically one by a processor). In multiple nodes, the resident processes coordinate with each other as if they were executed in a single one.
- *Robustness:* primitives of error detection are used for the development of fault tolerant systems. In this way, processes executed in a distributed system can be configured to migrate to other nodes in an automatic way in case of failure of the node in which they reside.
- *Real time:* allows applications with soft real-time constraints, where the response times are in order of milliseconds.
- *Updates:* for environments that cannot be stopped, Erlang considers mechanisms of hot code change, and, therefore, any software maintenance can be made while the system continues executing itself.

Real-World Applications:

A lot of practical applications for position systems exist. However, the technology is extremely useful since many handheld devices (mobile phones, PDAs, notebooks) implement Bluetooth capabilities. It is possible to divide such applications into two groups [8]. It can be very helpful for contextual information systems, on the one hand. When a user demands information from his or her mobile device, the response is modified according to the root of the message. In a museum, exhibition or trade fair, for example, in which the customer may ask where the exit or toilets are located [9]. In this situation, the user may send a request to the position system via the application on the mobile device. Via this method, the pertinent information is sent to him based on his own venue. One of the key benefits of our method is the use of the same technologies for connectivity and location. Thanks to this, only a Bluetooth adapter is needed for a mobile device. A machine that locates a computer in a clear way will be another function. That is, a mobile device would be placed without user order [10]. Suppose the case of a fair, in which each guest gets a terminal prone to be located; in this way the Organisation could take a hold of the visits 'stands', adjust the standard of the contents for subsequent editions.

II. CONCLUSION

We also incorporated a new framework in this article that enables mobile devices to be placed in indoor environments. This system uses the radio-frequency technologies offered by the Bluetooth network used for mobile device communication. The method is based on the signal intensity that is obtained from network access points on mobile devices. By requesting it to a serve, a computer may obtain its location showing the signal strengths obtained from multiple network access points. Servers have a (previously computed) signal intensity map that can be used to assess the location of mobile devices. As the new Bluetooth network is used to predict mobile device positions, the solution is low-cost and very convenient when it uses a technology adopted by most mobile users (mobile phones, PDAs, notebooks). In addition, measurements demonstrate that high accuracy is given by the device.

III. REFERENCES

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