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Design of Beacon Information Service Based on Internet of Things as a "New-Concept University" Information Service

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Abstract. The need for automation of information services through communication among objects is increasing daily with the emergence of Internet of Things (IoT) technology. It is said that the era of the IoT has finally arrived. It is not a recent event that the IoT has become an issue in industry. Recently, universities that support education information services have been introducing new information services based on the Internet of Things in order to gain a competitive advantage in university information systems. In other words, since the demand for smart education is increasing, the education field tries to provide information service using IoT to smart education. The Beacon information service used in this study is based on IoT and is designed as a university information service. This proposed information service supplies various types of university information to members through beacon communications.

Keywords: Beacon, IoT, Internet of Things,

1 Introduction

The need for automation of information services through communication among objects is increasing daily with the emergence of Internet of Things (IoT) technology. It is said that the era of the IoT has finally arrived. It is not a recent event that the IoT has become an issue in industry. IoT is a technology by which objects exchange data in real time through sensors installed in them [1-2]. In fact, we can see quite a few examples of IoT in physical objects such as electronic circuits, application, management software, automobiles, and buildings. In particular, universities that support education information services are introducing information services using IoT in order to gain a competitive advantage in university information systems. Recently, universities have been considering customized information services that provide desired information at the desired time to members of the university. Because information that is delivered one-sidedly is often regarded as spam regardless of the users' intentions, universities are focusing on developing services to deliver desired information when users want it.

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In this paper, we focus on information service using the Internet of things and try to utilize it in education field. The Beacon information service used in this study is based on IoT and is designed as a university information service. This proposed information service supplies various types of university information to members through beacon communications. More specifically, this service provides information desired by users, such as lecture rooms and their locations, lecture schedules, attendance records, university notifications, scholarships, books, academic calendars, and buildings, via the Beacon communication system through the smartphones that everyone carries.

2 Research

2.1 Internet of Things

The Internet of Things (IoT) started from the ubiquitous concept of "connecting to the network" and developed through the connection of information technology devices such as desktop computers, servers, and smartphones, as well as various other objects, to the Internet. IoT is a platform technology that enables the exchange of numerous pieces of information between objects and between people and objects through sensors using the Internet as a medium.

2.2 Beacon

Beacon is a wireless smartphone near-field communication (NFC) module based on the Bluetooth 4.0 protocol. Beacon's communication range is 70–100 m, and it offers higher accuracy than NFC with Bluetooth 3.0. Beacon uses the Bluetooth Low Energy (BLE) technology, which allows it to be used for several years with very small batteries. Thus, it is used for NFC in various ways. Furthermore, Beacon is ideal for implementing IoT because it can identify the locations of smartphones, tablet PCs, and wearable devices and can send them data signals with high accuracy and low battery consumption [3-4].

3 Design of the Beacon Information Service as a "New-Concept University" Information Service

3.1 Outline of the Proposed System

The proposed system detects the location of moving users and sends information they need using the location-based Bluetooth 4.0 technology. This system was

incorporated into the university information system. It provides various kinds of information to the students and faculty members, including information about lecture rooms to assist classes, library use, convenience facilities, and university notifications. In this study, a customized information service was designed using IoT-based beacons to provide desired information at the desired time and place to members of the university.

3.2 Structure of the Proposed System

Figure 1 shows the service flow of the proposed system, which consists of a mobile application, an operation system, and beacons. The mobile application delivers user information to the contents operation system, and once the user authentication has been completed, the operation management module sends data to the user. The operation system has information about the registered beacons that have been installed in the buildings in advance. The process for a user to receive university information through a beacon is as follows. The dedicated application is installed on the user's smartphone, and the Bluetooth feature is activated. As shown in Figure 1-1, the application activated on the smartphone searches for the closest beacon. When information from the beacon found is sent to the operation system as shown in Figure 1-2, the information received (Figure 1-3) is sent to the user.

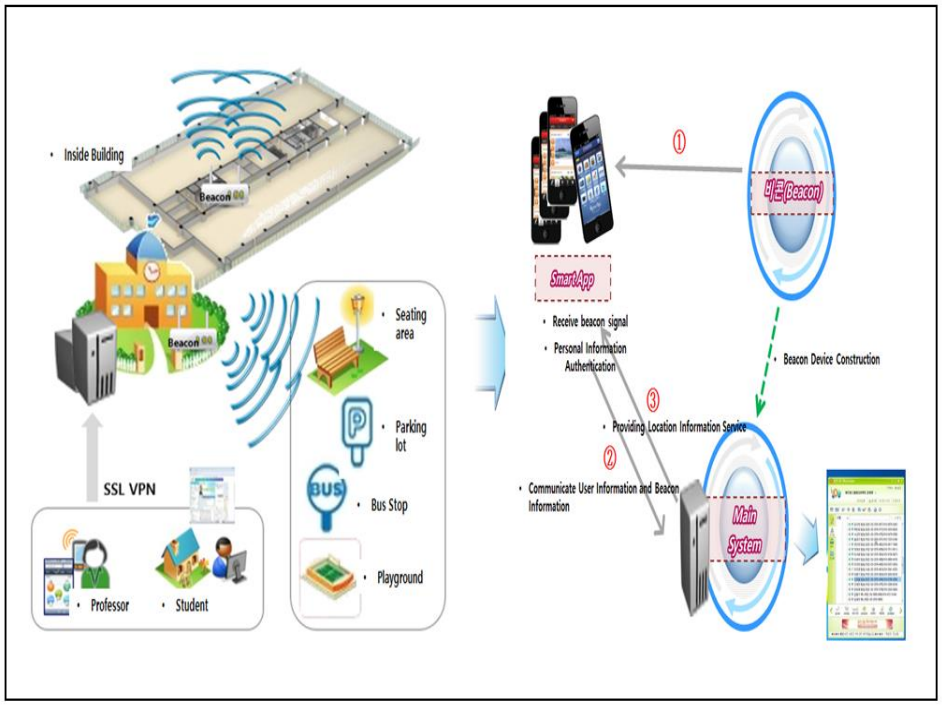

Fig. 1. Services Proposed System Flow Chart.

4. Conclusion

The proposed system provides desired information to users by detecting the location of moving users via Bluetooth 4.0 technology. In the past, information communication was a one-sided delivery service regardless of users' intentions, but the proposed system can provide customized information services to users by quickly delivering the desired information at the desired time. In universities, this system can provide information about academic calendars, lectures, books, university events, and buildings to students' smartphones. If the proposed system is widely utilized in universities, it could become a major IoT application. However, if the proposed system is used in a university, it should pay attention to the network security of the university. The network of universities will be able to increase the threat of information leakage with the Internet structure which is very familiar to hackers. Also, it should be noted that it is easy to replicate and analyze the source code on the assumption that the connection path with the user uses the smart device's app, so that a user's fatal information leakage may occur.

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