

# A Sensing System to break away from a Region using Location-Based Services

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**Abstract.** Most of the existing applications using LBS (Location-Based Services) are dynamic service mechanisms. In this paper, we propose a sensing system to break away from any specified location for any entities as a passive service mechanism. The proposed system has been initially locking between the smartphone and a target entity using LBS in smartphones. After a certain period of time, if the entity has been to break away from the specified boundary location, it is that the smartphone detects the straying status of the entity. Therefore, the proposed mechanism will can be used of many applications such as anti-theft or anti-lost of any entities, preventing of lost children. Especially, it will be more opportunities combining with the dynamic service mechanism.

**Keywords:** Sensing system, Location-Based Service, Passive service mechanism, Dynamic service mechanism, Geo-fencing, Smartphone,

## 1 Introduction

LBS(Location-Based Services) are used in a variety of contexts, such as health, indoor object search, entertainment, work, personal life, etc.[1-5] Most of these applications are dynamic service mechanisms.

In contrast, we propose a passive service mechanism, which is a sensing system to break away from any specified location for entities using LBS. The proposed system has been initially locking between a target entity and the smartphone using LBS. After a certain period of time, if the entity has been to break away from the specified boundary location, it is that the smartphone detects the straying status of the entity. Therefore, the proposed mechanism will can be used of many applications such as anti-theft or anti-lost of any entities, and preventing of lost children. Especially, it will be more opportunities combining with dynamic service mechanism.

This paper is organized as follows. In Chapter 2, we will investigate the research background. The framework design of the proposed system is presented in Chapter 3. The experimental results are described in Chapter 4. Finally, Chapter 5 provides concluding comments and suggestions for further research.

## 2 Related work

LBS include services to identify a location of a person or object, such as discovering the nearest banking cash machine or the whereabouts of a friend or employee[1][5]. LBS include parcel tracking and vehicle tracking services. LBS can include mobile commerce when taking the form of coupons or advertising directed at customers based on their current location[2][4]. They include personalized weather services and even location-based games. Another example is Near LBS (NLBS), in which local-range technologies such as Bluetooth, WLAN, infrared and/or RFID/Near Field Communication technologies are used to match devices to nearby services. This application allows a person to access information based on their surroundings; especially suitable for using inside closed premises, restricted/ regional areas[3]. Unfortunately, most of these applications are dynamic service mechanisms.

## 3 Design of a sensing system

In this paper, the proposed system for detecting regions detachment of the specific entity is divided into a client side for an ID(identification) management module for recognizing the entity, and a server side for modules of recognition and service of smartphone.

### 3.1 A Server-side Framework

The server as act a broker consists of a framework structure. This server framework is responsible for authentication, naming and network mediation services between an entity and smartphone.

#### (1) Network Manager

- Sender & Receiver for Entities IDs: Sending & Receiving for Entities IDs
- Sender & Receiver in App : Sending & Receiving IDs for App service of the smartphone

#### (2) Data Manager

- Naming Service Handler : Processing to create and register, authenticate a unique ID for any entities
- ID Checker : Processing to match between the registered ID and the requested ID from App

#### (3) ID Repository : Constructing Database for IDs that are requested by the Data Manager

### 3.2 A Client-side Framework

A client-side framework consists of an entity framework and an App framework of smartphone. The entity framework has holding authenticated ID via networks such as

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Wi-Fi, Bluetooth, TCP/IP. App framework detects the registered entities breaking away from user-specified location using LBS in smartphone.

(1) Entity Framework : Processing to recognize simply a unique ID per entity.

(2) App Framework

1) Network Manager

- Sender & Receiver for IDs : Sending & Receiving for Entities IDs to recognize

2) Service Manager

- ID & Event Listener : Handling the targeted IDs or the received events from the server.
- Location Monitor : Deviation detection module that periodically checks the specified boundary of a target entity
- LBS Handler : Monitoring range setting of the target entity using Google map
- Notification Handler : Processing the message alert

3) ID Repository : Constructing Database for the targeted IDs

## 4 Experimental results

For the implementation of the proposed system as a passive service mechanism, an experimental model is assumed that the target entity is set to USB memory and how to detect the entity through Android platform-based smartphone.

First of all, the server generates and registers a unique ID for the USB such as 'USB\_Client@ad8659' by the naming service handler, and the smartphone is connected to the server. Next, the server sends its ID to the smartphone. The synchronization between the USB and smartphone is done by the registered and same ID value. And then, we can not only detect the registered USB within pre-defined boundary such as 5 meters, 10 meters, 100 meters radius, but limit sensing range by changing the radius of 100 to 10 meters. After a certain period of time, if the USB has been to break away from the specified boundary region, it is that the smartphone detects the straying status of the USB, and vice versa.

## 5 Conclusion

LBS is an information service and has a number of uses in social networking today as an entertainment service, which is accessible with mobile devices through the mobile network and which uses information on the geographical position of the mobile device.

In this paper, we design and implement a sensing system to break away from any specified location for entities using LBS as a passive service mechanism. The proposed system will be used of not only many applications using LBS such as anti-theft or anti-lost of any entities, and preventing of lost children but also Geo-fencing application predicated by NRI(Nomura Research Institute). In addition, the system can be applied to more applications in conjunction with indoor LBS such as WPS(Wi-Fi Positioning System) and HPS(Hybrid Positioning System).

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