

# METROPOLITAN-SCALE POSITIONING SYSTEM BASED ON 802.11

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## ABSTRACT

Looking toward the ubiquitous information environment, there are some demands for positioning system which can use both indoors and outdoors. According to spread of wireless LAN, many positioning systems using wireless LAN have been developed. Although many studies have been made on accuracy in indoors environment, little is known about metropolitan-scale positioning system using wireless LAN. The positioning system we assume uses access point's reference trace set which consist of BSSID (Basic Service Set Identifier), signal strength, and location of access point. By using this reference points, the system estimates position. In this paper, we introduce metropolitan-scale positioning puroject based on 802.11 named Locky.jp.

## 1. INTRODUCTION

In recent years, many places, ranging from universities, companies, and homes to railway stations, airports, amusement facilities, and shopping malls have introduced wireless LAN and established wireless LAN facilities. Therefore, in the future we expect wireless LAN to become available anytime and anywhere. In addition, a considerable number of studies have been made on positioning systems using wireless LAN [1][2][3][4][5][6][7][8]. But little is known about metropolitan-scale positioning system using wireless LAN.

The positioning system we assume uses a reference trace set (RTS) consisting of BSSID (Basic Service Set Identifier), signal strength (SS) and position of access point (latitude and longitude). To construct a wide-area positioning system, it is important to collect the reference trace set effectively and widely.

$$RTS = \{BSSID, SS, latitude, longitude\} \quad (1)$$

By using reference trace set and triangulation method[?],

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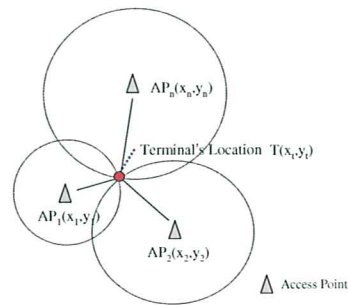


Fig. 1. Example of placing a figure with experimental results.

our system estimates terminal position. Fig.1 shows example of positioning using triangulation.

## 2. LOCKY.JP

### 2.1. Overview

Locky.jp[9] is metropolitan-scale positioning project designed to collect reference trace sets covering major locates in Japan through user collaboration. Locky.jp has the following 3 main goals.

1. Collection of metroplitan-scale reference trace set in Japan (and also abroad). The realization of a metropolitan-scale positioning system needs at least a prior survey of the wireless LAN environment. Locky.jp aim to this system through the collaboration of users.
2. Provision of a client program for the positioning system based on 802.11. We provide the "Locky client" that can estimate the device location based on reference trace set from a large number of users.
3. Development and provision of location-aware application. The "Locky client" provides different type of information according to the location. Locky.jp is also aiming for the development of different location-aware application.

## 2.2. Current Status of Reference Trace Set

We conducted wireless survey everywhere and collect collaborator. Fig.2 shows position of access points in Nagoya. In this environment we can receive wireless LAN signal more than 98% area. That is to say, wireless LAN based positioning is available everywhere.

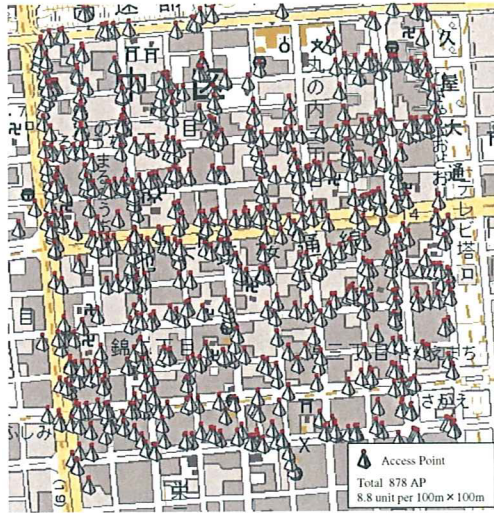


Fig. 2. Position Access Point (Nagoya Sakae)

Fig.3 shows all reference trace set in October 13. We collected 215076 reference trace set (= The number of access points) with 113 collaborators. These collaborators consist of universities, companies, and many other peoples.

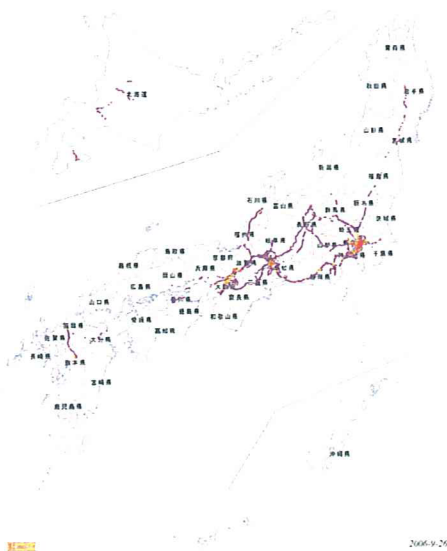


Fig. 3. Whole Reference Trace Set

## 3. CONCLUSION

In this paper, we introduced metropolitan-scale positioning project named Locky.jp. Location information is critical context for ubiquitous computing service, so we continue further research and discussion. Positioning system both indoors and outdoors will become a reality not-so-distant future.

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