
Extracting Social Contexts from Bluetooth Detection Logs

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Abstract

This project examines the daily detection log of surrounding Bluetooth devices in the environment obtained from the Bluetooth device carried by the user. The authors show possibilities to determine social contexts and changes of surrounding environments by analyzing the quantity of devices continuously or simultaneously detected on the detection log.

Keywords

Bluetooth device log, ubiquitous computing, context awareness, social context, everyday computing

ACM Classification Keywords

H5.2. Information interfaces and presentation (e.g., HCI): Miscellaneous.

Introduction

This research explores the possibilities of grasping social contexts by detecting the surrounding electronic equipments mounted with Bluetooth device, such as mobile phones, PDAs, laptops and home appliances. The method consistently detects the surrounding Bluetooth devices, and generates detection logs. In contrast to the method which determines user's location such as PlaceEngine[1], we attempt to track the social contexts existing around the user. We can grasp the social contexts anywhere seamlessly in real time, without taking actions in collecting data.

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Characteristics of Bluetooth Detection

This paper examines the social context within the 10 meter range of user carrying the class 2 Bluetooth device. There are many Bluetooth devices in the environment which respond to the inquiry (by sending their BDA¹) automatically. Using these social circumstances, we try to analyze the surrounding environment of user.

The features of Bluetooth detection log differ depending upon the situations of the surroundings. Thus, it is possible to assume the social contexts by analyzing the detection logs according to the changes of situations of surrounding environments.

Experiment Results

Here, we present the observations of Bluetooth detection log. We have experimented using 5 PDAs daily, 3 of them for 3 months and 2 of them for 6 months. Fig. 1 shows the detection log of a working day collected from two colleagues. The time-line is expressed on the horizontal-axis, and the device ID assigned in chronological order of the incoming BDA on the vertical-axis. The mobile phones are colored in red, and PCs and other devices than mobile phones in green.

The following points are verified from detection log:

Quantity or density of people

(Change of density of existing devices)

People moving to-and-fro

(Flow of existing devices)

People staying in same space (independent from place)

(Time length of existing devices)

¹ Bluetooth Device Address (BDA): Unique ID (MAC address) assigned to each Bluetooth device during manufacture.

The detection log informs long/short-term detection, appearance/disappearance of multiple BDAs, etc. These features indicate the characteristics and changes of the surrounding environment of user. The detection log also has possibilities to analyze the user's activities.

The left figure shows transportation by train during rush hours. From the log, we can verify three situations: (i) many people got on/off the train at major stations; (ii) almost all devices disappeared when changing the train; and (iii) several people took the same train until destination. In the right figure, several PC/PDAs were detected in 10:00-12:30 during research meetings, and one of them had lunch together with user. In 15:10-16:40, many mobile phones of students were detected for long-term during class lecture.

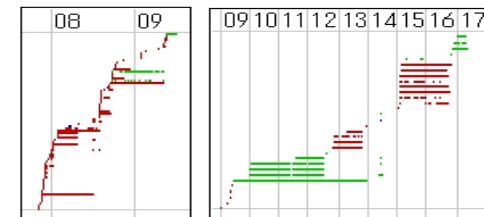


figure 1. Detection log [transportation: left, university: right].

Concluding Remarks

We are currently setting multiple parameters to analyze the characteristics of detection data. We are also performing experiments for long-term and short-term detections, as well as analysis for detection of same BDA on multiple daily activities.

References

[1] PlaceEngine: <http://www.placeengine.com/>