SEZAKI LAB.

[Urban Sensing and Mobility Analysis]

Center for Spatial Information Science

Socio-cultural Environmental Studies

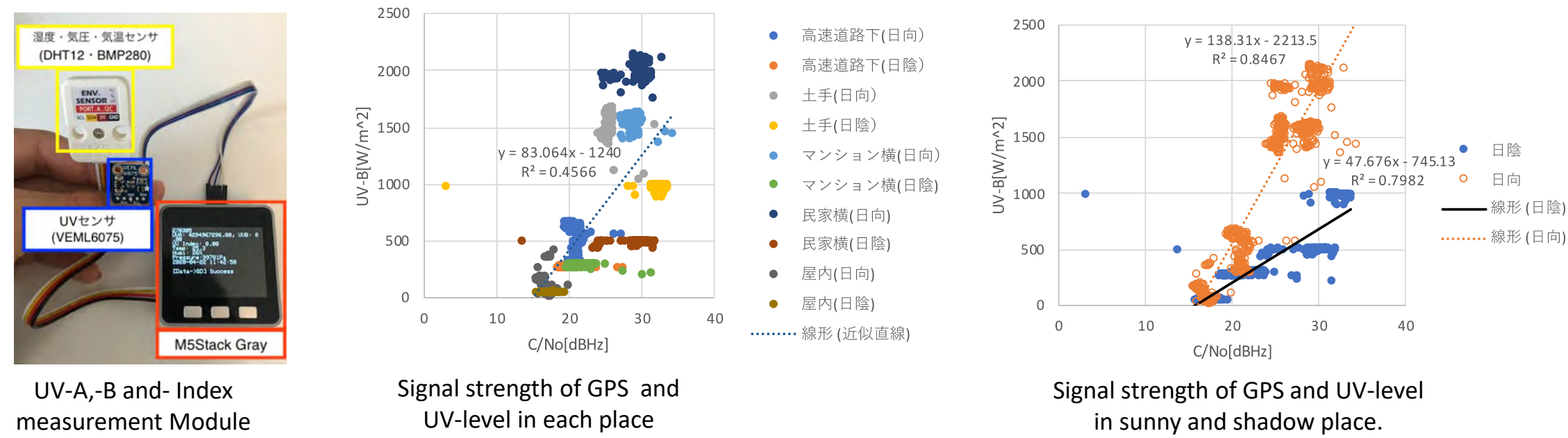Information & Communication Engineering

https://www.mcl.iis.u-tokyo.ac.jp

Estimating Ultra Violation (UV) by Using GPS Signal

Background: Sufficient Vitamin-D is an important factor for a healthy life, and it is generated at human skin by UV. However, excessive UV exposure increases the risk of skin cancer.

Goal: Monitoring daily UV exposure dose only by a mobile device

Approach: Estimating UV exposure dose from a strength of GPS signal

UV-A,-B and- Index measurement Module

Signal strength of GPS and UV-level in each place

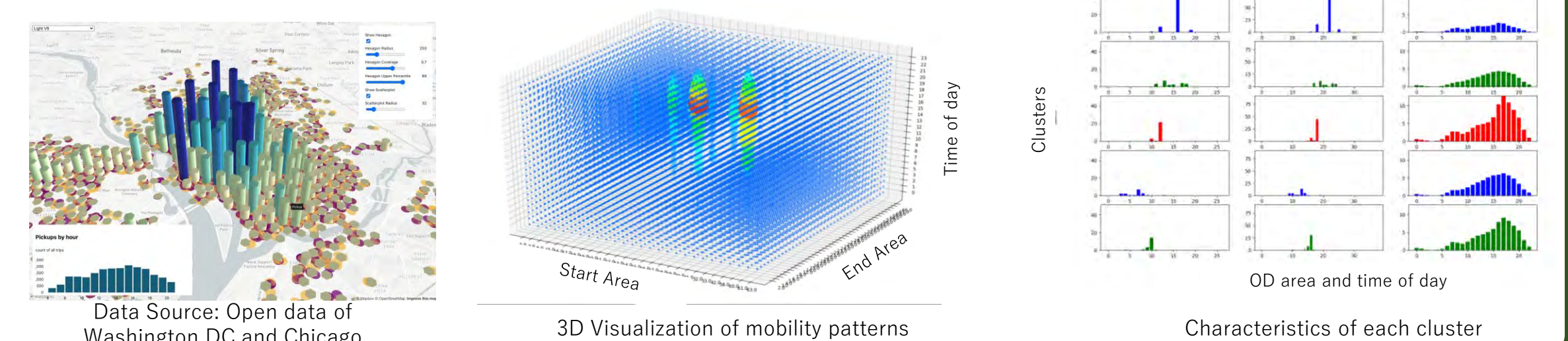Signal strength of GPS and UV-level in sunny and shadow place.

Toward Classifying Usage Pattern of Dockless-Micromobility by Non-Negative Tensor Factrization

Background: Dockless micromobility services spread to major cities
- Benefit: Improving last one-mile mobility
- Risk: Increase rate of traffic accident, and deterioration of landscape

Method: Extracting "potential mobility patterns" from None-negative Tensor Factrization (NTF)
- Our methods extracted a number of mobility patterns that seem like work-trips and tourists. This information can be used for urban design with Dockless micromobility services

Dockless Micromobility

Data Source: Open data of Washington DC and Chicago

3D Visualization of mobility patterns

OD area and time of day

Characteristics of each cluster

Mobile-assisted Ad Hoc Networking Architecture Based on Location Information

The proposed architecture achieves the significant reduction of the unnecessary packets and the improvement of the packet arrival rate

Proposed Method:
- Location layer : The roles of the location layer are to manage the locations of nodes and to determine the virtual area of each ad hoc network by a management server via mobile network.
- Ad-hoc layer : The roles of the ad hoc layer are to establish an actual route and then to send data along the established route via local networks
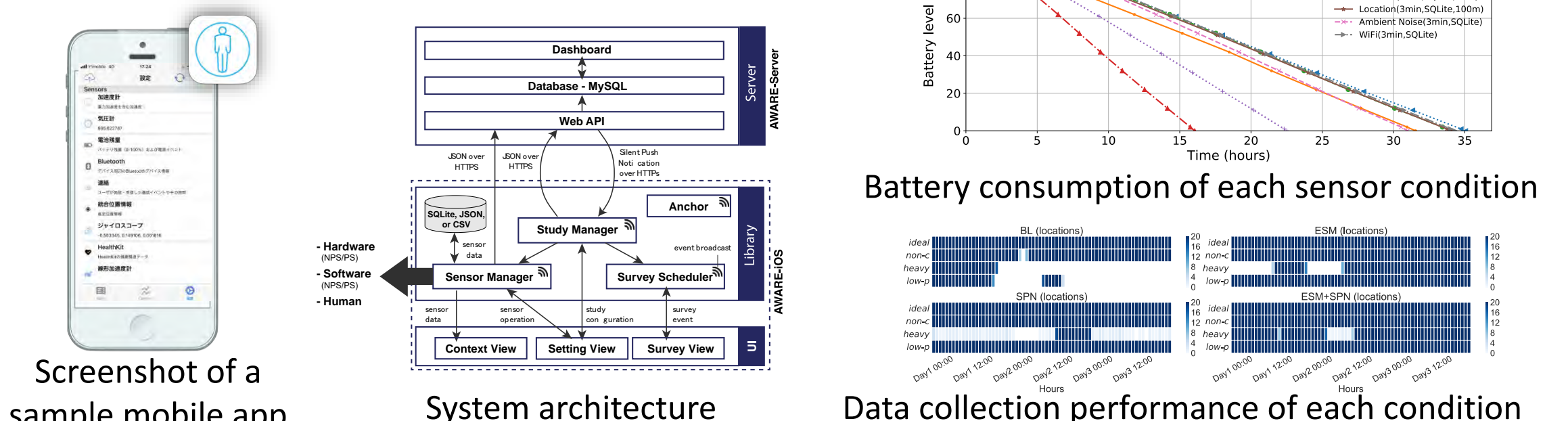

提案手法概要

Simulation result
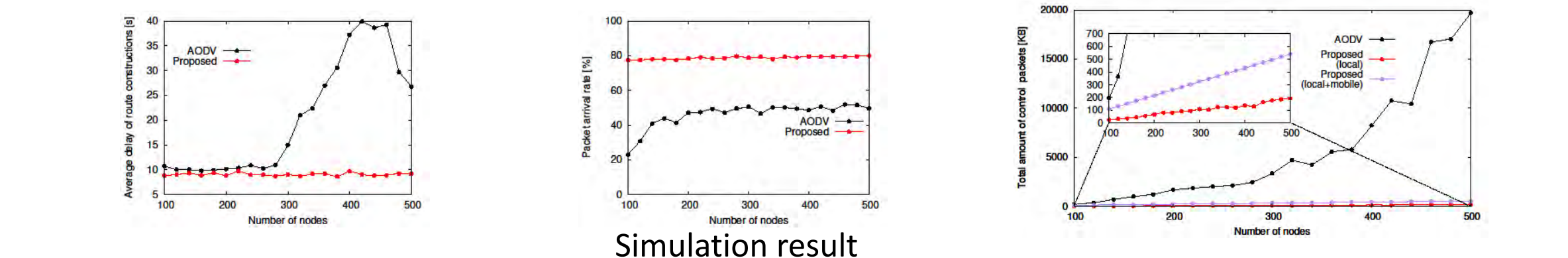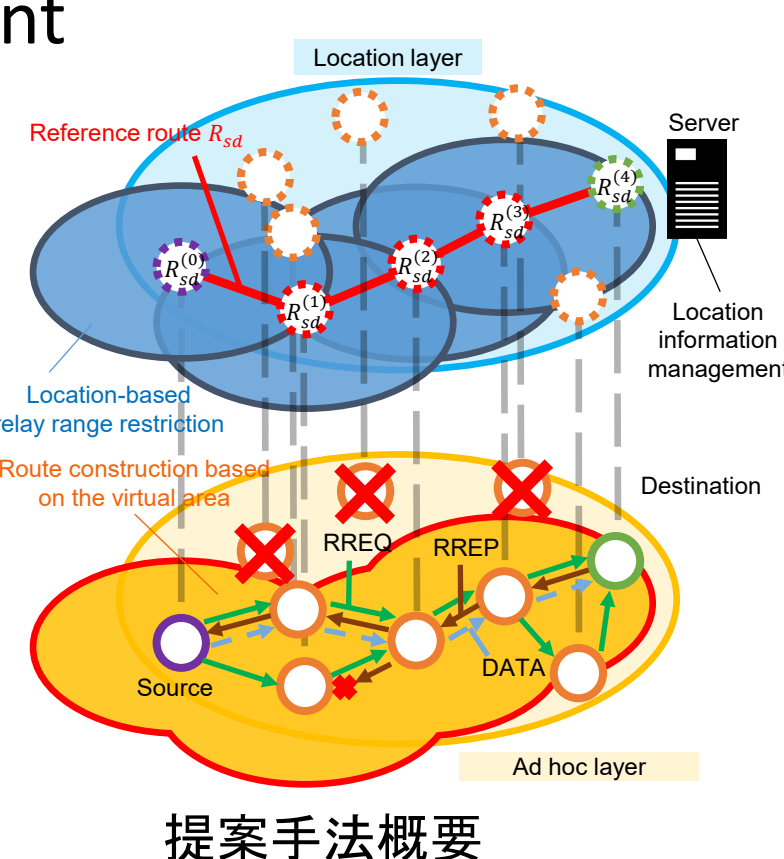
AWARE：Developing and Managing Open Source Mobile Sensing Framework

Background: The smartphone is used as a sensing platform among a great number of researches. However, the development cost for a stable sensing application is quite high and takes lots of tedious works.
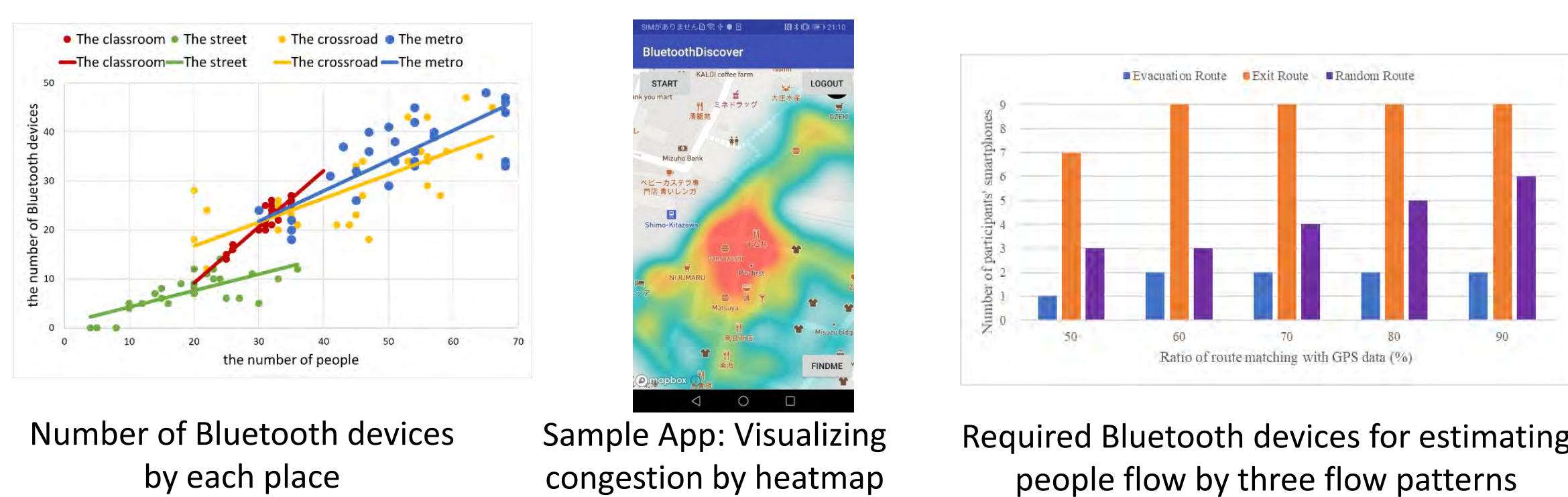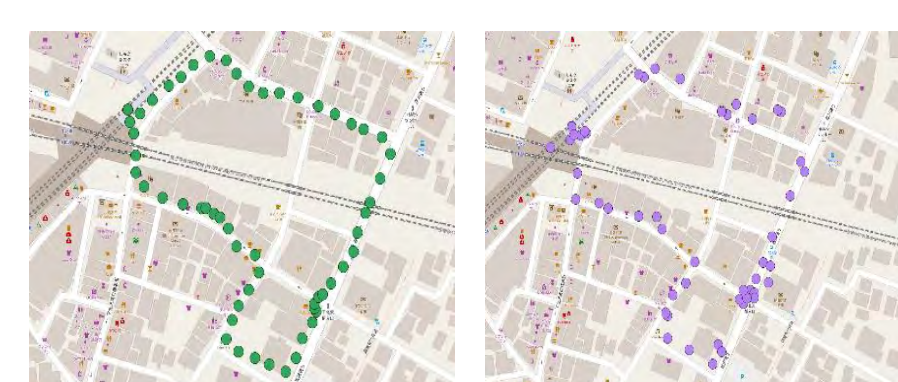
Goal:
- Providing a stable mobile crowd sensing framework
- Continues integration by open source community, and flexible framework integration

Screenshot of a sample mobile app

System architecture

Battery consumption of each sensor condition

Data collection performance of each condition

Crowd and People Flow Detection by Using Bluetooth Scanning

Goal: Detecting crowd and people flow by using surrounded Bluetooth devices

This method can be applied to recognize crowds and people flows by offline, and suggest a detour in the evacuation situation.

GPS(original route)（left）vs Our method (estimated route)（right）

Number of Bluetooth devices by each place

Sample App: Visualizing congestion by heatmap

Required Bluetooth devices for estimating people flow by three flow patterns

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Position Estimation Using LPWAN for Natural Environment Monitoring by Animals

Background: Continuous natural environment monitoring is required for environmental conservation

Issue: In the deep forest area, mobile network (4G/LTE) is not reachable, and human can not visit the place easily.

Approach: Attaching sensor to wild animals that living in the forest, and collect the sensor data via LPWAN (Low-Power Wide-Area Network)

Experimental Place

Sensor nodes' location   Receivers' location

Estimating location by using LPWAN

Signal strength and distance

Overview of this research

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