SEZAKI LAB.

[Urban Sensing and Mobility Analysis]

Center for Spatial Information Science

Socio-cultural Environmental Studies
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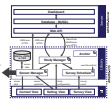
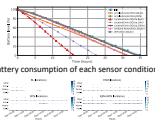
AWARE：Open Source Mobile Sensing Framework

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

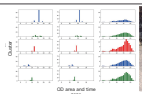
Data collection performance of each condition

Personal Mobility Optimization Using Available Taxi Resources

Background.
Rapid spread of dockless micromobility such as electric scooters and increase in relocation costs
Excess supply of existing means of transportation (e.g., cabs) due to the increase in new transportation

Use excess resources to optimize the relocation of dockless micromobility
→Context detection in taxi cabs
→Simulation of collection and relocation scheduling of electric scooters

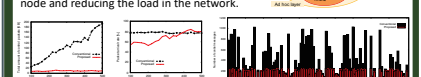

Scooter distribution map


Feature diagram of clusters


Context Estimation Using Taxis

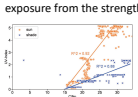
Route Construction Method Based on Traffic Load for Cellular-assisted MANET

Purpose:
MANET, which uses mobile communication, may cause uneven traffic load distribution since its area restriction algorithm prioritizes a neighboring area of a node having many neighboring nodes to make a virtual area.
Result:
Succeeded in distributing the traffic load of each node and reducing the load in the network.


Simulation result

Estimate UV Exposure by using Signal Strength from Satellites

Background:
Too much UV exposure cause skin cancer
Vitamin D is produced when we are exposed to UV
Purpose:
Estimate UV exposure from smartphone(without especial sensor)
Proposed Method:
Measured UV exposure and strength of GPS in a sunny day Estimated UV exposure from the strength of GPS


GPS intensity and UV amount

UV sensor


Application of measuring GPS

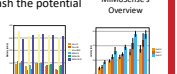
MiMoSense: An Open Crowdsensing Platform for Micro-Mobility

Background:
The lack of an open sensing platform for micro-mobility forces researchers to build their own data collection platform from scratch, which could be laborious.
Contribution:
1. As an open-source platform, MiMoSense shifts the researcher's focus from software development to sensing data analysis.
2. MiMoSense's various interface could unleash the potential of micro-mobility related research.


MiMoSense's Overview


Prototype on E-Scooter


Research Workflow in MiMoSense


Battery Consumption and Message Latency Evaluation

Designing an Incentive Model for Promoting Hygiene Behaviors

Background:
A behavioral tracking application (SelfGuard) recognizes users' infection prevention behaviors such as hand washing, stay recording, and physical condition recording through sensor-based experiments and data analysis. By providing incentives for those behaviors, we will identify how they affect people's behavior.

Significance:
Our goal is to help users improve their person hygiene and lower the risk of infection.


SelfGuard's Overview


Screenshots of SelfGuard


Experimental Process