

University of Luxembourg

CSC - Computer Science and Communications Research Unit

PCOG meeting

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Supervisor

Prof. Ulrich Sorger

Academic Background

- ▶ Bachelor's Degree in Telecommunication Engineering



UNIVERSITÀ DI PISA

- ▶ Master's Degree in Telecommunication Engineering



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- ▶ Internship for Master Thesis

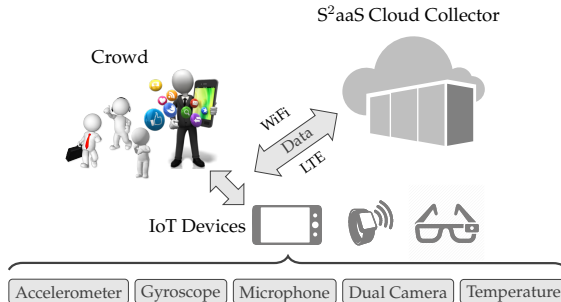
- ▶ Supervisors: Prof. S. Giordano, Dr. D. Kliazovich,
Dr. C. Fiandrino



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Mobile Crowdsensing

- ▶ Appealing paradigm for sensing and collecting data
 - ▶ Monitoring phenomena in smart cities
- ▶ Sensing as a Service (S^2aaS) business model
- ▶ Sensors commonly available in mobile and IoT devices



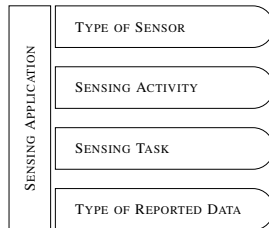
Acquisition Framework

- ▶ Opportunistic sensing paradigm
- ▶ Energy-efficient data collection
- ▶ Network-aware
- ▶ Analytical performance evaluation
- ▶ Simulations in a real urban environment with a large number of users

A. Capponi, C. Fiandrino, D. Kliazovich, P. Bouvry, and S. Giordano, "A Cost-Effective Distributed Framework for Data Collection in Cloud-based Mobile Crowd Sensing Architectures", *Submitted for **second round** of review to IEEE Transactions on Sustainable Computing*, 2016.

Survey on Mobile Crowdsensing Systems

- ▶ Early stages of research
- ▶ Propose a new taxonomy
- ▶ Applications taken into consideration
 - ▶ Intelligent Transportation Systems
 - ▶ Environmental monitoring
 - ▶ Health Care
 - ▶ Public Safety
 - ▶ Waste management



A. Capponi, C. Fiandrino, D. Kliazovich, C. Franck, U. Sorger, P. Bouvry, S. Giordano, N. Fonseca, and B. Kantarci "A Cost-Effective Distributed Framework for Data Collection in Cloud-based Mobile Crowd Sensing Architectures", *To be submitted to IEEE Communication Surveys and Tutorials*, 2017.

MCS Systems Performance in Smart Cities

- ▶ No tools for evaluating MCS on a large scale
- ▶ Design Principles
 - ▶ Scalability
 - ▶ Realistic Urban Environment
 - ▶ User Mobility
 - ▶ Communication Technologies
- ▶ Key Performance Indicators
 - ▶ Data Generation (samples collected in a region of interest)
 - ▶ Cost Evaluation (energy consumption due to sensing and reporting)



A. Capponi, C. Fiandrino, C. Franck, U. Sorger, D. Kliazovich, and P. Bouvry, "Assessing Performance of Internet of Things-based Mobile Crowdsensing Systems for Sensing as a Service Applications in Smart Cities", *Accepted for publication in 8th IEEE International Conference on Cloud Computing Technology and Science (CloudCom)*, Dec. 2016.

- ▶ Exploiting presented design principles
- ▶ Custom simulator for crowdsensing activities
 - ▶ Access and download: <http://crowdsensim.gforge.uni.lu>
 - ▶ Contact: crowdsensim@gmail.com



CrowdSenSim Mobile Crowdsensing Simulator



HOME

DOWNLOAD

DOCUMENTATION

PUBLICATIONS

TEAM

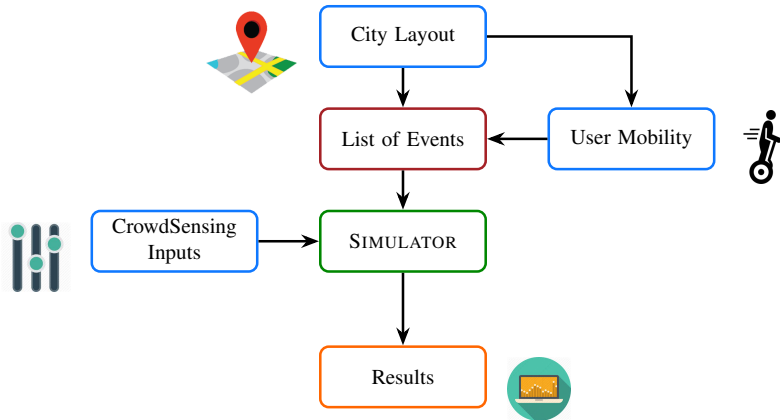
About the Simulator

CrowdSenSim is a discrete-event simulator designed for research use in Mobile Crowd Sensing. It allows simulation of large-scale crowd sensing activities in urban scenarios and can be used to develop novel solutions in data collection, task assignment, monitoring and resource management. It is released under the GNU General Public License version 3.



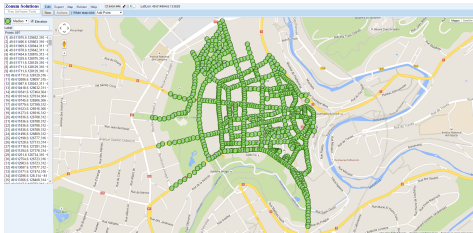
CrowdSenSim: Features and Architecture

- ▶ Large scale (time-space)
- ▶ Realistic urban environments



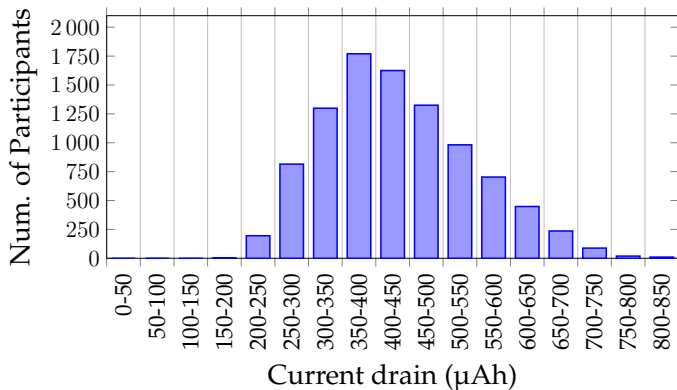
Evaluation Settings

- ▶ Luxembourg City center
- ▶ Users: 1000-10 000
- ▶ Walking speed: u [1 – 1.5] m/s
- ▶ Walking period: u [10 – 30] min
- ▶ Simulation period: 8 AM - 2 PM



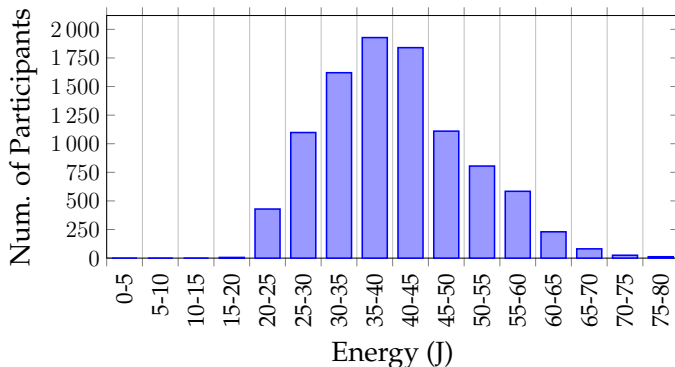
Evaluation Settings

- ▶ *Energy consumption for sensing process*
- ▶ Energy consumption for reporting process



Evaluation Settings

- ▶ Energy consumption for sensing process
- ▶ *Energy consumption for reporting process*



Summary

- ▶ Energy-efficient framework for MCS data collection
- ▶ Survey on MCS architectures
- ▶ Assessing performance of MCS systems in Smart Cities
 - ▶ CloudCom 16
- ▶ CrowdSenSim: simulator for Mobile Crowdsensing
 - ▶ Access and download: <http://crowdsensim.gforge.uni.lu>



Thank You!

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