

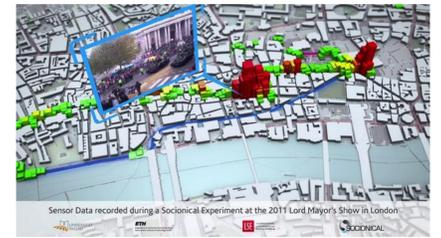
Design and Experimental Evaluation of Market Mechanisms for Participatory Sensing Environments

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Participatory Sensing

- Participatory sensing is empowered by the involvement of citizens and community groups in the process of sensing and documenting

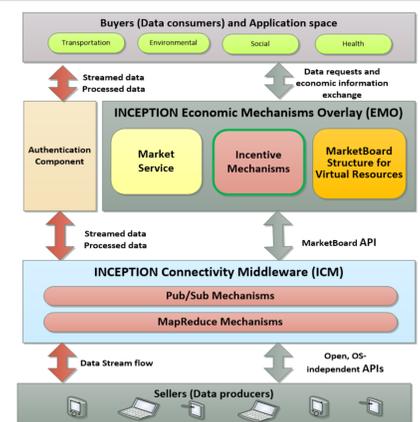


Key Economic Issues

- The performance of a participatory application greatly relies on the number of users contributing
- There is a cost in collecting, transmitting and storing information, and thus users may be reluctant to provide information. Also sensors are not "consumed".
- Why should users share or exchange such information? → They need the right incentives!**

Our Approach

- Treat users owning sensing devices as economic agents
- Develop a marketplace that takes into account the positive externalities in the demand side and the complementarities in the supply side
- Optimise the market mechanisms towards achieving **efficiency**, i.e. **high social welfare (SW)**, and **marketplace economic sustainability**



Market Mechanisms

- Based on Moulin-Shenker [1] with cost covering guaranteed
- Altruistic mechanism, with costs subsidization
- Marginal Cost Pricing (VCG-like) with optimal SW guaranteed

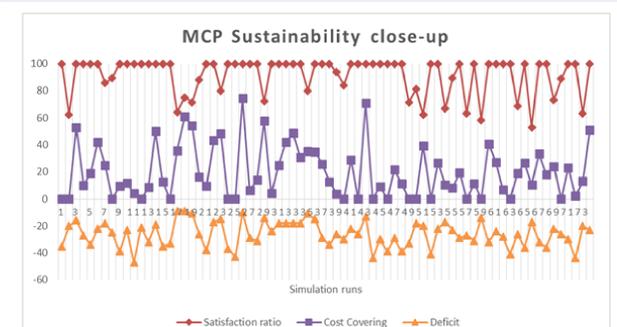
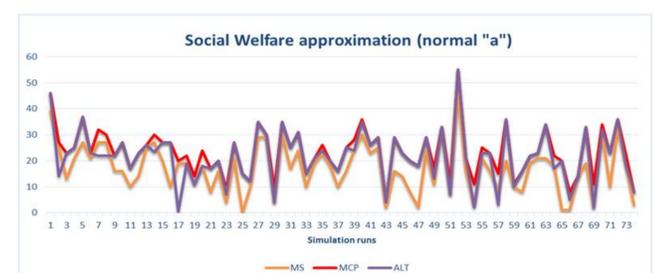
Evaluation Scenarios

- General inelastic demand
- Multi-unit elastic demand
- Multi-unit inelastic demand

[1] H. Moulin and S. Shenker. Strategyproof sharing of submodular costs: Budget balance vs efficiency. *Econ. Theory*, 2001.

Main Conclusions

- Cost covering and strategyproof mechanisms can have substantially improved performance **if buyers are altruistic in covering the budget deficit of others**
- The MCP mechanism provides excellent results but for our setting the **budget deficit is poorly covered** (we can hardly cover the costs of the suppliers). Thus, it is not suitable, because
 - ... economic efficiency (high SW) is important but in a participatory sensing environment it is imperative to also consider **the long-term sustainability market run**



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