
From Crowding Detection to Community Fieldwork: Supporting Sensing Work in Context

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Abstract

We describe our experiences with the prototype crowd sensing environments for supporting crowding detection and community fieldwork, and discuss the need to support sensing work in context. Sensing work is inseparable from the shifting observation modes in the overall inquiry process.

Author Keywords

Crowd sensing; sensing work

ACM Classification Keywords

H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

Introduction

To collect useful information based on citizen participation, we have developed different kinds of crowd-sensing environments: (1) a preliminary crowding detection environment that combines manual and automatic data collection methods, and (2) a fieldwork-support environment that uses a photo tagging mechanism to support exploratory data collection.



Fig. 1. Measuring CO₂ concentration to estimate the level of crowding.

Crowding-Detection Environment

Providing information about crowding in public spaces can help citizens get around in a city without unnecessary stress. We developed a prototype environment that allows people to share crowding information manually, using a simple Web form, and semi-automatically, using a CO₂ sensor. Fig. 1 shows a bag that automatically uploads CO₂ data via an Xbee-Bluetooth gateway pouch and a smartphone. We designed this citizen sensing appliance based on our preparatory experiment that revealed apparent correlation between CO₂ concentration and crowding on trains. Based on this system, we identified general approaches that can facilitate rapid development of crowd sensing environments[1]: (1) provision of a hardware/software toolkit, (2) support for preparatory and exploratory data collection, and (3) support for sharing and reuse of relevant models.

Fieldwork-Support Environment

Citizens collect and share geo-tagged photos and sensor data to explore issues in their local environments. FixMyStreet and Japan Geigermap are relevant examples. Data collection in this context can be more open-ended and exploratory than in the crowding-detection scenario. We developed a citizen sensing environment called Scene Memo, which allows participants to share photos and tags in real time to support rapid exploration in a community fieldwork setting[2]. The system provides social cues that influence collaborative data-collection activities in different ways.

In our preliminary experiments with Scene Memo, shared tags seemed to allow participants to work efficiently by avoiding redundancy, socialize and

compete with other participants. Also, it seems that shared tags can support a type of discovery and learning when it is embedded in a right kind of sociotechnical environment and collaboration context.

Sensing Work in Context

In some cases, citizens 'passively' collect data in existing sensing environments. In other cases, they can be more active, creating and modifying their own sensing environments. Supporting the latter cases is important to develop a citizen-centric sensing environment and foster *cultures of participation*[3].

Our experiences suggest that citizen-centric sensing involves different kinds of sensing work in different context. For example, participants' modes of sensing work can change from an exploratory one to more focused ones, which closely reflects the shifting modes of observation in the citizen-science inquiry process. In turn, sensing tools must be adaptable to the shifting modes of sensing work.

Conclusion

We briefly described our experiences with the prototype crowd sensing environments. Based on these experiences as well as existing techniques, we can design a crowd sensing framework that supports different modes of sensing work and active participation of citizens.

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References

- [1] Konomi, S., Shoji, K. and Ohno, W. (2013) Rapid Development of Civic Computing Services: Opportunities and Challenges. Proc. HCI International, Springer. (to appear)
- [2] Konomi, S., Sasao, T., Arikawa, M., and Fujita, H., (2013) A Mobile Phone-Based Exploratory Citizen Sensing Environment, Proc. International Workshop on Human Interfaces for Civic and Urban Engagement (HiCUE). (to appear)
- [3] Fischer, G., "Understanding, Fostering and Supporting Cultures of Participation," interactions, Vol. XVIII.3, pp.42-53, ACM Press, 2011.