

# DISTRIBUTED COLLABORATION IN CONTEXT-AWARE SYSTEMS: AVOIDING DISRUPTION TO BOTH USERS AND THEIR NEIGHBORHOOD

Fátima Castro Jul, supervised by Ana Fernández Vilas, Rebeca P. Díaz Redondo  
I&C Lab, Department of Telematics Engineering. University of Vigo

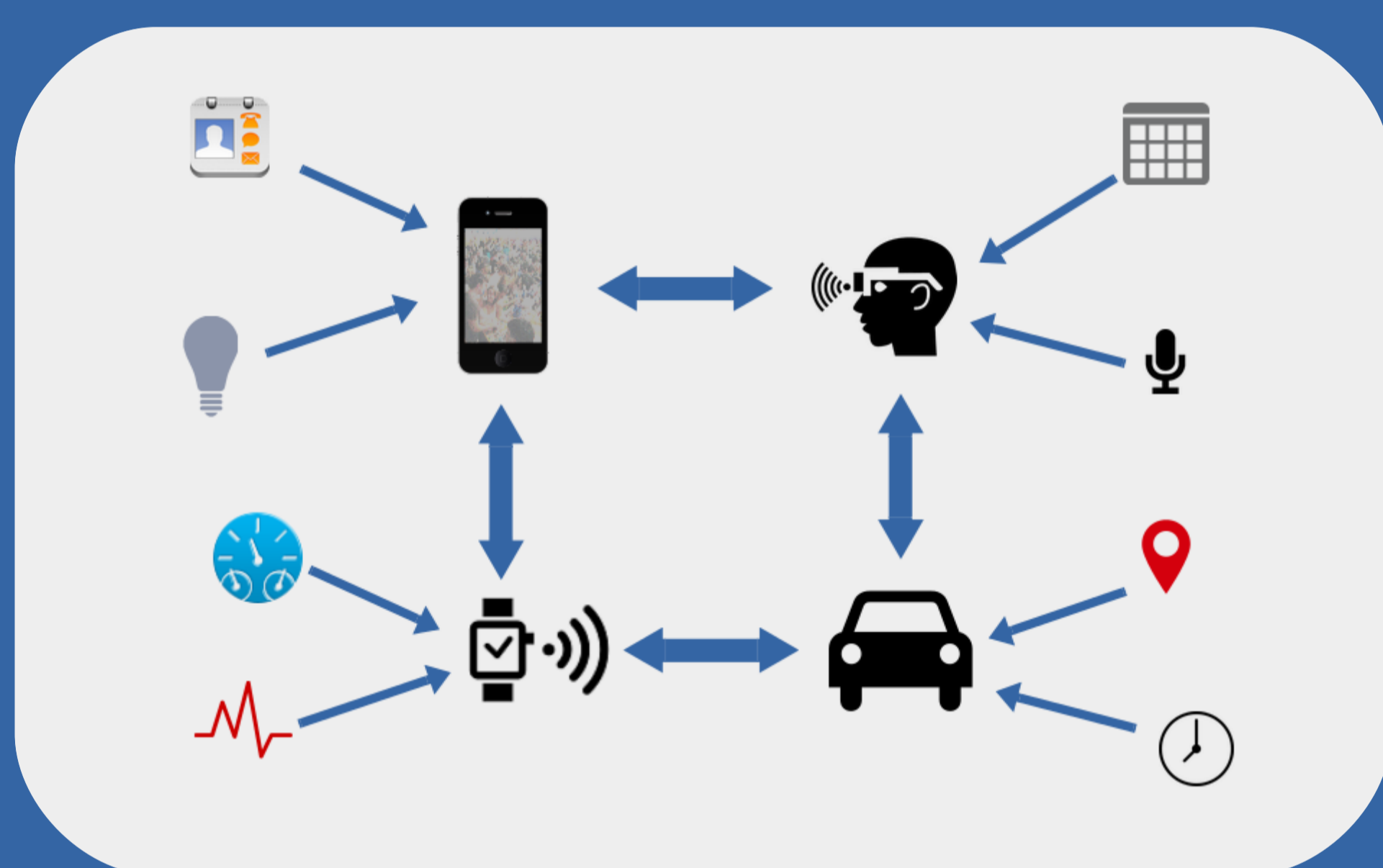
## Motivation

The proliferation of embedded sensors has enabled mobile devices to be aware of their changing circumstances and adapt their behavior accordingly. This adaptation should be performed as transparently as possible in order to ensure minimal disturbance to users [1]. Current research on context-dependent behavior focuses on routine inference through training [2]. This thesis aims to study the possibilities of collaborative strategies for this task [3]. These strategies will allow not to limit adaptation to everyday activities, but to expand it to unusual situations. Cooperation may include both socially [4] and physically close devices [5]. In the latter case, the area to be considered may vary from local proximity, where direct communication between devices can be performed, to bigger urban areas where information is exchanged through distributed ad hoc networks.

## Objectives

Design, development and evaluation of collaborative strategies in context monitoring and management. Information from physically and socially close devices will be combined to support autonomous decision-making and improve adaptation to unusual situations.

Research areas: distributed and proximity-based communications, ad hoc networks, context inference, decision strategies, information dissemination, social networks.



## Results & Discussion

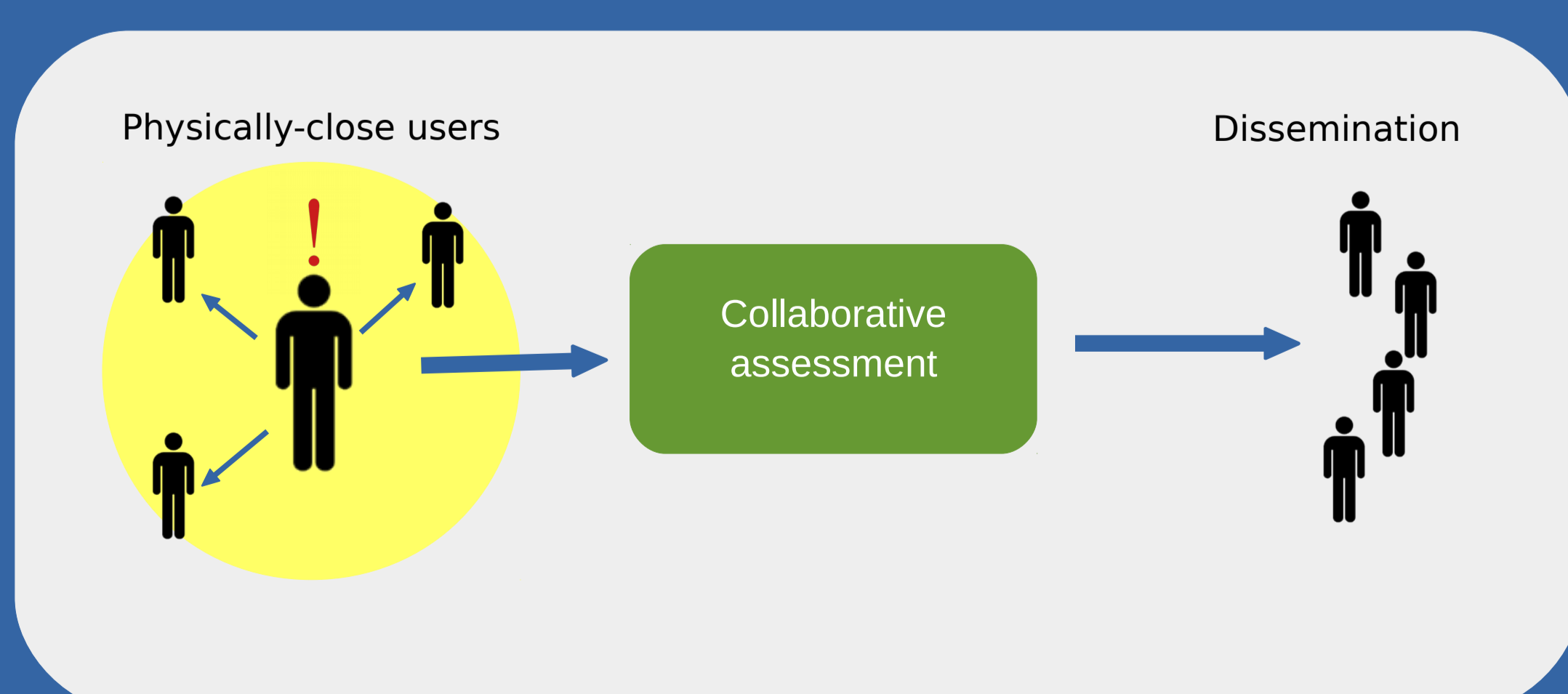
- Exchange of data on appropriate behavior in room-size areas. Assessed by simulation using real data on people movement in indoor scenarios.

- F. Castro Jul, A. Fernández Vilas and R. Díaz Redondo. "How should my device behave now? Applying consensus protocols for autonomous context management?" *Journal of Computers* (To appear).

- Application of collaborative assessment strategies to alert dissemination in order to reduce irrelevant and duplicate messages.

- F. Castro Jul, A. Fernández Vilas and R. Díaz Redondo. "Have you also seen that? Collaborative alert assessment in ad hoc participatory sensing" *UCAmI 2016* (In review)

- F. Castro Jul, A. Fernández Vilas and R. Díaz Redondo. "Collaboratively filtering alerts in ad hoc networks", *Ad Hoc Networks* (In review)



## Research plan

- State of the art review:

- Comprehensive literature review in context detection, context-aware adaptation, device collaboration and ad hoc networks.

- Collaboration in close proximity:

- Gathering of real data on users' context changes.

- Design of communication strategies to enable collaboration between nearby context-aware systems.

- Collaboration in urban areas:

- Application of collaborative assessment strategies to data dissemination in participatory sensing schemes.

- Collaboration in social proximity:

- Application of the collaborative strategies designed in the previous stages to socially close devices.

- Evaluation of the proposed communication strategies employing network and urban mobility simulations based on real data.

- Result dissemination through publications in international conferences, workshops and journals.

## Next year planning



## References

- [1] V. Pejovic and M. Musolesi, "InterruptMe: designing intelligent prompting mechanisms for pervasive applications," *Proceedings of the 2014 ACM International Joint Conference on Pervasive and Ubiquitous Computing. UbiComp'14*, pp. 897-908, 2014.
- [2] T. Maekawa, N. Yamashita, and Y. Sakurai, "How Well Can a User's Location Privacy Preferences be Determined Without Using GPS Location Data?," *IEEE Transactions on Emerging Topics in Computing*, vol. 6750, no. c, pp. 1-13, 2014.
- [3] P. Huuskonen, J. Mäntyjärvi, and V. Kónönen, "Collaborative Context Recognition for Mobile Devices," *Handbook of Ambient Intelligence and Smart Environments. Springer US*, pp. 257-280, 2010.
- [4] A. Sarjanoja, M. Isomursu, P. Isomursu and J. Häkkinen. "Integrating collaborative context information with social media: a study of user perceptions." *Proceedings of the 25th Australian Computer-Human Interaction Conference: Augmentation, Application, Innovation, Collaboration. ACM*, 2013.
- [5] D. Christin, P. Sánchez López, A. Reinhardt, M. Hollick, and M. Kauer, "Share with strangers: Privacy bubbles as user-centered privacy control for mobile content sharing applications," *Information Security Technical Report*, vol. 17, no. 3, pp. 105-116, 2013.