Autonomous and Distributed Recruitment and Data Collection Framework for Opportunistic Sensing

Group 1

Giacomo Benincasa (giacomo@cise.ufl.edu)
Efrain Gonzalez (egonzalez@ufl.edu)
Guangyan Hu (guangyan@cise.ufl.edu)
Jordan Leeper (jleeper@ufl.edu)
Güliz Seray Tuncay (gulizseray@gmail.com)

Abstract

Opportunistic sensing is an approach that dynamically exploits the sensing resources offered by smart phones in order to collect data about a certain area. Opportunistic sensing differs from other types of people-centric sensing due to the *opportunism* with which the sensing activity is performed. Participants are not expected to change their behavior in order to provide data to the sensing activity, and may contribute to the sensing only for a short fractions of time.
Because of the little or no control required from the participants, issues like energy efficiency, parsimonious use of expensive cellular network and privacy preservation are paramount. We propose the creation of a suite of network protocols to support the creation of opportunistic-sensing applications that are distributed, private and that do not rely on any infrastructure, with the exception of a limited number of nodes that are designated as sinks.

Numerous approaches have been proposed to support people-centric sensing recruitment, however, most of them rely on registries that collect possible candidates for the sensing activities and therefore that require the presence of a trusted third party. We design a recruitment protocol to efficiently send recruitment messages in a ad-hoc fashion.

Numerous applications that have been devised to support participatory sensing campaigns send the collected data via cellular network. While this is often a viable approach, most smartphone owners subscribe monthly data plans that limit the amount of data that they download or upload each month. Possible participants are likely not to take part to a sensing activity if they risk incurring unexpected fees. Therefore it is useful to deploy sink nodes and collect the sensed information in an ad-hoc fashion, by opportunistically exploiting connections between the sensing nodes and the sinks. Many such protocols to collect information in sensor networks have been devised. However, opportunistic sensing networks are defined by extreme churning: participants may take part to the sensing only for a short time, and then leave the sensed area and never return before the sensing activity has ended. Despite the fact that protocols for mobile, delay tolerant, wireless sensor networks have been proposed, no one, in our knowledge, addresses the unique problems that opportunistic sensing networks entail.

References

Recruitment:

Reddy, S., Estrin, D., & Srivastava, M. (2010). Recruitment Framework for Participatory Sensing Data Collections. *International Conference on Pervasive Computing*.

J. Burke, D. Estrin, M. Hansen, A. Parker, N. Ramanathan, S. Reddy, M. B. Srivastava, Participatory Sensing

Jeffrey Goldman, Katie Shilton, Jeff Burke, Deborah Estrin, Mark Hansen, Nithya Ramanathan, Sasank Reddy, Vids Samanta, Participatory Sensing: A citizen-powered approach to illuminating the patterns that shape our world

DTN Routing/Dissemination:

Lindgren, A., Doria, A., & Schelén, O. (2003). Probabilistic routing in intermittently connected networks. *ACM SIGMOBILE Mobile Computing and Communications Review*, *7*(3), 19. doi:10.1145/961268.961272

Hui, P., Crowcroft, J., & Yoneki, E. (2011). BUBBLE Rap: Social-Based Forwarding in Delay-Tolerant Networks. *IEEE Transactions on Mobile Computing*, *10*(11), 1576-1589. doi:10.1109/TMC.2010.246

Mascolo, C., & Musolesi, M. (2006). SCARR: Context-aware Adaptive Routing in Delay Tolerant Mobile Sensor Networks. *Proceeding of the 2006 international conference on Communications and mobile computing - IWCMC '06* (p. 533). New York, New York, USA: ACM Press. doi:10.1145/1143549.1143656