

## Service-oriented mobile social networking

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### Teaser

Mobile social networking is composed by two key-ingredients: people and the smart devices carried by them [1]. First, people follow a social rather than a random mobility pattern. People tend to meet other people at to spend time together with people with similar interests [2]. Second, devices are designed with advanced hardware and software capabilities, and they can communicate among themselves based on short range wireless interfaces, thus forming a mobile network. Indeed, they are equipped with different types of resources such as sensing units and several computational capabilities. Such resources can be seen as exploitable services that can be shared with other devices. When the service-oriented approach is applied in a mobile social context, common application problems have to be rethink for this new challenging perspective.

The goal of this project is to study how to exploit mobility and sociality of people in a mobile social network in order to advertise and discover the services provided devices. This problem is commonly referred to as the service discovery.

The Wireless Network Laboratory at ISTI-CNR investigates the service discovery problem, and in particular the possibility of advertising and discovering services offered by devices in the mobile social network. We propose an efficient strategy for advertising other devices about the existence of new or existing services and, at the same time, a strategy for discovering a specific service. The algorithm we have designed is referred to as CORDIAL (Collaborative Service Discovery Algorithm) to empathize the opportunities arising from people close to us.

CORDIAL adopts both a reactive and a proactive mechanism. The reactive mechanism is used to diffuse a service query and implements the query forwarding strategy. Such strategy is executed by a device as soon as the user carrying it needs to access to a specific service. Consider the following scenario where a user needs to tag a picture with the GPS coordinates. The user device does not provide such functionality, however she can discover devices in proximity offering such service. Once the user finds the service needed, in this case the GPS, she can invoke it.

FIGURE 1 GOES HERE

Figure 1. The Reactive and Proactive strategies and Accuracy and Proactivity metrics

The basic idea of the reactive phase is to select those devices in contact with *interests* similar to the query sent by the user. Moreover, our strategy gives priority to those devices that are able to interact with other devices (e.g. strangers) that can potentially answer to the service query.

The proactive mechanism of CORDIAL is required to proactively diffuse queries not yet answered (namely the pending queries) and to advertise the existence of services. In this case, the goal is to maximize the diffusion of the messages (queries and service advertisements) and, at the same time, reduce the message duplication.

### Results highlights

We have reproduced mobile social networks by using real-world mobility traces. Such traces well reproduce the human mobility in wide-outdoor environment such as a university campus and a city district. Among all the metrics analyzed, we gave particular emphasis to the capacity of the discovery algorithm to store service advertisements of interest for the device, by avoiding the submission of queries (the *proactivity* metric). Moreover, we analyzed the capacity of the algorithm to store only those service advertisements of interest for a device. Such policy avoids storing off-topic advertisements (we measured such behavior with the *accuracy* metric). With both of the metrics (proactivity and accuracy), CORDIAL obtains optimal values also when compared with other social-aware discovery strategies.

This project investigates the possibility of exploiting, in an opportunistic fashion, the increasing number of resources offered by smart or low-power devices in mobile social networks. Future works include the possibility of using CORDIAL in both participatory and opportunistic crowd sensing scenarios as well as using CORDIAL combined together with off-loading computing techniques.

## **References**

- [1] Michele Girolami, Stefano Chessa, Antonio Caruso, “On Service Discovery in Mobile Social Networks: Survey and Perspectives”, *Computer Networks*, 88 (2015):51-71, DOI 10.1016/j.comnet.2015.06.006
- [2] M. McPherson, L. S. Lovin, J. M. Cook, “Birds of a Feather: Homophily in Social Networks”, *Annual Review of Sociology*, 27: 415–444, 2001.

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