

Extending the reach of social-based context-aware ubiquitous systems

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The proliferation of mobile devices equipped with communication technologies such as WiFi, 3G, and 4G, coupled with the exponential growth of online social networking, have increased the demand for social-context-aware systems. These systems leverage social information provided by users with contextual awareness, particularly location, to provide real-time personalized services. With Euromonitor International indicating a 37.7 % growth in mobile phone penetration in the past five years--ICTQatar recently reporting that each household owns 3.9 devices on average--Qatar is positioned as a strong candidate not only for the consumption of such services, but also for researching, building, and testing solutions related to context-aware system challenges.

We address some of these challenges and propose pragmatic solutions. Our contributions fall into the following two categories:

- (i) We design and implement SCOUT, a context-aware, ubiquitous system that enables real-time mobile services by providing contextually relevant information. This information can either be generated reactively based on user request, or proactively created and disseminated to potentially interested users. Our SCOUT prototype consists of an android-based mobile client interfacing with facebook's API and a load-balancing profile-matching server that interacts with a localization engine.
- (ii) Since mobile users may not all experience reliable mobile-to-core connectivity due to contention, cost, or lack of connectivity, we therefore extend the reach of context-aware services to disconnected mobile users by proposing a novel communication paradigm that leverages opportunistic communication. We first send the intended information to the smallest subset of connected users deemed sufficient to reach the disconnected destinations. This subset then selectively forwards, based on social profiles, this information to nodes that are more likely to meet the destinations. Our evaluation, via simulation, shows that our algorithm achieves an improvement of 25% to 80% compared to current communication paradigms, while reducing overhead by as much as 50%.

With SCOUT currently operational, and based on the simulation results, our ongoing work includes integrating our communication paradigm into the real system. We are also working on integrating real-time group recommender systems that identify groups based on user location coupled with social information to provide real-time contextual group recommendations.