Demo: SenseTogether- Cooperative Ambience Monitoring Platform with Continuity and Benefit Awareness

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1. INTRODUCTION
In this demonstration, we present CoMon [1], a novel cooperative ambience monitoring platform. CoMon newly addresses a severe energy problem caused by continuous sensing and context processing, through opportunistic cooperation among nearby mobile users. For cooperative monitoring, CoMon automatically detects nearby cooperator candidates that are likely to remain in the vicinity for a long period of time. Then, it devises a cooperation plan that provides mutual and fair benefit to cooperators. Through continuity- and benefit-aware operation, CoMon enables applications to monitor the environment at much lower energy consumption. In this demo, we will show the key operations of CoMon and their effectiveness under various usage scenarios.

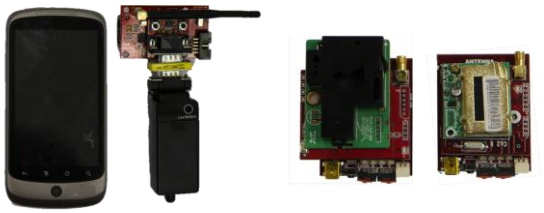
2. HARDWARE SETUP
We prototyped CoMon on Android phones and various types of sensor devices. Figure 1 shows example hardware devices for the demo. To demonstrate cooperative context monitoring of CoMon, we plan to use multiple Android phones as well as wearable sensor devices with various sensing modules (e.g., accelerometers, gyroscopes, ECG, CO_2 sensors, dust sensors, GPS, microphones).

3. DEMONSTRATION
We plan to demonstrate the key functionalities of CoMon.

Context monitoring: CoMon runs as a middleware on top of a smartphone OS. It provides sensing applications with APIs to specify the contexts of interest (e.g. location, activity) in a declarative query. We will first show diverse context types and sensing devices that CoMon supports, and the detailed operation of context monitoring.

Cooperative monitoring: As a key of CoMon, we will show the cooperative operation among multiple cooperators. Our demonstration will be performed in three phases: (1) cooperator detection, (2) cooperation planning, and (3) cooperative monitoring (See Figure 2 for screenshots).

In the first phase, CoMon finds nearby candidates via periodic Bluetooth scans. To establish stable cooperation channels, it selects the ones that are likely to stay together longer among the discovered ones, leveraging our heuristic predictors. For the demonstration, we will pre-configure the smartphones to have different social relationships and encounter histories, such as friends, family and strangers. Then, we will show that CoMon discovers and selects the most proper ones among the nearby candidates.



(a) Nexus One (b) BT-serial converter (c) Dust sensor (d) CO_2 sensor

Figure 1 Example Demo Setup (see [1] for details).

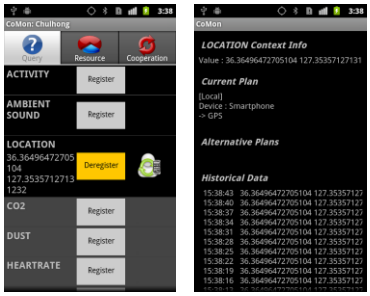


Figure 2 Screenshots showing CoMon operation

In the second phase, CoMon conducts cooperation planning to decide which contexts to share and trade, so as to provide mutual and fair benefits for all cooperators. We will show that the planning decision is effectively made considering currently running applications, available sensor devices and their resources. For better understanding, we plan to visualize the planning process between cooperators.

Finally, we will demonstrate that once the cooperation channel is established, CoMon provides applications with monitoring results stably and seamlessly. We will also present how much each smartphone's energy consumption is saved through the cooperation, exposing system status.

Application deployment: In addition, we plan to show several proof-of-concept applications running on CoMon. We consider two example applications: *TripMemory* and *PollutionAlarm*. The former is the application that tracks a user's travelling path and logs her surrounding events extracted from ambient sound. The latter continuously monitors surrounding air quality and alarms users if severe. We will show that CoMon enables these applications to run at much reduced energy cost by leveraging opportunistic cooperation.

4. REFERENCES
[1] Lee, Y. et al., CoMon: Cooperative Ambience Monitoring Platform with Continuity and Benefit Awareness, In MobiSys, 2012.

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