CenceMe: Injecting Sensing Presence into Social Network Applications using Mobile Phones (Demo Abstract)

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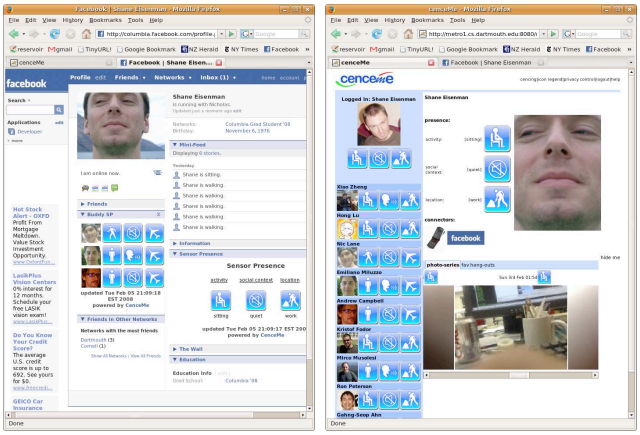
I. Introduction

The near overnight mass adoption of social networking portals, such as Facebook and MySpace, is the latest chapter in the story of people's willingness to embrace technology that allows them to better connect with each other, following in the wake of instant messaging services, personal web pages and even email. We conjecture the next step in this progression will come from on-going research into emerging forms of people-centric sensing systems (e.g., [3] [2]). Our research in this area has lead us to develop the CenceMe system [4] which uses sensor data gathered using mobile consumer devices (e.g., cell phones) to learn about the everyday activities of the general population. CenceMe transparently makes useful inferences from this data and supports both the self-consumption and social sharing of this data.

II. Design

The CenceMe system provides a stream of high level inferred states regarding a person (e.g. running, at a party, in a conversation) based on sensors embedded in cell phones (e.g., camera, microphone, accelerometer). These inferred states or "facts" collectively compose the *sensor presence* of a person. This form of presence represents an enhancement over conventional, largely textual forms of presence information often used in IM clients (e.g., "I am away"). CenceMe allows a user to: (i) automatically export enriched forms of presence information to members of her social network (e.g., publish status messages in Facebook), and (ii) support historical analysis of his activity (e.g., how often did I go to the gym this week?).

Users of CenceMe install a sensing daemon on their phone which continuously operates but is designed to not noticeably impact the usage model of the phone. This daemon samples the available sensors on the device and executes resource-aware classifiers [5] that produce facts about the individual. Facts are buffered locally on the device and opportunistically transmitted (via GPRS, WiFi, etc.) to CenceMe backend servers. These facts undergo additional processing on the backend servers in the second stage of our split-tier classifier design. Backend classifiers are used to draw cross-user inference and inference on data sets that exceed what is feasible to store on the phone. Ultimately facts stored in the backend servers are made available (filtered for privacy) via a standard CenceMe API to consuming applications such as web portals (e.g., Facebook, the CenceMe portal) and VOIP clients like Skype, including user presence update notifications.



(a) Facebook with CenceMe (b) CenceMe portal

Fig. 1.

III. Prototype

Our prototype system runs on any Symbian-based cell phones that include JVM support (e.g., Nokia N95, N80). The software architecture of the sensing daemon is split into modules written in C++ and Java to maintain portability where possible while addressing limitations of the JVM system APIs. Fact bundles are pushed to the backend servers via XMLRPC calls over either WiFi or GPRS. A web-service-based API is offered from the backend servers to external systems. We have built: (i) a number of CenceMe widgets for Facebook (see Figure 1(a)), and (ii) a web portal that offers a broader and deeper user experience than the widgets alone can provide (see Figure 1(b)). For cell phones without the suite of sensors found on high-end models (e.g., accelerometers), we have developed a prototype CenceMe key ring attachment which provides the CenceMe daemon on the phone Bluetooth access to GPS and a 3-axis accelerometer. We plan to expand our current focus on consumer-driven social networking, and apply CenceMe technology to public health initiatives, domain specific sensing (e.g., skiing) and supporting logistics and production line efficiency in the commercial setting.

References

[1] A. T. Campbell, et al. People-Centric Urban Sensing. *WiCon*, Boston, Aug 2006.
[2] M. Srivastava, et al. Network System Challenges in Selective Sharing and Verification for Personal, Social, and Urban-scale Sensing Applications. *HotNets*, Irvine, Nov 2006.
[3] S. B. Eisenman, et al. The BikeNet Mobile Sensing System for Cyclist Experience Mapping. *SenSys*, Sydney, Nov 2007.
[4] E. Miluzzo, et al. CenceMe - Injecting Sensing Presence into Social Networking Applications. *EuroSSC*, Kendal, Oct 2007.
[5] N. D. Lane, et al. Cooperative Techniques Supporting Sensor-based People-centric Inferencing *Pervasive*, Sydney, May 2008.