Wireless Rope: Experiment in Social Proximity Sensing with Bluetooth

Tom Nicolai, Nils Behrens
Universität Bremen
TZI – Center for Computing Technologies
Am Fallturm 1, 28359 Bremen, Germany
Email: {nicolai, psi}@tzi.de

Eiko Yoneki
University of Cambridge
Computer Laboratory
Cambridge CB3 0FD, UK
Email: eiko.yoneki@cl.cam.ac.uk

Abstract

The proposed demonstration Wireless Rope aims to study large scale Bluetooth scanning for proximity detection with consumer devices and its effects on group dynamics during the conference. Participants can download a program for Java enabled phones, which collects information of surrounding devices by Bluetooth. Users can interact through a GUI with members of an existing group or form a new group. All connection information will be collected by tracking devices and a connection map of all participants can be obtained via the web.

1 Introduction

As the field of wireless and locative technologies matures, a more enduring relationship between the physical and cultural elements and its digital topographies will become interesting topics to explore. Their interaction, influence, disruption, expansion and integration with the social and material practices of our public spaces will be getting more focus. Is public space a crowd of individuals? How can the crowd inspire the individual through collaboration, competition, confrontation? How change, effect, or experience could only be achieved by a mass movement, a cooperative crowd? How can we stage a series of new happenings? In [1], Haggle project takes an experiment of human mobility, where mobility gives rise to local connection opportunities when access infrastructure is not available. Our experiment Wireless Rope aims to take a further look from a social perspective [3].

Wireless Rope is an interactive project enabling tribes to stay together while they act together or individually. Especially when exploring crowded places, companions can easily get lost, and considerable effort is needed to keep everybody together. The main part is a program for Java phones that collects information of surrounding devices using Bluetooth. Like a real rope tying together mountaineers, the Wireless Rope gives the urban group immediate feedback (tactile or audio) when a member gets lost or approaches. Thus everybody can fully engage in the interaction with the environment, and cognitive resources for keeping track of the group are freed. The program also displays the current status of the rope (Fig. 1). At the same time, collected information kept in the devices are gathered at a central station via special tracking stations. Registered users can look at the connection map created by gathered information from phones via the web (Fig. 2).

Proximity detection is a basic technology and crucial factor in the concept, and its detection is about determining whether two objects are close to each other. It may also involve the measurement of the exact distance. Bluetooth is a widely available technology in urban settings. Bluetooth can do proximity detection, usually it can determine whether two devices are within 10m (up to 100m, depending on the class) of range. Depending on the implementation it can also measure the strength of the signal, from which a distance can be approximated. Thus, Bluetooth is an apparent choice for realizing proximity detection on consumer devices.

We plan to evaluate the logged information afterwards to analyse the connection patterns, group formation and evolution, and social patterns including an evaluation of the usefulness of Bluetooth for this kind of proximity detection. The result from this experiment may provide the aid which highlights relations between objects, people, situations within the given space, a scientific conference environment. This could be extended to map urban inhabitants. Our future fabric of digital and wireless computing will influence, disrupt, expand and be integrated into the social patterns within our public urban landscape.

2 Experimental Setup

The demo will run over the whole time of the conference, from the first day thru the last. At a stand, we will introduce the demo to conference visitors. It consists of the five main components below and involves active and passive participation by conference attendees. More involvement will increase the scale of this experiments. Privacy information will be carefully handled throughout the whole experiment. Participation is voluntary and no personal information of non-participants will be disclosed.

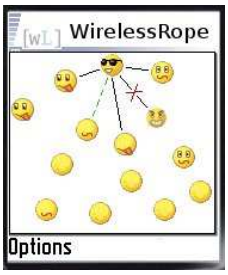

Figure 1: Sightings on phone display (draft)

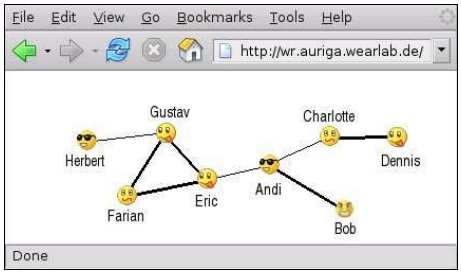

Figure 2: Connection map on website (draft)

Wireless Rope program on Java Bluetooth phones To actively experience the demo, a conference participant can download the Wireless Rope program from the web, or it can be installed at the demo stand. The program collects information of surrounding Bluetooth capable devices by periodic device inquiries and visualizes the results on the display of the phone. Sightings are grouped into one of four categories:

Stranger: All new sightings are classified as strangers.

Familiar Stranger: Strangers which are sighted repeatedly are automatically advanced to familiar strangers [2].

Watch: If the user is interested in being notified of the leaving or approaching of a (familiar) stranger, he can put the person on his watch-list (unidirectional link).

Contact: During an interaction with a person, both might agree to add themselves to their contacts (bidirectional link). Besides being notified of their proximity, contacts can use the Track Stations to exchange additional data.

Log data are kept within the device until the information can be automatically transmitted to a tracking device. Approximately twenty users of this program are enough to collect useful data. To motivate as many people as possible to participate, we designed the program to put as few constraints as possible on the phones of the users. Furthermore, the program does not involve any additional costs, e.g. for going online. The only requirements on the phones are that it can execute Java programs, that it has built-in Bluetooth support, and that Bluetooth is accessible through Java, i.e. it needs the JSR-82 API.

Bluetooth devices without Wireless Rope All Bluetooth devices (phones, PDAs, laptops, ...) running in visible mode (respond to inquiries) automatically become part of the experiment (passive participants). Wireless Rope users are notified of their existence and collect the sightings. The only difference is that these devices cannot be added to the "Contact" category. A large part of conference attendees is expected to have a Bluetooth device at their disposal.

Track Stations We will install a couple of Track Stations at highly frequented locations (e.g. the main conference room, breakout area), consisting of small PCs in a box. The Track Stations automatically record the passing-by of users and can transmit relevant digital tracks to contacts at a later time. Thus the Track Stations augment the reach of the Wireless Rope at important places. Periodically, these devices collect all log data from the mobile phones and store them in a database for visualization and later analysis.

Reference Points For roughly localizing the Wireless Rope users in space, we will install approximately ten reference points at the conference site with known locations. These are implemented as small Bluetooth beacons.

Connection Map The information collected by the Track Stations is visualized in realtime on a website. This connection map is anonymized. Any participant (active or passive) can determine his location within this map by querying for his Bluetooth address. A Web-terminal at the demo stand will be used for demonstration.

A PC at the demo stand as well as the Track Stations have to be connected to the Internet by wired Ethernet or WLAN. For the reference point devices, power connection is sufficient. No other infrastructure is needed for the demo.

3 Conclusion

The Wireless Rope demonstrates the use of Bluetooth device inquiry for social proximity sensing. It is designed to be a useful tool for the users during the conference. For the authors it also serves as an experiment to collect data for later analysis such as the connection patterns, group formation and evolution.

Bio. Tom Nicolai is a PhD candidate at the TZI, Universität Bremen.

References

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