

SiSSy – Smart-its child Surveillance System

Henrik Jernström

PLAY Studio, Interactive Institute

Hugo Grauers gata 3

41133 Göteborg, Sweden

henrik.jernstrom@interactiveinstitute.se

ABSTRACT

In this paper I describe what functions are necessary to support people responsible for children by using computer-augmented artifacts. The suggested solution, *SiSSy*, is based on using input from *Smart-It* devices to prevent children from finding themselves in danger by alerting parents of the situation. To collect information of how the system should be designed I gathered a group of possible future users to participate in a brainstorming workshop. I report the results from the workshop and how these have influenced the design of *SiSSy*.

Keywords

Smart-Its, Ubiquitous Computing, Context Awareness

INTRODUCTION

The vision of Ubiquitous Computing has the ambition to relieve us from the demanding and intruding properties of the computer, get it out of sight - out in the periphery of our lives, while still being able to reap the benefits of computational services. Computers should conform to humans and humans' needs, rather than the other way around. One solution for this is to attach computers to objects in the real world and connect them to each other to make them support people's requirements whenever and wherever they need it [2]. Ubiquitous Computing now seems within our grasp by the increasing growth of computer power, smaller and more accurate sensors, greater communication bandwidth and less power consuming devices. One research project that tries to realize some of the possibilities of Ubiquitous Computing is *Smart-Its*.

The Smart-Its project

The *Smart-Its* project [3] is collaboration between TecO Karlsruhe, ETH Zürich, VTT Finland, University of Lancaster, PLAY Interactive Institute and FAL Viktoria Institute and is funded by the European Union's Disappearing Computer Initiative. The goal is to make inexpensive computational devices for post-hoc computational augmentation of everyday things. *Smart-Its* are devices that perceive their environment with various sensors, communicate with peers, and have adaptable and modifiable behaviors. The vision of these devices is for them to be as cheap, non-intrusive and common as modern radio-tags so that they can be used to build and test ubiquitous computing scenarios by augmenting a great number of everyday objects and places with *Smart-Its*.

THE SiSSy

Children disappear from their parents in shopping malls, crowded places and sometimes children even get lost from daycare. It is impossible for parents and daycare personnel to always have full control over what children are up to, where they are going, and if there is more than one child - who is doing what. The *Smart-its child Surveillance System, SiSSy*, is an approach to tag children and parents with *Smart-Its* devices which can sense the environment and determine whether a situation is dangerous or if the child is engaged in something hazardous. The idea is to make *SiSSy* easy to use without requiring any specific infrastructure such as large transmitting equipment or satellites communication. The system is by its nature primarily suited for children between ages two and five and will, implemented and ready, be tested on children of that age.

From the parents point of view

To ground my research and find the relevant functionality for *SiSSy* I chose to engage possible future users by arranging a brainstorming workshop. Five parents took part in the workshop, which lasted for three hours including introduction and scenario presentations. The comic strip-like scenarios were used to illustrate the intention of *SiSSy* and give the participants a notion of the *Smart-Its* capabilities. To make the discussion easier and give it a more concrete form a map over a playground was used with small toy figures exemplifying children and parents. The session was recorded with a video camera.



Figure 1: Parents discussing different scenarios using a map and toy figures

The participants' opinions are summarized as follows:

- It is important that SiSSy warns *before* anything has happened. It has to sense sudden and rapid movement away from other devices, which should trigger an alarm.
- SiSSy must be totally reliable to have parents' complete trust. However, they also recognized that if this is well accomplished, there might be a risk of parents becoming inattentive to what their children are doing.
- SiSSy should be able to sense moisture to prevent accidents in water, altitude to detect dangers of falling, and car exhausts and traffic noise to make it possible to decide whether the child is near traffic or not.
- The behavior of SiSSy should be easy to modify. Different sensors can be used for different purposes in different situation and SiSSy should support this. It is more likely that SiSSy will be used if it works in more than one place.
- Smart-Its could also be used for tagging the surroundings and not just for tagging children and adults. The benefits would be to create secure and non-secure areas when a family is temporarily at a location e.g. at a playground, on a picnic, etc.
- There were also arguments for making SiSSy absolute position aware, motivated by that if you can't find a missing child there is really no point with using SiSSy.
- Wristwatch-like device for the parents with a vibrator alarm with preferably text messages that calls for the parent's attention [1] and informs about the situation, who, were and what.
- The child device should be attached properly on the child's belt and must be silent. This to prevent any risk that SiSSy could cause disturbance in the psychological development for a child from being under surveillance.



Figure 2: Smart-Its assembled in a cassette box.

Smart-Its description

The Smart-Its prototype used for SiSSy is designed and manufactured by TecO, University of Karlsruhe. It consists of two main boards: an RF-board equipped with a 868.35

MHz radio transceiver and a sensor board that can detect sound (using a microphone), touch pressure, light level, 2-dimensional acceleration and temperature. An I2C bus connects the boards together and both boards are equipped with a microchip PIC microcontroller running at 20MHz. The system allows for ad-hoc networks to be formed spontaneously, and has support for sensor data processing and context recognition.

Implementation

My work will progress in order to satisfy the user requirements as far as it is technically possible using the current Smart-Its platform (making absolute positioning unfeasible). The physical characteristics of SiSSy devices are shown in my design prototype (figure 2) with the intention to attach the box to children's belts. Parents' devices are connected to a wristwatch with a cable, used for attracting attention when an alarm is triggered (cf. [1]), using vibration and colored LEDs. In addition, several stand-alone devices have been constructed. SiSSy's behavior will adapt to the situation and decrease or increase the broadcast radius whether the situation is dangerous or not (as one of the requirements for initiating an alarm is the loss of contact between the devices). The system will also be able to route information through intermediate devices to make the functionality more flexible. The first SiSSy ready for use will be evaluated by the same parents who took part in the above described workshop. The test will be carried out on a playground similar to what the workshop map represented.

DISCUSSION

The perfect SiSSy application has to be completely reliable for it to help parents and personnel working with children. Complex contexts should be detected and understood by the combination of different sensors, their input and appropriate algorithms and the system should determine whether it is dangerous for children or not (falling, traffic, crying etc). Because of the inherent complexity of the problem, it is most likely that SiSSy will primarily be an experiment to explore the Smart-Its concept and bring up important questions for the use of Smart-Its in a wider sense. The goal is to demonstrate a complex application based on ad-hoc networking and real-time information from distributed and mobile devices.

ACKNOWLEDGMENTS

The Smart-Its project is funded by the Commission of the European Union as part of the research initiative "The Disappearing Computer" (contract IST-2000-25428).

REFERENCES

1. Hansson, R., Ljungstrand, P. and Redström, J. Subtle and Public Notification Cues for Mobile Devices. In: *Proceedings of UbiComp 2001*. Springer.
2. Weiser, M. "The world is not a desktop". *Interactions*; January 1994; pp. 7-8. ACM Press.
3. <http://www.smart-its.org/>, (14 September 2002)