Smart-Its go to Dinner: Scenarios for Context-Aware Technology in Restaurant Applications

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INTRODUCTION

Smart-Its are intended as an enabling technology, which lets researchers build demonstrators and prototypes of context-aware applications with comparatively little overhead. Much of the work in the project has been focused on the technical development of Smart-Its hardware and software, to make the technology as robust and efficient as possible. In parallel, all partners have been active in building demonstrators that utilize the Smart-Its technology in various ways. However, in addition to this technically driven work, we have also seen the need to take a systematic approach to application development.

The PLAY studio and the Future Applications Lab have engaged in scenario work as a means of exploring potential uses, users and interactions with Smart-Its. Early results of this work consisted of a number of applications and scenarios for the restaurant domain [2]. For the Jamboree, we have taken a number of these concepts further and implemented them with Smart-Its. For our applications, we have used scenarios to drive technical, communication and perception development. By taking a specific context and a scenario-based approach, high-level principles for future applications and real-world potentials for Smart-Its technology have emerged.

WHY RESTAURANTS?

Early in the scenario work, we decided to focus on a specific context in order to explore augmentation of real-world activities, user roles, interactions, and everyday objects. Restaurants offered an interesting and challenging context to explore dynamic environments. Within the restaurant context there are diverse artefacts, multiple actors with different interests and agendas, as well as many practical and logistic issues – preparing and serving food, handling deliveries, treatment of sensitive items and maintaining quality, etc.

Furthermore, everyone can relate to the restaurant setting because everyone visits restaurants! Therefore choosing this domain created an instant common ground for workshops and brainstorming sessions, and provided participants with ample opportunities to use their own everyday experiences in the work. Finally, although restaurants may sound like a specialized domain, in fact it proved to be a microcosm of other situations, and offered general principles and lessons applicable to other industries and settings.

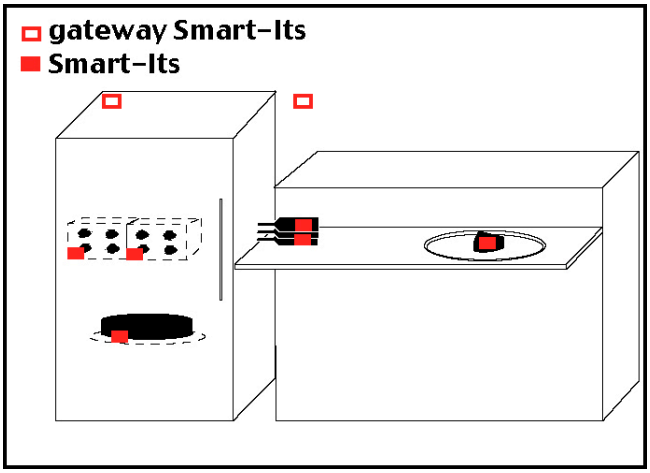

Figure 1: *Furniture setup, food props and Smart-Its for the demo*

MOTIVATION FOR THE SCENARIOS

Through our scenario-driven work we have identified opportunities for Smart-Its to support logistics, ad-hoc communication, and collective awareness among sensor-enabled artefacts which are widely applicable to other domains. At the Jamboree, we illustrate these through three of scenarios for restaurant applications.

The scenarios we chose to implement are a subset of more complex ones developed during a series of brainstorming workshops. In the workshops, we used several design methods – in particular, design for extreme characters [1] – to explore potential applications, interactions and interfaces in the restaurant context. In our illustrative scenarios Smart-Its technology is used to support:

- Post-hoc augmentation of everyday objects
- Sensing and sensor fusion for dynamic monitoring and quality control of food items
- Items communicating, sharing and collectively negotiating prices with one another
- Ad hoc networks of items facilitating logistics and workflow

The *percepts* (i.e. higher-level interpretation or aggregations of raw sensor data) used in these scenarios are:

- Grouping of multiple artefacts (using combined acceleration values, and potentially other sensors to determine shared context)
- Decay of food artefacts (sensor values over time, including temperature, acceleration, and light in order which indicate appropriate treatment of each food item – for instance, the decay of the quality of wine is based on the angle and temperature at which it is stored and whether it has been shaken excessively)
- Status of container (whether the fridge door is open or closed is determined by the artefacts themselves measuring light and temperature)
- Status of artefacts (items such as the cheese plate measure whether they are running low on cheese or not by measuring pressure/weight)

SCENARIOS

For the Jamboree, we built an interactive environment where the exhibition visitors actions trigger different responses. The setup includes a restaurant fridge and counter and a projection screen. Visitors manipulate a series of food items and props which are equipped with Smart-Its for sensing and communication. These artefacts are:

- A piece of cheese
- Two bottles of wine
- A serving tray
- A box of oysters

When users perform different actions – such as taking the cheese out of the fridge or combining the wine and cheese on the serving tray to complete an order – the Smart-Its artefacts sense this and send information to a central server. Simulations of interfaces and scenarios in the restaurant are thus triggered and shown as animations on a screen behind the setup. In the following we briefly describe each scenario.

Oyster auction

This scenario illustrates self-aware food artefacts which keep track of their own lifecycle and report their quality. Oysters are triggered (by the action of opening the fridge door which metaphorically opens a communication link between the contents of the fridge and external items) to compare their status and quality in relation to other oysters in a delivery truck and being loaded off a dock at the harbor. Their status is updated and displayed as a label on the package of oysters.

Dynamic menu

Items keep track of and can be queried as to their status, as well as signal when significant changes affect their quality. In this scenario, wine bottles keep track of their treatment (including temperature, exposure to light, excessive shaking etc.). This information is used to calculate the overall quality along a "decay curve" specific to each food item (wine and oysters naturally have different optimal temperatures and lifespans). The status of all items is dynamically calculated, prices are negotiated collectively among the items, and output as a dynamic restaurant menu, advertising billboard, and pricelist.

Ready to be served

A combination of user involvement (the chef) and perception by multiple artefacts enable an order to know when it is ready to be served. Once all the right objects have been put on the serving tray, the chef moves the tray to another counter. The action of moving the items together groups them and signals that the order is complete. Once the order is complete and all the items are at the proper serving temperature, the tray will signal to the waiter that it is ready to be delivered to the customer's table. The scenario demonstrates how collective awareness and ad-hoc groupings of smart artefacts facilitate logistics.

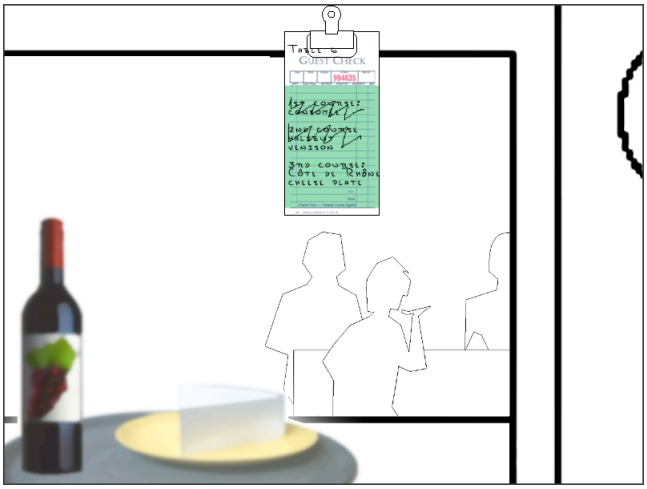

Figure 2: *Sample image from an animation showing a wine bottle and cheese plate "ready to be served"!*

CONCLUSIONS

By using a methodical approach, going through several iterations of scenario planning and brainstorming before starting the implementation work, we have arrived at 3 applications which illustrate many of the deeper issues and opportunities inherent in future applications and domains for Smart-Its technology. Much of the resulting work can also be generalized to other domains where there is a similar collection of inter-dependent factors that affect complex tasks.

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