

# Supporting Collaborative Scheduling with Interactive Pushpins and Networking Surfaces

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## ABSTRACT

We have developed a prototype to explore support for tangible and collaborative scheduling. The prototype is based on the Pin&Play technology and has been developed with a film festival team that conducts collaborative scheduling on large surfaces. The prototype shows how the festival team could retain the advantages of the current practice of large pin boards and paper notes, while gaining many additional functions only possible through digital augmentation.

## Keywords

Ubiquitous computing, Pin&Play, tangible interfaces, networking surfaces, collaborative scheduling

## INTRODUCTION

Collaborative scheduling tasks often require large work surfaces to facilitate collaboration and overview. Such tasks are commonly manual and involve spatially arranged tangible objects, e.g. paper notes. The common disadvantage of such practice is the lack of digital support. Finding a technically feasible solution for such practices is however not a trivial task.

We present a scheduling prototype that addresses issues on how to combine digital and physical information on large surfaces. It is based on a novel networking technology called Pin&Play [3] and fieldwork from scheduling activities at the Göteborg Film Festival [2]. The prototype shows how the festival team could retain the advantages of the current practice of large pin boards and paper notes, while gaining many additional functions only possible through digital augmentation.

## BACKGROUND

### Pin&Play

The prototype is based on the Pin&Play technology that consists of interactive and networking pushpins and a conductive surface. The idea behind the technology is that any surfaces, such as walls, can provide digital augmentation to physical objects that are attached to them. The Pin&Play surface serves as a physical medium that



Figure 1. Scheduling with augmented paper notes

provides power and communication through a bus-network. The interactive pushpins are independent entities that can communicate with when attached to the surface. They have LEDs that can light up, and can also hold information without being connected to the surface.

### Göteborg Film Festival

The prototype supports collaborative scheduling activities at the Göteborg film festival that schedules 500-700 films, shown during 12 days. Currently, the entire scheduling is a manual process, where three walls represent the schedule. It consists of different colored paper notes representing screenings, arranged in a matrix according to day, time and cinema. The scheduling of the program is a complex task, involving both expert knowledge and physical constraints such as transportation, guest speakers, seminars and the cinemas. All films are stored digitally in a database, but the actual scheduling is done manually. When the schedule is finished, the time consuming task of manually transferring the matrix in to the database starts.

### THE SCHEDULING PROTOTYPE

The prototype is small-scale and supports the scheduling of 15 films distributed over two days with three starting times and cinemas (see Figure 1). It consists of an augmented board with interactive pins connected to a network, a film database and a web-based application. The web application provides an updated representation of the physical board and information of constraints that occur during the physical scheduling. It also has a graphical query interface.

Each interactive pin is attached to a paper note to represent a film, and a screening when attached to the board. The physical scheduling is done as before, but now each note is directly connected to the network and the database. This has several advantages compared to the scheduling practice without augmentation. This will be illustrated below.

### **Scheduling a Film**

Without augmentation, the team has to keep in mind both physical constraints as well as expert information when scheduling. They discuss constraints, before pinning and moving notes on the schedule. With augmentation, the team can focus more on their expert knowledge. A film (paper note with pin) is scheduled by being pinned into to a slot on the augmented board. The pin is then identified and located by the system and a check is performed whether the chosen slot (time, cinema, and date) is suitable or not. A schematic representation of the current state of the board is shown in a separate web interface. If the film is unsuitable for the selected time slot (e.g. if it is too long), the user is notified. This is done with visual icons on the web interface, and additional information on what caused the notification.

### **Searching for Films with Certain Criteria**

As the scheduling progresses, it becomes increasingly difficult to locate a certain film on the large boards. With the prototype, the user can locate one or several films on the board, and easily find films that share certain conditions by entering search criteria (e.g. title, director, genre) in the web interface. LEDs on the pins of the matching films then light up on the physical schedule for a short time, making them easy to locate. This provides the user with an overview of the result in a larger spatial context. The user can also see the resulting film(s) of his or her query displayed in the web interface.

### **Displaying Additional Information about a Film**

The team sometimes need to check specific information related to a film. The prototype allows users to search for such information both in the web interface, and on the physical board by attaching a query pin to the same slot as a film occupies. The query pin will then trigger the web interface to display all additional information about that specific screening. Such information does not fit on the physical paper note, but is nonetheless suitable to have easily accessible during the scheduling.

### **Transferring the Final Schedule**

When the user considers the schedule to be finished, it has to be transferred to the database. The prototype does this automatically, by calculating the end time of every film and giving it a unique screening number. The web application displays the schedule with screening numbers, which can be checked for errors by the team, before it is finally exported to the database.

### **IMPLEMENTATION DETAILS**

The scheduling actions illustrated above, give a brief insight into how the prototype works. Full technical details can be found in [1]. A positioning is not originally provided by the Pin&Play technology and had to be

implemented to support the scheduling in this case. Currently the prototype is constructed of slots, which are separated by addressable switches. When a slot is switched on it is available on the network and any pin(s) attached to it can be identified. The position of each pin is stored in a database by saving the serial numbers of the switch, the pin and the slot. This way, the pin's identity is linked to all digital information about 'its' film in the database.

The web application was designed to provide more complex interaction and support the representation of additional information. It can also support other team members that are co-located, i.e. scheduling film seminars in another room.

As the pins are slaves on the network, they cannot call for attention when already being connected. This problem was solved by having a pin, used as a "query pin". When attached to a slot, its presence on the network triggers a request for more information about the film situated in that particular slot, which is showed on the web interface.

In the current prototype the connection between a pin and a film (paper note) is hard coded.

### **CONCLUSION AND FUTURE WORK**

There are several challenges to augment the paper based work practice at the Göteborg film festival with Pin&Play. For example, future work involves creating an easy accessible and robust connection between a pin and the paper note. A possible solution is to have a "docking station", where a film (with a digital id and a physical note) and pin (with a digital id) are associated. Another challenge is the temporary positioning solution. This would not be feasible on a large-scale prototype, causing too much time suspension.

The prototype has been tested and discussed by festival team members in an evaluation workshop. They stressed that the prototype captures the most important aspects of their work, illustrating how they can keep the benefits of their paper-based practices and gain digital benefits.

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