Experience-Scapes

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Abstract
Experience-scapes systems enable scripted sequences of media events (acoustic, visual, and haptic) to be triggered based on time and/or sensed activity. These systems use event-based schedulers and sensors in physical environments to detect and respond to individual and group activity. They are designed to motivate, sustain, and augment a wide variety of human behaviors. Ongoing user testing is geared toward understanding how these systems can be used to better understand, encourage, and organize personal and group activities. A primary goal of experience-scapes research is to leverage increasingly available ubiquitous and physical computing platforms to enhance personal and group self-awareness and self-efficacy. Through user testing and refinement, experience-scapes are becoming deployable, interactive, smart environments that empower people to reflect on their everyday activities. They also help people to design motivational, self-actualizing events and interventions to accomplish near and long term aspirations.

Keywords
interaction design, interactive media, multimodal interfaces, pervasive computing, physical computing, smart environments, smart homes, ubiquitous computing
ACM Classification Keywords
H.5.2 User Interfaces—Auditory (non-speech) feedback, User-centered design.

Introduction
Movies and video games have soundtracks that set contexts, moods, and event trajectories. At times, it appears to the viewer that these sounds motivate the characters to engage in their activities—motivating them to relax, to concentrate, to excel in sports and other performance activities, and, at times, to go beyond their own capabilities to achieve what might have seemed “impossible.”

This paper describes ongoing work to develop “experience-scapes.” Experience-scapes are analogous to soundtracks. They are aural, visual, and/or haptic media presentations that may range from a single piece of music or sound such as an alarm to a rich combination of multimedia with ambient interventions and haptic sensations. The purpose of an experience-scape is to provide scripted media to motivate and sustain behaviors.

People often want to change their habits or establish new ones. Developing new habits and routines, however, is difficult for most people [1]. As an end-user programmable tool, experience-scape systems are being developed to help people use readily deployable, interactive, smart environments to script media events to achieve personal and group goals. For example, an experience-scape may be used at home to motivate an exercise routine in the morning after waking up. A user may setup the experience-scape system and tailor the environment to call attention toward the exercise equipment, and, once engaged in exercise, the system may customize a motivational soundtrack of a suitable duration. If the user stops before the end of the soundtrack, then a progression of self-tailored interventions to motivate reengagement occurs. These might include new motivational sounds, sounds of disappointment from the exercise equipment, or pre-recorded personal reminders. They may even initiate a cell phone call to or from a friend, coach, virtual agent [2], or any other scripted event that may be influential at that point in time [3].

Likewise, in an office environment, a group of workers can use experience-scapes to encourage group activities such as lunch breaks or all-hands-on-deck meetings and to design pre-scripted experiences to motivate and initiate networking and to facilitate brainstorming sessions.

Experience-Scapes
Experience-scape systems leverage physical computing to give users greater awareness and control over their lives and provide the opportunity to preplan any sequence of desired experiences. They interface present activity logging and feedback coupled with planning and scheduling tools. Experience-scape systems rely on the physical computing strategy of placing sensors within an environment such that a combined hardware and software system may respond to physical actions. Sensors may be placed in practically any object including furniture, clothing, jewelry, toys—nearly any everyday item [4]. The emergence of affordable, off-the-shelf technologies such as the Arduino [5] and Phidgets [6] circuit boards is facilitating the development of smart devices and environments.
We are implementing experience-scape systems that allow users to author their own experience-scapes with plug-and-play sensors that allow the user to adjust sensor response. We are also working toward a system that will have a variety of prototypical experience-scape templates with appropriate corresponding media libraries and strategies. Users are able to import their own media for their experience-scapes, e.g. their MP3 files. The ability to author an experience-scape allows users to customize the experience-scape in a way that can make the media experience personal and meaningful.

In the current implementation, most experience-scape scenarios consist of two parts, a “call-to-action” and a “support-action.” These two parts are scripted sequences of media events. The call-to-action invites the users to begin the scheduled event. After the activity is sensed and the call-to-action is no longer needed, the support-action plays to provide motivational support for the activity. During scheduling, the users can map sensors to the call-to-action and support-actions. For example, motion sensors in a home might detect when the user has woken up, and a wireless accelerometer or pressure switch on a yoga mat can be used to trigger support-actions. The users can define the conditions under which a call-to-action and a support-action begin and end. Sometimes users may choose not to script a support-action as they may not want any media to play while performing the activity, e.g. during a meeting. Once the support-action is complete, the experience-scape is rescheduled by the system.

**User Study**

An experience-scape system is currently deployed in the lobby of the Arts, Media, and Engineering (AME) graduate program at Arizona State University (Tempe, Arizona, USA). (See figure 1.) This experience-scape system addresses a specific problem in an academic environment: How can faculty, students, and visitors be encouraged to interact with the project prototypes that are present in the lobby? Although there are prototypes that are readily available, faculty and students, who are already familiar with their usage, tend to neglect them during their daily activities. Creating an experience to encourage using these technologies on a continuous basis benefits the AME research agenda. Since this lobby is part of an office environment, the experience-scape must not only be able to gain visitors’ attention but must do so without becoming annoying to occupants.

![figure 1. A tangible interface prototype in the Arts, Media, and Engineering lobby at Arizona State University that can communicate with the experience-scape system.](image)
The system is installed on a public computer. Anyone can schedule a time to invite people into the space. When scheduling an activity, the author specifies the time, e.g. 11:30 am. The author can specify whether the activity should take place daily, on specific days (e.g. Monday, Thursday, and Friday), or at specific time intervals (e.g. every three hours). Then, the author selects media for the call-to-action. A sensor infrastructure is automatically mapped to the experience-scape. As part of the lobby experience, smart objects with 2-way radio connections using SparkFun’s Bluetooth transceivers [7] have been developed that can interact with the system [8]. In general, however, experience-scape authors can map new sensors to new activities, locations, and events.

In this implementation, five minutes prior to a scheduled activity, a Web-cam sensor, equipped with machine vision software, checks to see if someone is present in the lobby. If the lobby is occupied, the experience-scape is not played and is, thus, rescheduled. If no one is present in the lobby at the scheduled time, then the call-to-action begins. The sound file that was chosen during the scheduling is repeated at regular intervals until someone enters the lobby. Then, the support-action begins. The support-action is a brief animation that plays at fixed intervals on a monitor in front of the lobby. The animation is an unobtrusive invitation to interact with the prototypes. If no one interacts with any of the prototypes, the animation will play. Otherwise, the animation will not play, and the experience-scape is rescheduled.

**Distinguishing Features**

In comparison to other smart environments and technologies, the distinguishing features of an experience-scape system are: the emphasis on scheduling media based on (1) temporal qualities, (2) sensed activity within a smart environment, and (3) the ability to create a continuous suite of motivating and contextualizing media experiences.

Smart homes and offices have been a topic of research for several years. For example, the Gator Tech Smart House [9] is a smart house with an emphasis on assistive technologies. The goal of this project is to create a smart home that can help support the daily activities of disabled and elderly people. In this example, the inhabitants of the space are monitored but do not schedule their own activities. As described, the system is reactive.

LinuxMCE [10] is another smart technology. LinuxMCE not only provides home automation and security features but also media control options, e.g. allowing media to “follow” a user through the house. LinuxMCE, however, does not provide the level of interaction that an experience-scape system provides. An experience-scape system could complement LinuxMCE applications, assistive technologies, or other smart technology platforms. The emphasis in our system, though, is on the ability to author rich and purposeful media experiences rather than coordinating various applications.

**Challenges**

Developing this system presents challenges—the foremost challenge being the presentation of the media. Spaces can be private (only one person in the space), "semi-private" (others may not be present but are aware of what is happening in the space), or public (multiple people in the space). A private space is the
easiest case. Since the participant is alone, the media for the call-to-action and support-action can be presented without disturbing other people. Semi-private spaces are more problematic. A room with an open door where others are present in an adjacent room is an example of a semi-private space. Playing media can intrude on the personal spaces of others, and not all solutions to this problem are socially acceptable. For example, someone who would like to be encouraged to engage in an activity by a piece of music, may choose to wear a pair of headphones. Headphones, however, can cut off social interaction, e.g. in a home, or may not be acceptable, e.g. in an office during work hours. Public spaces, such as office spaces, present other challenges. Co-workers may have to compromise and collaborate on matters of taste and frequency of presentation. Ultimately, the solutions to these problems will require an awareness of context with multiple alternatives for delivery.

In the example implementation, steps have been taken to address these challenges. Until a compromise is found, the sound files can be changed without removing the experience-scape from the scheduler. The experience-scape for the lobby is preset so that it will automatically turn off after a preset duration and the time between playing call-to-action sounds is adjustable.

Finally, the experience-scape system has the challenges typical of physical computing (integrating robust sensors and software, costs, etc.). Fortunately, the increasing interest in “Do It Yourself” projects and the availability of increasingly cheaper hardware are providing resources to ameliorate these issues.

Future Applications
Experience-scape systems are self-actualizing platforms. The high-resolution feedback and planning activities provide reflective experiences and opportunities for users to consider their goals and tailor their experiences toward achieving them. A suite of informational resources and strategies for goal setting, monitoring, and sustained behavioral change is being incorporated as well as a personal diary feature to encourage reflection.

Experience-scape systems can be platforms for various uses. For example, experience-scap es can be used for therapeutic purposes. They could be used in an assisted living situation to encourage elderly people to be active and to provide feedback to working caregivers through Web-based access to sensor and activity logs [11]. They could be used to remind people to take medications before leaving home. They could encourage family time such as reading and playing with children, e.g. a whimsical and relaxing media sequence to start story time. They could be used as a media-rich time management tool. They could encourage desired personal activities and hobbies such as cooking, gardening, crafting, or reading, inviting people to move toward these locations and engage in these activities and discouraging them from other activities such as excessive TV watching or trips to the kitchen. Experience-scape systems could be used as an edutainment or an entertainment platform, specifically for pervasive or alternate reality gaming. Social applications could be developed as well [12].

Experience-scape systems challenge users to set their goals, their aspirations, and their desired behaviors. What will your weekend morning experience-scape be?
What have you always wanted to learn? What do you dream about doing? Experience-scapes open the possibility to project the future trajectories of one’s life and to enact concrete steps to achieve those trajectories.

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