Mediator and Medium: Doors as Interruption Gateways and Aesthetic Displays

Motivation
Doors are more than entrances to rooms, they are entrances to a person’s time and attention. People can mediate access to themselves by choosing whether to leave their door open or closed when they are in their office. Doors also serve as a medium for communication, where people can exchange messages with passersby. These qualities make the door an excellent location for designing solutions that help people better manage their time and attention. In this work, we present a study of doors, derive design insights from the study, and realize these insights in implementations deployed in our workplace.

Design Studies
We observed the roles doors play in two dimensions: 1. As mediators of interruptions between visitors and inhabitants. 2. As a medium for personalization and information exchange. We used a combination of observations, interviews, and surveys to study doors.

Objects and Properties
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Action and Relationships
We also spent ten hours observing the actions that take place around and “through” doors. Some actions we witnessed include:
- Glancing in doors while walking down a hall
- Knocking on a door gently, leaning in to listen for activity within the office, then leaving
- Sliding an assignment under the door
- Reading a poster on a door
- Drinking coffee at a door

From Observation To Design
In the second phase of our effort, we mined our observations for design insights. We found that our design effort might be applied in the following areas:
- Exploring the effect to interrupt
- Exploring the temporal communication between inhabitants and visitors (e.g., daily schedule)
- Personalizing aesthetic expression on doors
- Selectively publishing information (e.g., a professor’s schedule is shown only to her students)
- Tracking exchanges between inhabitants and visitors
- Developing new affordances for interruption
- Adding the flow of information between inhabitants and visitors

Design Implementations
In the third phase, we put our design ideas to work in the implementation of two systems: Remote Door Awareness and the Door Projector. These systems work together to enhance awareness while providing new means for aesthetic expression on doors.

Remote Door Awareness
This system is comprised of three parts: sensors to measure the state of a door, a history database of door information, and a visualization system for communicating history to end users.

Door Projector
We built a system using a door with a window and a data projector. Our goal was to change the unusable two-way communication channel into a one-way information channel that could be manipulated by the office inhabitant. We implemented this system by covering the window with vellum and projecting onto the window the door from the inside of the office. The projected area in the window was flipped, so it could be viewed correctly from the outside. This creates a public area on the window, and a private area on the inside of the door.

Virtual Notes
We used a sticky notes program to leave virtual notes on our door. This allowed students to post announcements and remote visitors to leave messages. We also posted instructions for using the door system on the private side of the door.

Abstract Visualizations
We created displays to explore ways of presenting the history data captured by the door sensors. The displays were intended to extend the range of awareness typically afforded by a physical door in aesthetically pleasing and novel ways, while also preserving privacy and being minimally disruptive.

Digital Art
The students were able to customize the door with web pages, graphics, and other elements.

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Future Work and Implications
Though our initial deployment of the Door Projector and Remote Door Awareness systems shows promise, it is clear that more work is needed. The following presents several areas that need to be addressed.

Implementation
The Door Projector does not currently support interaction with the surface of the door. Instead, users must run software from personal machines in order to interact with the door. We would like to explore the use of a computer vision technique to recognize when a user touches the door. We believe that true-form interaction will improve the usability and utility of the door system.

Field Studies
The Remote Door Awareness visualizations need to be tested on larger groups. The current work has only investigated use with a handful of individuals. With additional members we can study how our system might affect social networking and group cohesion.

Outstanding Issues
Privacy issues are also an area of major interest. While the awareness systems provide knowledge to a wider audience, it is important to examine whether this affects the inhabitants (i.e., does it increase interruptions to the point where it is no longer useful).

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