

Intelligibility and Flexibility in Proxemics-Inspired Interfaces

You probably recognize this situation: A group of people are having a conversation, and one person spontaneously wants to share something via their device to the others' devices, however, they give up because it is simply too complicated. Imagine that everyone had an app called *Slam-to-Share*. They open the app and simply place their mobile devices on a table, and one of them slams the table surface with the fist. The devices jointly sense the impact and connect to each other. Now, they are able to jointly view and control the same digital content across their devices.

In this talk, we explore different kinds of proxemics-inspired interfaces. Proxemics theory is the study of people's use of space for social interaction. It helps us understand how people engage with each other through proximity (e.g., distance and orientation) and how the surfaces around us influence our opportunities for engaging with each other.

Proxemics-aware interfaces sense and respond to people's spatial movements around interactive surfaces and devices, such as people's distance and orientation to each other and to different devices. For example, proxemics-aware displays are commonly used to advertise products in public spaces and attract people's attention. However, proxemics-aware interfaces may suffer from a number of interaction challenges. Common problems include people not realizing that they are being tracked, not knowing how the display will respond when they approach it, or how they can opt-out of the interaction. We will illustrate these issues with a number of "dark patterns" in proxemics-aware interactions. Next, we will show how this can be addressed by making proxemics-aware systems more *intelligible* (or understandable). With Proxemic Flow, we show how a secondary peripheral floor display can be used to inform people that they are being sensed, reveal interaction zones to facilitate opt-in and opt-out choices, and guide interactions to help people discover what they can do with the system. We also illustrate how making proxemics-aware interfaces intelligible can be beneficial in social interactions by allowing people to rearrange themselves around sensor limitations (e.g. sensor occlusions).

While these examples show the benefits of making the underlying aspects of proxemics sensing visible (or intelligible), the sensing in these systems is often still quite rigid. People still need to adapt to the system and play by the system's built-in rules. However, in social situations, theories of proxemics and territoriality tell us that people tend to flexibly reorient themselves around a system depending on their task and the social relations with one another. It is therefore especially important that proxemics-aware systems support people in flexibly using the space around them to enact social relations through proximity and territoriality. Moreover, these systems should also support *control and flexibility* and provide answers to questions such as: "How can I interact from a distance? How can I opt out while still being up close?". In our CHI 2020 paper *Proxemics Beyond Proximity*, we explore this question of how we can make proxemics-aware systems more flexible. We offer three design sensitivities for enabling flexible social interaction with proximity-based cross-device interactions. Through prototype concepts, we show how interactions can (a) incorporate the non-interactive surfaces in the environment, (b) enable flexibility in interpersonal distances and orientations, and (c) support multiple alternative ways of interacting to achieve the same effect. We finally broaden these design sensitivities to the design of other kinds of proxemics-inspired interface design, with examples of shape-changing interactive tabletops that enable more flexibility for configuring personal and group territories around the table surface.