Casual Interaction: Scaling Fidelity for Low-Engagement Interactions

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Abstract
When interacting casually, users relinquish some control over their interaction to gain the freedom to devote their engagement elsewhere. This allows them to still interact even when they are encumbered, distracted, or engaging with others. With their focus on something else, casual interaction will often take place in the periphery—either spatially by, e.g., interacting laterally or with respect to attention, by interacting in the background.

Author Keywords
Casual interaction; peripheral interaction; engagement

Introduction
While most systems today assume a user is fully engaging with them, this is often (a) not possible for users due to interaction constraints, or (b) not desired by users because they choose to focus their attention on a different task. In what we call the *focused–casual continuum* [9], users themselves decide how much they engage with a system. This requires interactive systems to offer input over a whole range of user engagement levels, or different devices, custom-built for specific engagement levels.

In this paper, we will outline how casual interactions are related to peripheral interactions. Both focus on interaction where the user is engaged elsewhere, maybe

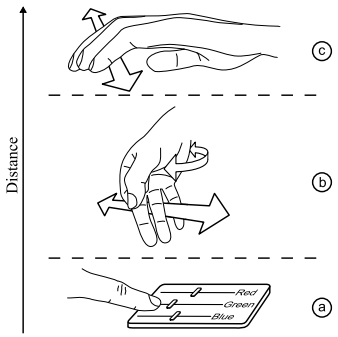

Figure 1: In this example, a user can pick the color of a moodlight at varying levels of control. It enables (a) fine control via touch on the device, (b) in-air control of brightness and hue by moving and rotating the hand, and (c) abstract control of mood by waving over the device.

concerned primarily with another task, but still wishes to interact with something else on the side. While similar, we also think there are some differences, which we will also try to carve out.

Interacting at Varying Levels of Control and Engagement

In Figure 1, we show an example of an interactive system that offers multiple ways to interact, each varying in level of engagement required and level of control available. Here, a user is controlling a moodlight—changing brightness and hue of the emitted light. Choosing a precise RGB color is possible by changing the value of three color sliders using touch in the device. While this enables a user to specify a hue and brightness very accurately, it also requires her to observe the device and execute fine motion as well. The color change could be observed from the light itself, but targeting the touchscreen controls requires a view of the device.

Two different ways to interact are available above the device. In both cases, the user does not need to closely observe the device anymore. Immediately above the device, moving the fingers back and forth can be used to control the brightness of the light, while rotating the hand changes the hue. Here, a comparably high level of control is retained while the demand of engagement with the device is much lower than with precise touch interaction. Finally, a user can just wave the hand above the device, signaling it to change to a different mood setting. No fine color control can be exerted in this case, but at the same time the engagement demand is much lower than in the other cases. Now, a mood change can be made without close interaction with the device—it can happen in the background/periphery of the user.

Note how at all time the user gets to take back control and intervene if more precise command specification is desired. This can be as simple as grabbing the device instead of gesturing above it. By enabling the user to make an active choice of engagement level, the system is relieved from determining that level itself. While some previous work exists (e.g., by Horvitz [7]) that tries to estimate how much control a user requires at a moment, we postulate that a user will always know best how much control she indeed wants. The focused–casual continuum also explicitly allows for more than two levels of control/engagement (other than agents that either take over or not).

What Motivates Users to Interact more Casually?

We identify three categories of reasons users are prohibited from or unwilling to fully engage with their devices: social, mental, or physical constraints.

Social Constraints

Close interaction with a system is not socially acceptable in all situations. Users adapt their behavior to their current surroundings and settings like a family dinner are less appropriate for device use than an evening alone on the couch. Depending on the situation, users might even deliberately show disengagement from their device to project a more attentive self [6].

Mental Constraints

When distracted or tired, users are less able to focus on an interaction. Even primary task, are shifting in and out of users' focus [1]. Ultimately, users can only make so many active choices [2] and offering them a way to interact at a lower level of control would already be worthwhile.

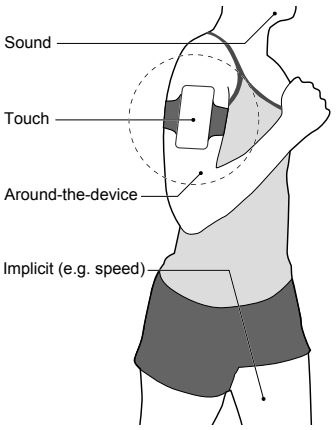

Figure 2: Here we show multiple ways a runner could interact with a mobile device. Using touch, precise input can be made, but the runner would need to stop and possibly remove the device from its holder. Around-device interaction is less precise but also could be used while still on the move. Without stopping (but possibly with slowing down), a user could issue voice commands to a device. Finally, the act of running itself could control a system. For example, a music player that picks songs based on the running speed could be implicitly controlled.

Physical Constraints
Physical reasons for users being unable to exert full control can be as drastic as missing limbs or as basic as wearing gloves. Systems should not assume that a user at any given moment is able to invest the full range of agility and precision in a task. Think of carrying a number of shopping bags: touch interaction with a phone is harder in those circumstances, but wished for nonetheless.

In all this situations, users are less *able* to interact with their devices yet not necessarily less *desiring* to do so. By allowing them to interact at reduced levels of engagement (and thus control), we can give them a way to retain some control and not give it up completely (e.g., to an agent).

How Casual Interaction Differs from Peripheral Interaction

An important property of the focused–casual continuum is that it is gradual. While actual implementations might only offer discrete interaction levels, the concept itself allows for a continuously varying level of control. For example, recently we have investigated using pressure to allow users to determine the level of control they desire over their phone's autocorrect functionality [10]. Slight and less precise touch allows for less engaged typing and signals the system to correct most errors, while more deliberate input allows to gain back control and override system corrections. Thus casual interaction can move between happening more in the periphery or the focus of a user's attention—in contrast to peripheral interaction's stress of secondary tasks.

We would also like to stress that casual interaction comes with a strong focus on user choice. Instead of automatically determining how much control a user desires, we believe users themselves should be the ones who pick the level of engagement and control they want. Especially when it comes to reacting socially appropriate, a user is likely to make better choices than an automated system on how much device interaction is acceptable. We believe it is this aspect of user control, that is distinctive of casual interactions. Concepts, such as Buxton's foreground/background model [3], Ju et al.'s implicit interaction framework [8], or Dix's incidental interactions [5] also see this range as a binary choice, in contrast to casual interaction's gradual continuum.

Device Outlook for Casual Interaction

Small mobile devices inherently require close engagement for most interactions. Especially touch interaction is hard to perform without focusing on the device. We believe that to make good use of the focused–casual continuum, future devices need to be able to sense more around the device. Previously we have explored interaction with a prototype simulating a mobile device able to sense hand movements in the air above the device [9]. With current developments like PrimeSense's *Capri*[1] or Occipital's *Structure Sensor*[2], we believe many mobile devices will soon have the capability to sense the world around them.

Once our devices are able to sense around them, we believe there will be a surge in ad-hoc utilization of everyday objects for interaction purposes (similar to, e.g., [4]). When interaction can be decoupled from our devices, we will be freed from the need to grab them and touch them every time we want to make an input. Instead, we believe there will be an abundance of choices on how to relay commands to, e.g., our phones—some requiring users to closely engage, while others pick up subtle changes to allow for less engaging interactions.

[1] `http://www.primesense.com/solutions/sensor`
[2] `http://structure.io`

Conclusion

Casual interaction, like peripheral interaction, allows users to control a system with less than full attention/engagement. There are a number of reasons why we think a user might want to relinquish some control in a number of situations. But casual interaction leaves that choice to the users, allowing them to pick the right balance of engagement and control at a given moment themselves. With devices' sensing capability soon enabling them to pick up input not just directly on the device but possibly all around them, the question of how to use this freedom for appropriate interactions will become more pressing. We believe the casual–interaction continuum is one way to capture the range of possible interactions and the motivations for choosing between those more in the foreground and those more in the periphery of a user.

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