

Azalea: Co-experience in Remote Dialog through Diminished Reality and Somaesthetic Interaction Design

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Figure 1: The final prototype for Azalea, constructed from laser-cut wool, wood, foam, and plexiglass. All sensing and actuation is implemented via a smartphone that slots into the cushion.

ABSTRACT

We introduce Azalea: a design to enrich remote dialog by diminishing externalities, created through a process informed by somaesthetics. Azalea is a tactile cushion that envelops a smartphone running a bespoke app. A pair of Azaleas mediate an embodied co-experience between remote interlocutors via a motion-driven soundscape and audio-driven visuals. While most designs for enriching remote communication increase dimensionality and fidelity of modalities, Azalea diminishes distractions and serves an abstract medium for co-experiencing embodied information. We present the theoretical foundations and design tactics of Azalea, and characterize the experience through a qualitative empirical study. Our

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findings culminated in 12 qualities, supporting 5 themes with design implications that contribute to (1) a design ethos of diminished reality and (2) an expansion of somaesthetic HCI towards expression and communication.

CCS CONCEPTS

- Human-centered computing → Interaction devices; Mobile computing; Gestural input; Smartphones.

KEYWORDS

Somaesthetics; remote communication; embodiment; embodied information; smartphone sacrifice.

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Figure 2: Azalea: idle (left), initializing (center), in use (right).

1 INTRODUCTION AND RELATED WORK

In co-located communication, significant information is often conveyed through gestures, subtle nonverbal cues, gaze, facial expressions, and so forth. These refer to affect, attention, intent, and other subtle aspects of interpersonal communication that are not “compressible” in a digital medium. Hence, in contrast to co-located communication, channels for such subtle exchange between remote interlocutors are either absent or lack fidelity. The problem is compounded as interlocutors are located in different environments. Thus, the limitation is not only that interlocutors do not “co-experience” [5–7] subtle “embodied information” [8] – they are, in fact, environed by entirely different stimuli. Co-located communication is therefore preferred when affect, attention, intent, and subtle cues are significant (e.g. when breaking up a romantic relationship [44]).

In neuroscience, concepts like theory of the mind [45, 55], mirror neurons [18, 34, 48], the shared manifold of intersubjectivity [16, 17], and somatic markers [14, 15] explain exchanges of embodied information between co-located interlocutors. These relate to sensory as well as motor systems in the human body [8, 54]. In HCI research, a common approach to recruiting these concepts, is *augmenting* communication through adding dimensions and fidelity to the experience. These often rely on capturing and digitizing human and environmental features. For example, in teleconferencing, Holoportation transmits high-quality 3D representation of speakers using a head-mounted device [52]; GazeLens augments a tablet with a 360 degree camera for professional collaboration [41]; MirrorTablet captures gestures through the front camera of a tablet instrumented with a custom mirror [42]; and LightBee utilizes drones, projecting the faces of interlocutors on a drone-mounted display, controlled by head movements [71]. We propose a contrarian design challenge: *How might we diminish – rather than augment – reality, to enrich remote communication?*

To foreground embodiment in HCI design, we found a suitable foundation for ethos and methodology in somaesthetics – due mainly to work by Höök and colleagues in synthesizing theoretical constructs relevant to HCI [28, 30, 32]. Somaesthetics as an interdisciplinary discipline of research and practice integrates diverse works that center “the soma – the living, sentient, purposive body – as the

indispensable medium for all perception” and “sensory appreciation (aesthesia)” [60]. In HCI, this informs “experience-centered” approaches [43, 69] leading to designs where technology is used for “engaging participants in deepening the experience of their own felt bodily sensations and movements” [32]. Hence, current examples of somaesthetic HCI so far have been emphasizing introspection. For example: Aslan et al. have presented a design to allow “users to experience their own heart’s behavior by providing haptic feedback” [3]; Bergström and Jonsson’s Sarka directs the user’s attention to the “weight distribution and motion intensity of different parts of the body” [9]; Ståhl et al.’s Soma Mat and Breathing Light “subtly guide participants to turn their gaze inwards, to their own bodies” [65]; Asplund and Jonsson’s SWAY helps participants “reflect on their own body and increase their body awareness” [4]; and La Delfa et al.’s Drone Chi promotes bodily awareness through meditative movement [37–40]. Conversely, potentials of somaesthetics for expression and communication are relatively under-explored. Examples in this domain – of somaesthetics-informed designs for communication and expression – include soft(n), a “networked, tangible interactive artwork” [58]; Mediated Body, a performative and playful exploration augmenting touch with light and sound [26]; the Embodied Encounters Studio, a toolbox for ideation and play [29]. Our work follows from a similarly situated design challenge: *How might we capitalize on somaesthetics in HCI to design an artifact for channeling embodied information in remote communication?*¹

To this end, we undertook a constructive design research project [20, 35, 72] through a process informed by literature that imports somaesthetics in HCI. Here, we present 3 contributions [68] that resulted from this project:

- Azalea (Fig. 2) – a design that addresses the challenges above by grounding in research and instantiating prior theoretical contributions in HCI.
- A qualitative empirical study that articulates the Azalea experience and how it instantiates responses to our design challenges.

¹As we write, in 2020, we are practicing “social distancing” and isolation to counter a pandemic. In this environment, we are quite convinced that this is a worthwhile design challenge.

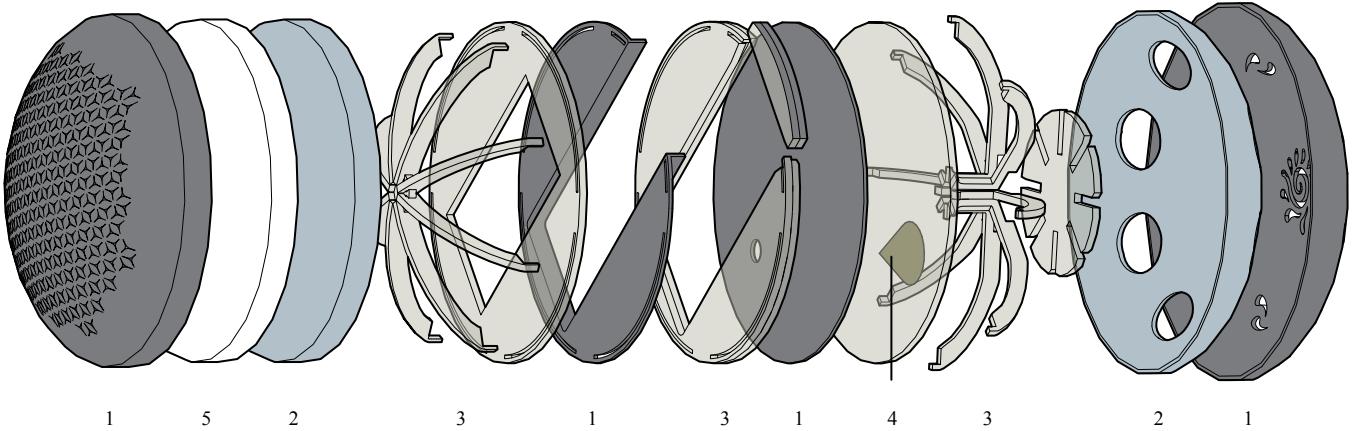


Figure 3: An exploded view of the Azalea build. Layers of soft wool (1); an inner foam layer (2); the structural pieces in laser-cut acrylic (3); a reflective cone to redirect the light of the flash (4); and a layer of protective linen (5).

- Implications for future work, in response to research questions framed as design challenges: (1) articulating a “diminished reality” ethos and (2) expanding somaesthetics, to enrich remote communication.

In current literature, “diminished reality” is a computer vision and graphics technology [25, 49, 73], defined as “removing an object or collection of objects and replacing it with an appropriate background image” [73]. Design researchers have investigated this technology for innovative experiences in interior design [63], gaming [57], and supporting individuals with autism [70]. In this paper, we hijack the term “diminished reality” in service of design innovation. In what follows, we use this term to denote a design ethos predicated on removing stimuli and actuation from a context.

2 THE DESIGN OF AZALEA

2.1 Design Process

Our design process was informed theoretical and methodological resources on somaesthetics in HCI. We were influenced by the “strong concept” ([31]) Somaesthetic Appreciation [30]. This gives designers access to a foundation of somaesthetics through four qualities to be embodied in their process and resulting artifact(s): “subtle guidance,” “making space,” “intimate correspondance,” and “articulating experience.” Then, we utilized the “soma design” approach which curates a menu of motivations, examples, skills, and methods for IxD [28]. Following this resource, the first and second authors (who are also the principal designers) conducted the design process.

The scope for design intentions was guided by interviews with somatic connoisseurs [59] experienced in Feldenkrais, dance, yoga, and mime, as well as a blind person; and by engaging in practices that increase somaesthetic skills (yoga, Feldenkrais, and expressionist dance). The significance of the environment came into focus in this stage, where themes emerged around designing contexts rather than specific experiences. Aesthetic laborations (A-labs) [1] and other material explorations aided in form and material selection, with desiderata being articulated around an artifact that is serene,

organic, soft to the touch, and inviting to hold, but still rigid and sturdy inviting confident movement.

Informed by these activities, we employed numerous ideation and prototyping methods. A large set of concept sketches were generated through Crazy 8's². We performed a form of artifact analysis by scrutinizing the experience of sitting around a campfire – a metaphor that was common to many early concepts, that eventually evolved into a handheld object. We considered the campfire as a powerful aesthetic social experience where people feel comfortable, calm, and encouraged to share stories. Hence, many elements of Azalea were modeled after this experience, such as a dark natural environment, the sound of fire crackling, and drifting off while staring into the fire. Concurrently, we undertook conceptual investigations around the technology of sensors and actuators in the smartphone. We considered possibilities including heart rate, movement, image projection, and proximity sensors.

Alongside somaesthetics as a resource for ethos and methodology, in form and material choices, we were inspired by Slow Technology – “a design agenda for technology aimed at reflection and moments of mental rest rather than efficiency” [24]. Here we found aesthetic guidelines for devices to support reflection and presence instead of “use”, purposefully departing from conventional efficiency and usability concerns: “focus on slowness of appearance (materialisation, manifestation) and presence – the slow materialisation and design presence of form” (F); and “focus on aesthetics of material and use simple basic tools of modern technology – the clear and simple design presence of material” (M).

2.2 Azalea: Artifact Description

Azalea comprises a physical device – essentially a tactile cushion that envelops a commodity smartphone – and a smartphone app (Figures 2, 3). The smartphone, after launching the Azalea app, is inserted into the cushion. Azalea thus “swallows” the smartphone – the phone and the cushion become one.

²<https://designprintkit.withgoogle.com/methodology/phase3-sketch/crazy-8s> – accessed 2020-09-15.

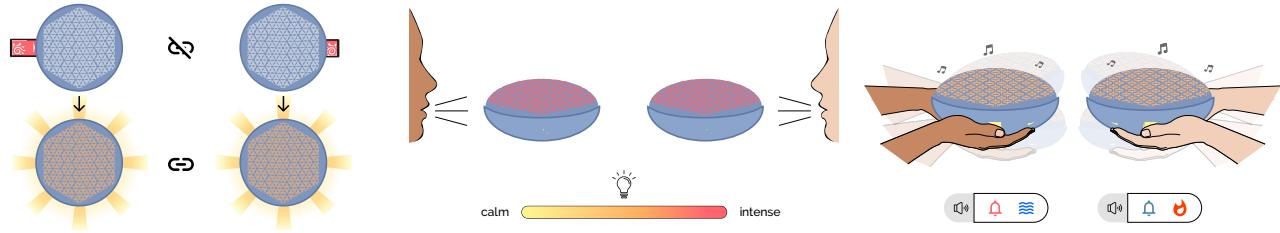


Figure 4: Overview of the interaction design: initiation by inserting the mobile phone (left); the light changes in response to loudness (center); movement produces a shared soundscape of fire, water, and singing bowls (right).

The interaction design involves a pair of Azaleas to establish a shared embodied co-experience [5–7] between remote interlocutors (Figure 4). The app recruits the proximity sensor and inertial measurement unit (IMU) on the phone for sensing, as well as the display and rear flashlight for actuation. Sound is transduced through wireless earphones. The two Azaleas exhibit exactly the same actuation, in synchrony. Azalea can be used as a stand-alone mode of communication, (as in our study) or augment a voice call that is started before launching the app and inserting the phone.

Azalea's interaction design is grounded in qualities of Somaesthetic Appreciation [30]. First, the physical design strives for “subtle guidance” and “making space.” This is done via lights and colors on the artifact which are intentionally limited in brightness, so they cannot be distinguished in a well-lit environment. Thus, the artifact subtly necessitates that the user moves to a darker space, or to turn off the lights. This dark environment limits the tendencies to engage with other stimuli or to move around. Further, by giving up access to the smartphone, a significant distraction is eliminated. Hence, the interlocutors are subtly guided into a calm and focused space, mentally and physically.

Amid the dark and empty physical space, with synchronized actuation, Azalea provides a focal point for co-experience where “intimate correspondence” and “articulating experience” figure in a cryptic fashion. The movements of the artifact, as it is manipulated by the user, are translated in real-time into a soundscape composed of water, fire, and singing bowls. One Azalea's translational movements – via the accelerometer – are mapped to the volume of a crackling fire sound, and the other to ocean waves. Their rotational movements trigger the sounds of singing bowls, pitched at two different notes that harmonize. Soft materials and forms inspire users to touch and hold the device continuously, rather than set it down; and the soundscape, which corresponds to subtle movements, unfolds in constant flux. The sounds are mirrored exactly between the pair of artifacts. Thus, “intimate correspondence” between movement and sound is achieved, and information embodied in movement is “articulated” between interlocutors.

Azalea contributes a visual dimension to the communication via light and color intensity. For this purpose, the entire front display of the smartphone is continuously set to a color and intensity that corresponds to the sound volume picked up by the audio input. A quiet conversation induces a mild yellow glow, and increasing loudness drives the display towards a bright pink burn. The rear flashlight is left always-on, and scattered through laser-cut slits on

the back; it serves merely to amplify the sense of one's own subtle movements as it shines in the environment.

The interior of the cushion is fabricated in laser cut wood and acrylic (Figure 3). The centerpiece in wood fits a smartphone.³ Opaque wood separates lights between the front display and the rear flashlight. Curved forms on both sides are cut in acrylic, chosen over wood or 3D printed plastic due to transparency, efficiently propagating the smartphone's lights to the surface. All pieces are cut to fit, and glued to increase stability. The structure is covered with three layers of soft material: (1) thick polyester foam, soft to the touch, and reasonably transparent; (2) white fabric, covering the foam for a “finished” look; (3) gray wool, with a high-quality aesthetic. The wool layer bears laser-cut patterns: the front has perforations, emanating a subtle glow (from the front display); and the rear has slits radiating white light. To assemble, the soft layers are glued, then sewn with an elastic band that mounts on the internal structure.

The Azalea app is implemented in Java on Android. Other than the standard libraries, we used Firebase⁴ for networking, and TarsosDSP⁵ for audio processing. The cushion has no electronic components. This is a feature of the design. Instead of a “technological” and “digital” sense of interaction, we wished to evoke an “organic” feeling of “natural” communication. The imagery of “giving up” or “sacrificing” the smartphone, which is “swallowed” by Azalea – as well as the choice of materials (e.g. wool) and fabrication methods (e.g. hand-sewing) – also stem from this ethos.

3 EXPERIENCE STUDY DESCRIPTION

Our study characterizes the experience and value of Azalea, revealing how it embodies responses to our design challenges. Thence we synthesize themes with design implications regarding our research questions, framed as design challenges: (1) instantiating a “diminished reality” ethos and (2) expanding somaesthetics, to enrich remote communication.

We visited pairs of participants at their own spaces (mostly homes), presented a pair of Azaleas, and let them to use and explore the design in open-ended sessions lasting approximately 20 minutes. Surveys and interviews followed.

³We used Xiaomi Redmi Note 2. As the phone's rear light is located in a corner, we also fabricated a reflective PVC cone for symmetrical light distribution. This, and the geometry of the smartphone slot, is to be tailored when adapting the design for different devices.

⁴<https://firebase.google.com> – accessed 2020-09-15.

⁵<https://github.com/JorenSix/TarsosDSP> – accessed 2020-09-15.

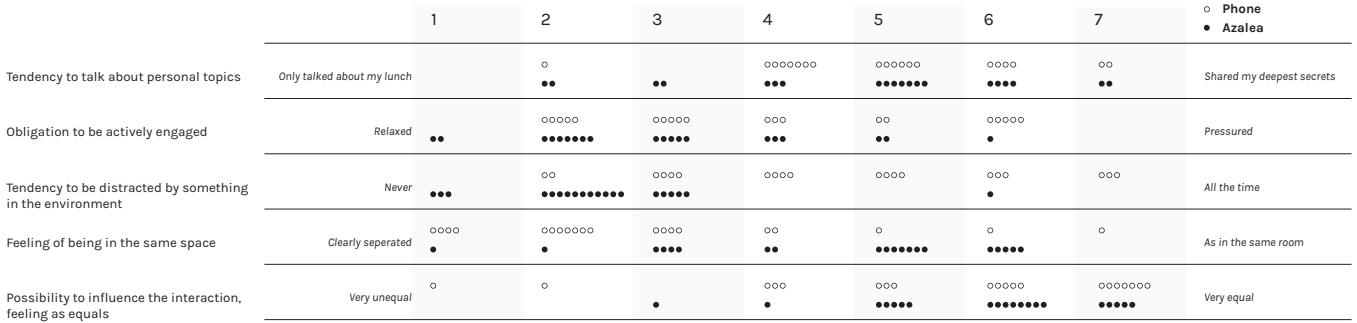


Figure 5: Results from our questionnaire, comparing Azalea to a regular phone call.

We recruited 20 participants (10 pairs) via acquaintances and snowball sampling – mainly younger adults. We did not pursue a more extensive recruitment strategy due to an ongoing pandemic. We prioritized studying Azalea in its intended context – interlocutors' own spaces. Each pair of participants had existing relationships to each other – as friends, colleagues, or romantic partners – already communicating remotely with each other via various means.

Participants were recruited with the premise to have an “enhanced phone call.” Two authors (henceforth: “we”) visited the participants’ location with one Azalea each. We briefed participants about Azalea and the procedure, and documented informed consent. We emphasized that the conversations are not recorded. After setup, we left the space to ensure interlocutors’ comfort and privacy.

We administered two similar questionnaires with 5 questions, graded on a 7-point scale (summarized in Figure 5). The first was given before the session, covering the experience of a regular phone call. The second questionnaire, grading the design, was given after the session. Finally, we interviewed the participants – first, one-on-one, eliciting individual experiences, not influenced by their counterpart. Then, the two participants and two researchers had a semi-structured conversation, through a regular phone call. Thus we aimed to collect reflections from multiple perspectives. Interviews covered, e.g. the meanings in the interaction design, perceptions of different media modalities, and the physical design.

Interviews were recorded, transcribed, printed on paper, and cut into excerpts. Informed by thematic analysis [2, 12, 23], we iteratively clustered and re-arranged excerpts, arriving at a set of qualities that consolidate participants' experiences. We constructed affinity diagrams to visualize relationships and proximities between excerpts and qualities. Finally, we organized this analysis into a set of themes that incorporate the qualities non-exclusively. 12 qualities and 5 themes resulted from this analysis. The results are shown on Figure 6 and described in the following section.

4 THE AZALEA EXPERIENCE AND DESIGN IMPLICATIONS

Our analysis revealed 12 qualities that articulate the experience of Azalea, and how it instantiates responses to our design challenges of (1) articulating a “diminished reality” ethos and (2) expanding somaesthetics, to enrich remote communication. We subsequently

organize these qualities into 5 themes, associated with design considerations and implications to inform future work.

4.1 Qualities

4.1.1 Removing Distractions. Our interaction design had the intention of subtly guiding participants into a space without distractions – thus, Azalea envelops the user’s smartphone and requires a dark environment to function well (see: Section 2). The relevance of this was corroborated by participants, who mentioned getting distracted by surroundings while on a voice-only call. One noted: “*if you call with someone [...] you check your phone, notifications pop up, you scroll a bit, etc.*” They “*like the idea of locking your phone away.*” This allowed them to focus on the exchange: “*It was darker, more secluded, so then I could listen a bit more. I was less aware of my exact environment...*” The questionnaires also suggest that Azalea compares favorably to a phone call in this regard (Figure 5). Thus, Azalea demonstrates how constraints can be designed to influence the users’ physical environment beyond an artifact.

4.1.2 Ritual Transitions. Having a specific sequence of actions with intention – a “ritual” – evokes state of mind and experience, associated with this intention. The initialization of Azalea is such a ritual: the smartphone is inserted and Azalea comes alive. A very clear action marks the transition into the “diminished reality” with Azalea: *“I guess the fact that to use this properly, you have to get into a room, turn off the light, sit more comfortably, etc. Those things combined probably does something to you, relaxing you, helping the conversation.”* *“I think the feeling from inserting the phone was ‘I connect now’ I connected to the experience, activated it.”*

4.1.3 Simulating Context. Azalea not only facilitated the subtraction of distractions, but simulated a shared context via co-experienced soundscape and illumination. “Cosy,” “Zen,” and “*being in the same room*” were common word choices to describe its character. One participant summarized: “*He is here [holds out hands] in the conversation. I know that the conversation is happening here.*” “*It feels like a good thing to have something to gather around, even though it’s in different places.*”

4.1.4 Identical Artifacts. Interlocutors had artifacts that are identical in appearance, feel, and functionality; creating a sense of common ground. Thus, in a way, the user experience gained “intersubjectivity” [8]: *“The sounds and sharing the same visuals felt like it anchored us more in the same dimension.”* This strategy removed

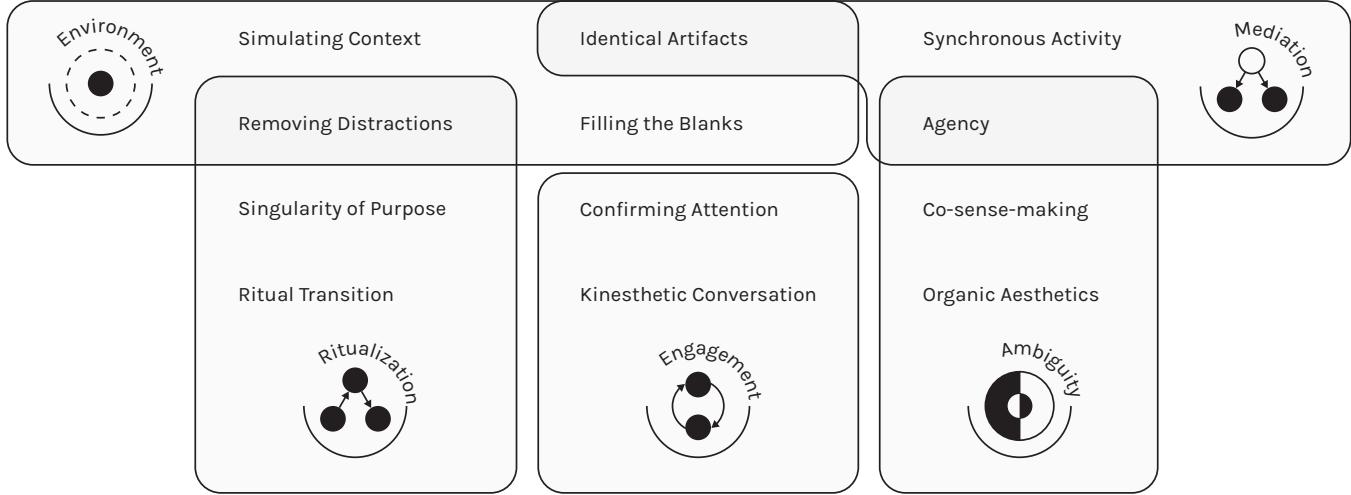


Figure 6: The qualities that articulate the experience of Azalea, organized into five themes that relate to design implications.

complexity from the experience, and unsealed meaning, as interlocutors understood that they possess an identical design: “*We learned that, whenever I turned it, or spun it around, it produces a certain sound, and that it did the same with his, just that mine had fire and he had water. So I would know that, when he was spinning his and I was spinning mine, so it was pretty easy to visualise how he was interacting with it.*”

4.1.5 Kinesthetic Conversation. Both physical and digital aspects of Azalea – form, material, weight, sound, light... – influenced how people move and position their bodies during sessions: “*The design had a great effect on how I moved around, rather than what I would say in the conversation. It made me move in ways I don't usually move.*” “*The fact that it was the size it was made me hold it with both hands or with one hand underneath it. I never grabbed it like a burger. I held it like a baby.*” The coupling of movement to sound encouraged some people to move (“*If we moved the artifact around, we would get waves. When I did that while moving in the room, it felt like I was walking in shallow water. That felt cool. It was strange when I was sitting down that I got the watery sound.*”), while others preferred to be still (“*I did walk around with it, but it felt more natural to sit still for some reason.*”). Though actions were different, the quality was appreciated: “*The fact that the other person will be part of your movement is really nice. It feels more like hanging out for real.*”

4.1.6 Synchronous Activity. Co-interacting with an identical device evoked closeness between interlocutors, and called for engaged physical activity: “*we were actually doing the same thing and in the same moment.*” Notably, the interaction is referred to as an activity that people “do”: “*It's like we're doing something now, so I have to be there in that moment with her.*” Thus, participants felt a need to stay engaged during the sessions, as movement was relayed through the artifact: “*You could hear someone doing a little bit like [imitates Azalea sound], or just sitting still, so then you could notice if another was moving, which you normally couldn't with a normal phone call. It makes me feel like I know more what the other person is doing right now.*”

4.1.7 Filling the Blanks. Participants noted that the soundscape, constantly present in the background, created social comfort; removing awkward silences that occur during conventional calls: “*I feel that [in a call] I have to give [the other] feedback, to show that I'm active, there and listening. But I didn't feel that now, because there was something on the background all the time.*” “*Sometimes we were just listening to the sounds because they were interesting. So then it wasn't really that the conversation ended, just that we were interested in the sounds, so then we weren't talking.*”

4.1.8 Agency. Some participant accounts pointed to the design having a degree of agency, rather than being a neutral mediator. They noted, for example, that a proportion of their conversation through the design was about the design itself. Some also mentioned how Azalea might feel like a participant in the conversation. This quality was unintended, and served mostly as a conversation facilitator (“*I felt like the focus was more on the device. I fiddled around with it, like rotating it and stuff like that. But I feel like it still somehow kept me engaged with the conversation and not distracting me.*”), but also put off some people (“*I was super distracted by the azalea. I was very interested about what happens when I do things. This distracted me from the conversation.*”).

4.1.9 Singularity of Purpose. A smartphone can be a “portal” that opens to myriad applications. Azalea has a singular, specific purpose in deepening communication. Though this does not prohibit emergent use, there is no other application that it has been designed for. Participants appreciated this quality: “*I really enjoyed having such a focused phone call.*” “*If I wanted to make a fast call I wouldn't use this. Maybe when I talk with my grandmother for a long time, or with my best friend. But I think it should be a longer call. Then you have time to disappear into this space for a while.*” Participants also proposed that having the Azalea cushion in their spaces can remind them to maintain contact.

4.1.10 Confirming Attention. Participants felt acknowledged and engaged when they receive signals that their interlocutor is attentive. This is natural in co-located communication, and Azalea’s

cryptic modality fulfilled the same purpose: “*If I hear that the fire is sparkling, I know that [other user] is sitting with the Azalea in his hand, not using the hands for something else.*”

4.1.11 Co-sense-making. Actuation in Azalea is intentionally cryptic, meaning to spark curiosity. Some interlocutors took this an invitation to explore and make sense of the ambiguous together. This shared process, in turn, encouraged depth in conversation and added a sense of accomplishment: “*It was like a puzzle to solve together.*”

4.1.12 Organic Aesthetics. Azalea’s materials and forms, and the “masking” of electronics, seem to evoke calm and comfort: “*The projections were cozy, it was like lighting candles.*” “*I was looking at the projections a lot, it was like a starry sky. It was nice, I liked the shapes, it catches your eye. It’s nice to look at lights, there’s something biological about it.*” The design was found a good fit for a cozy space: “*I can associate it more as a product that you have at home, but maybe as a pillow or something, but not as a device. It was not like that plastic cover that you see in all the home devices that we have.*”

4.2 Themes and Implications

We clustered the above qualities, non-exclusively, into 5 themes which bear implications for HCI design. These themes articulate our responses to two relevant research questions, which we posed as design challenges:

- How might we implement “diminished reality” – in lieu of technological augmentations – to enrich remote talk?
- How might we expand on somaesthetics in HCI for remote communication?

4.2.1 Environment. Azalea originated as a somaesthetic design research project. We observed the significance of how interlocutors’ surroundings bears on remote communication during the early stages of this work, and positioned the project to address this challenge. Excerpts from formative interviews exemplify: “*It depends on the environment and where I am. If I am home then I can talk about everything but if I am on a train or a restaurant for example I will be more superficial. And I prefer to meet and talk.*” “*If I sit behind my computer while on the phone, I’ll definitely get distracted. But if I decide that I should be actively engaged in the conversation, I go lay on the couch or take a walk.*” “Making space” as a quality of Somaesthetic Appreciation also encapsulates this concern.

Building on this, we reframe the qualities *removing distractions*, *simulating context*, having *identical artifacts*, and *filling the blanks* from our consolidated account of participants’ experiences as *interaction design strategies* of somaesthetics and “diminished reality” for communication. In Section 2 we described the tactics employed in Azalea’s design, which culminated in these strategies.

An insight for future work is that a discrete artifact at hand can embody qualities that influence the Environment at large. In Azalea, first, a calm glow instructs the participant to remove distraction and diminish their environment. Then, identical co-actuated artifacts “simulate” a shared environment. “*Filling the blanks*” alleviates potential discomforts of the diminished environment. (“*There is not always a need to talk. It gives [us] higher tolerance for silence.*”) Thus we demonstrate how “making space” for somaesthetic design can be instantiated through cues expressed in a compact, contained

artifact – not necessarily by “making” a larger space. Expansive mental space and “bandwidth” can be enabled in a portable design: “*With an ordinary phone call, when you’re only talking, the bandwidth is too small to let you experience the same thing, so you can at least see each other. But in this case, we had the device and the same experience and that made it almost like we shared a room...*”

4.2.2 Ritualization. A ritual can be as simple as lighting a candle – an action sequence that delineates intentions. In Azalea, removing environmental distractions and inserting the smartphone is a clear and simple action sequence that marks the transition to co-experience. In Azalea, design decisions that culminated in Ritualization derived originally from “subtle guidance” in Somaesthetic Appreciation.

In 2018, a systematic literature review analyzed 52 “unconventional user interfaces for emotional communication between long-distance partners” [46], noting that: “augmenting current technologies and integrating them into users’ communication ecology could be more easy and beneficial than introducing totally new devices. Some devices were based on dedicated objects, while it turned out that users tended to prefer the hybrid approach of using e.g. a mobile phone and perceived it enriching.” We wish to refine this insight and integrate it to a theme of Ritualization, due to our participants’ accounts of how they appreciated a physical device with *singularity of purpose*. Our interpretation is that participants (perhaps fatigued by ubiquitous digital gadgets [67]) appreciate a purely “natural” artifact, completely devoid of electronics. Hence alongside *ritual transition* as a core means and *removal of distractions* as an end; we propose that artifacts with bespoke and minimal purpose can facilitate intention-rich rituals in interaction design.

4.2.3 Mediation. As we note in Section 1, our work was motivated by the notion that many of the subtle phenomena in co-located interpersonal communication are impossible to “compress” in an artificial medium. Hence the “*artifact as medium*” is, in some ways, a tractable design consideration; and in some ways an emergent phenomenon, impossible to design. We speculate, this might explain why Somaesthetic Appreciation, despite potentials of “intimate correspondence” and “articulating experience,” does not appear to have fueled an assortment of designs for remote communication.

The character of Azalea as medium is articulated in the qualities of *synchronous activity*, and *identical artifacts*, and *agency*. The first two of these qualities address both of our research questions, suggesting a key insight: as much as we utilize digitally mediated co-experiences – e.g. co-experience of movement, mediated through sound – we can also unblock channels for meaning in remote communication via identical physical forms and materials at hand. Our PCs and phones used in everyday communication, in fact, are vastly customized; quite often impairing communication simply because the medium’s Heideggerian presence-at-hand is not mirrored between interlocutors. While identical Azaleas do not solve the relevant technical issues, the design appears to alleviate their perception. Hence, we wish to propose qualities of *synchronous activity*, and *identical artifacts* to extend “intimate correspondence” in Somaesthetic Appreciation towards supporting remote communication. However, as our quality *agency* exemplifies, there is always more to uncover in the gap between design intentions and participant experiences.

4.2.4 Engagement. Engagement encompasses qualities of *kinesthetic conversation*, *confirming attention*, and *synchronous activity*. Distinct from how engaged participants are with the artifact (cf. Mediation) rather than distractions (cf. Environment), here we refer to interlocutors' engagement with *each other*. These qualities can be consolidated into two actionable principles for design: (1) move, and (2) keep moving. Engagement in the conversation is facilitated by shared action: “*If you’re talking with someone normally you don’t know if they disappear away into their computer or their phone. Now you know that there is something that you both focus on together.*”

A ingredient for engaging remote co-experience is acknowledgement (*confirming attention*). As we noted previously, this occurs naturally when co-located, and becomes a challenge over distances. Through movement (*kinesthetic conversation*), interlocutors can use movement to indicate their presence and confirm their attention. The insight is how such information can be transcoded between modalities. In Azalea, we began with mapping movement to soundscapes. Future work can comprise other modalities (e.g. haptics) and more granular sound and lighting design tactics.

4.2.5 Ambiguity. Azalea was intentionally designed as an open-ended interaction that departs from conventional “use.” Qualities of *organic aesthetics*, *co-sense-making*, and *agency* articulate how the result bears on participants’ experiences. We cluster them under a theme of Ambiguity since faculties of curiosity, exploration, and playfulness underpin participants’ attitudes.

Especially when they first encountered and began exploring Azalea, for many participants, the relationship between cause and effect was unclear. Some noted that, at times, what the device is deciding and what the user is deciding could be unclear (*agency*). Many participants engaged in exploring these behaviors together (*co-sense-making*): “*I think influencing the soundscape and colours affected influencing the conversation in some kind of feedback loop, in the sense that we conversed about how to interact with the thing. [...] That worked very well in creating an extra interplay in the conversation where you take turns exploring and describing.*” The *organic aesthetics* of the artifact interplay with these qualities to facilitate positive experiences. While previous work has touched on such qualities individually (e.g. [10, 56, 66]), Azalea exemplifies how they combine to enhance the experience of remote interlocution.

4.3 Discussion

The 5 themes above have implications that may serve future design research and practice that aims to enrich human communication or relates to the two approaches which motivate our work – diminishing (rather than augmenting) reality, and somaesthetics. While above, we focused on our novel results, such motivations have also informed relevant previous work, to which we would like to do justice.

The theme of Ritualization in connection with somaesthetics has been explored previously by Loke et al. in the context of a “participatory live-art installation” [47]. While Loke et al.’s work follows from artistic and expressive goals, Azalea makes the case for how the same foundations can serve the comparatively more utilitarian goal of enriching private remote dialog.

Many designs for remote communication which experiment with local physical embodiments of remote presence have been presented in research literature. Examples include SmallConnection, which conveys “faint information such as light, wind and touch” via robotics [51]; shape-changing tactile robotic devices such as Bendi [53], RobotPHONE [61], and Vital + Morph [11]; Mobile Feelings, which transmits “body data” such as breath and heartbeat [64]; and “digital but physical surrogates,” which are small robotic avatars for remote colleagues [22]. Design implications for fostering and nourishing intimate relationships have followed from prototypes like the Cube and the Picture Frame [19], and Hugvie [36]. Azalea represents a fundamentally different design ethos which we hoped to capture in the concept of “diminished reality.” While robotic and electronic devices can certainly enrich communication by augmenting our world, the crux of Azalea is a non-electronic device which “swallows” and removes embodiments of the digital.

Ideas and examples from theory-focused work also have noteworthy parallels and orthogonalities with our themes. In *Beyond Being There*, Hollan and Stornetta have made the argument against co-located communication as a “gold standard” [27]. They propose directions and qualities with benefits “beyond face-to-face,” many of which are utilitarian and purposeful (e.g. “anonymity”, “clarity”, and “archive”). Conversely, themes like Environment and Ambiguity in our work illustrate a distinct design ethos. Sengers et al.’s *Reflective Design* gives the example of the Virtual Intimate Object (VIO) – a minimalist 1-bit communication software for intimate relationships, which embodies, to some extent, the themes of Mediation and Ambiguity [62]. In response, Azalea embodies a similar ethos in the form of an essentially non-digital, non-electronic design that represents a nudge away from the the digital, rather than adding one more bit.

Finally, though our work has focused on remote communication, work such as Dagan et al.’s *Design Framework for Social Wearables* suggest that Azalea’s design ethos and resulting themes may have implications for co-located communication, which may be empirically investigated in future work [13].

5 CONCLUSION

We reported on a constructive design research project that investigated how we might design to enrich remote interlocution. Distinct from previous work, we adopted two contrarian design challenges: (1) To diminish, rather than augment. (2) To expand the frontiers of somaesthetic HCI towards expression and communication (Section 1). Our project culminated in Azalea – a tactile cushion which envelops a smartphone running a bespoke app (Section 2). We constructed a pair of Azaleas, and conducted an empirical study to characterize how participants articulate their experience of the design (Section 3). We presented qualities (Section 4.1) that consolidate the experiences of participants, and themes (Section 4.2) which cluster said qualities and reveal implications responding to research questions which seek to inform future design and research:

- How might we expand on “diminished reality” as a design method to enrich remote talk?
- How might we further expand somaesthetic HCI for expression and communication?

To summarize the implications of our work:

- We hijack and radically expand the concept of “diminished reality” as an ethos in service of product design and interaction design. We present Azalea as an example of how it can be implemented – a design that motivates people to “turn off” their environment and distractions, inviting focus to connection and co-experience.
- We expand on and reframe the qualities of Somaesthetic Appreciation with 12 fine-grained qualities instantiated in Azalea. These are organized and presented as 5 themes which relate to design tactics and considerations, contributing to somaesthetic HCI a direction towards informing artifacts for expression and communication.

Our study does come with limitations. One is the somewhat homogeneous sample of participants in terms of age and geography (young adults with ties to our institution), which makes it challenging to generalize our findings to a larger population. Another is the comparatively short time scale on which we conducted the studies. Azalea’s intended purpose of enriching personal communication and its open-ended interaction design point to studies where it is deployed as probes over longer time scales [21, 33, 50] as an appropriate research method. In particular, we remain curious as to how the experience of owning and living with Azalea plays out after the “novelty factor” wears off. These limitations can be overcome with future work.

We are convinced that “diminishing” digital influences, cultivating somaesthetic appreciations, and enriching human relations are all worthwhile pursuits for a good life. We hope that our project serves to inspire and inform all three of these motivations.

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