Tip of my Tongue: Eating for Cognition

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ABSTRACT

Our position takes food as a material for interaction design, examining how we eat shapes the way we think and perceive the world around us. Starting from the connections between odor and memory, and between tastes and judgement we describe the potential for food to support novel interactions. Our proposal uses food produced by 3D printing to explore how it can perform the role of memory cue or shape perceptions within interactive experiences. Towards this goal we discuss methods that support designing with the personal nature of the connections between specific odors and memories. In concluding our position, we reflect on questions that arise from taking a holistic perspective on designing for bodily experience and outline some directions in which this proposal should be developed.

INTRODUCTION

This position paper takes its starting point from the *Eat* and *Cogitate* aspects of the in5 framework (see sidebar). It is motivated by an interest in the potential for food as a material for interaction design. It places food at the center of attention, both in the contexts promoted by in5 and through

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In5 – Eat and Cogitate

For this position paper we draw on the in5 principles *Eat* and *Cogitate* [7]. For the purposes of this position paper we consider the act of eating centered on the experience of consuming food, focusing mostly on the moment of eating and the impacts of digestion in the following hours. For cogitation we are focused on food's and digestion's impacts on memory performance and social judgements.

Figure 1. nūfood printer shown with print

the rich personal and cultural histories that are woven into our experience of food. Given food's unique qualities as a material, it has a wide potential to connect and interact with our sensory and cognitive performance. In this paper we focus particularly on how food could be used to cue memory recall and form part of a scene-setting for conscious reflection and appraisal. Whilst food experiences are deeply embedded into our everyday lives, they have remained out of the reach of interaction designers due to the difficulty of delivering chemical stimuli in the course of interactive experiences. With the advent of novel food production technology such as 3D food printing there is a possibility to utilize food as a way of constructing novel interactive bodily experiences.

RELATED WORK

Proust famously writes about a madeleine cake as a cue for remembrance, with one bite transporting him back to an earlier time in his life [8:50–51]. This phenomenon is not just a literary device but supported by the influence odor has in supporting memory recall [2,12]. Odor is a large part of the experience of flavor [1], a term describing the multisensory experience we have while eating food. Therefore food, as a ubiquitous and richly varied material is a medium through which memory cueing odors can easily be delivered. Despite a growing body of HCI work on emotional memories [11] such work seldom leverages the embodied qualities of taste or odor. Beyond odor another aspect of food is the experience of tastes (bitter, sour, salty, sweet and umami) whose experience has emotional [6], embodied and temporal characteristics [9]. Tastes have also been shown to shape the way we perceive the world, making people both less harsh (after tasting a sweet taste) and more harsh (after bitter tastes) in moral judgements [3]. One of the challenges that has limited the exploration of these two sets of connections and the potential for taste to shape our in-bodied experience has been the one of synthesizing stimuli for taste and smell [10]. A technology that is bringing closer together our experience of food and digital technologies is 3D printed food. Perceptions of this technology indicate its potential adoption should be more focused on shaping new forms of experience rather than automating cooking and dining [5]. This positions the technology; not as a tool for automating away the care and consideration around making and consuming food, but instead promotes new forms of mindful and conscious food consumption.

PROPOSAL

This proposal considers 3D food printing as a technology that can produce food as part of digital experiences, supporting memory recall and reflection. This system would place the activity of eating as a cue for cogitation. We envisage 3D food printers located within the home and connected to a smartphone (such as the *nūfood* printer – see Figure 1 [13]); this would allow mobile apps to control the production of food samples and also to place the food within multimodal interactive contexts combining the bodily food experience with visual and audial stimuli [Fig 2]. The system would support users in recalling a moment or vignette (as is the case with Proust's madeleine [8:50–51]). Systems could be designed to support recall on-demand (as you would when choosing to view old photographs) or allow users to 'stumble' across memories

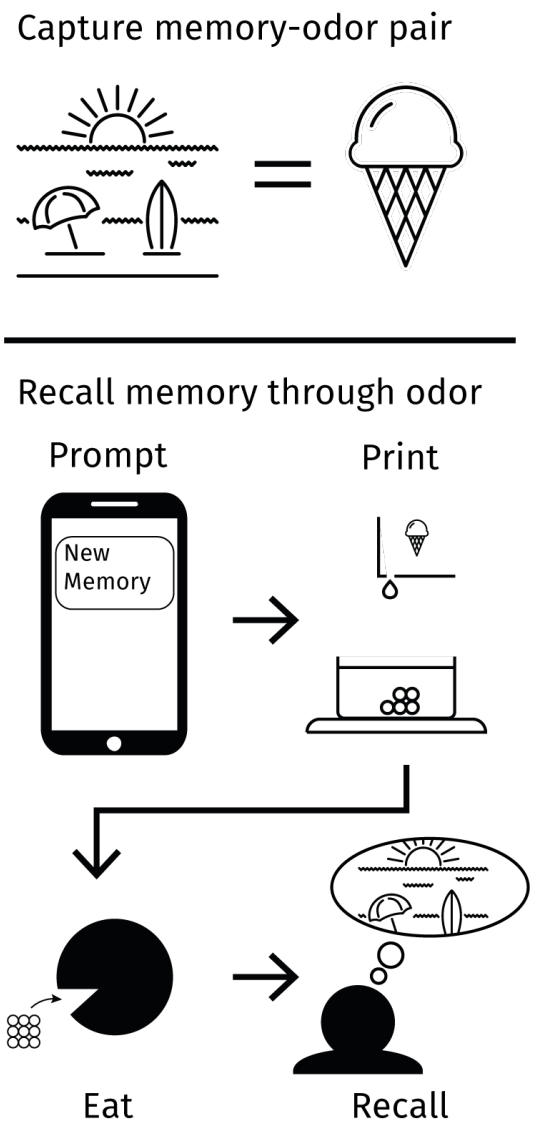

Figure 2. Schematic of food as memory cues, showing set-up (top) and use (bottom)

through digitally curated experiences that control the delivery of food as memory cue. Specifically, this could be a system that supports users with declining memory recall performance associated with aging, allowing them to create prompts in the form of printed food stimuli helping them recall stories from their youth. Eating is a bodily experience that creates a re-experiencing transcending the more passive experience of simply looking at family photos or videos, moving towards a visceral felt aspect of remembrance. Additionally, the potential for taste to inform judgements could allow a user to consciously augment their judgements through food stimuli, choosing to consider more or less harsh judgements as suited the context. This could be of particular use in self-reflection where prompts to either appreciate the qualities of a piece of work or to help detect any room for improvement can be difficult. One constant aspect across both memory and judgement applications would be the agency of a user in controlling the elicitation of such food-based experiences thus placing them as director of experience, rather than passively consuming food.

METHODS FOR DESIGN

Any interactive system built on odor-memory association will be built on an understanding of the of an individual user's associations between specific odors and specific episodic memories. Therefore, the design effort needs to consider not just the mechanics of such a system but the methods to elicit the personal pairings for any one user. To this end, we propose a tool for exposing this personal flavor world through *embodied probe tools*. They would take inspiration from cultural probes [4] extending them to focus on methods of observing, appreciating and designing with embodied experience. These tools would be designed to provoke food experiences that emphasize how the various bodily systems (e.g. digestive, cardiovascular, endocrine and nervous) are impacted for a specific user. With the attention towards understanding embodied experience through in- and circum-bodied phenomena, *embodied probe tools* would draw on sensory experience and the multiple adjacent and overlapping processes and experiences of eating from salivation, to gustation, digestion and excretion. Responding to this would mean considering how to allow the user to reflect over time about the state of their own body, through modifying diary and logging tools to capture embodied phenomena. Not only useful in the conception of a system, similar tools should be adapted to be part of the 'onboarding' experience that users undertake the first time they use a food-based interactive system. To extract the maximum value out of the food experience probes, they should be built on the principle of re-experiencing by the designer [Fig 3.] as a way to create an embodied as well as a cognitive empathy to support the design process.

Re-experiencing as a method for building understanding

Re-experiencing is proposed as an embodied approach to analyzing the data collected from *embodied probe tools* [Fig 3]. At its basis is the principle that the designers or researchers using tools expose themselves to the same conditions and experiences as the participant as part of the interpretative process. *Re-experiencing* builds on the intention of cultural probes as tools to create

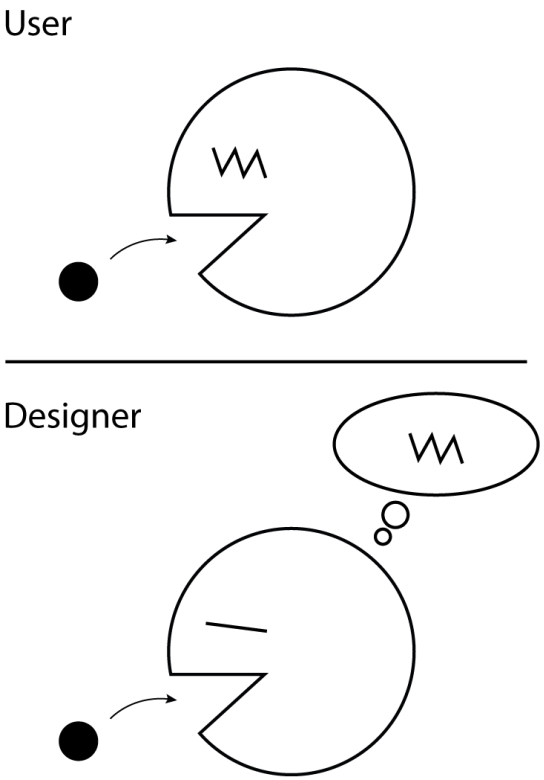

Figure 3. Re-experiencing example. The participant is given a sour food stimulus and describes eating it as 'like their mouth scrunching up', the designer later tastes the same stimulus and tries to notice this sensation for themselves, appreciating the bodily sensation that is dominant for the user.

empathy [4] both through embodiment as well as cognition.

DISCUSSION

Our proposal takes as its starting point the intention to consider a connection between the food we put in our mouth (*Eat*) and the way we think about and perceive the world (*Cogitate*). Our intention is to move towards a more holistic approach to designing with food in interaction design while building on the connection between food experience with memory and judgement. We are aware that what we propose here is only part of the multilayered experience of food. Our objective is to iteratively broaden the perception of how the act of eating can be seen as part of interactive experiences, drawing on insights from beyond HCI, designing and evaluating them towards systems that account for the gamut of experience and the impact eating has across the in5 principles [7]. One of the unresolved questions in finding novel uses for food is the increased disconnection between the food required as part of a healthy lifestyle, and food consumption for pleasure. It should be noted the principle behind this proposal is to move towards a mindful consumption of food that promotes the user taking control with deliberate intentions of eliciting deep and sustaining experiences beyond the immediate flavor sensation.

Directions Forward

Key to avoiding some of the pitfalls as well as creating engaging and powerful interactive experiences with food will be the sensitivity to a holistic perspective on bodily experience. It will be important that the individual experience is prioritized in such systems and not lost through a desire for generalizable design principles. By necessity this will require systems to be built that support the user in directing and tailoring their experience. In the methods section here we outline approaches that support the development of our proposal, going beyond high-level metrics such as acceptance or usability to understand more micro level experiences in- and circum-bodied. In this proposal we have described the influence of odor and taste arising from food stimuli on memory recall and judgement making, these draw on just two insights from the psychology into the relationship between sensory food experience and what is happening cognitively. We hope that these initial proposals can work towards incorporating insights from sociological perspective on what food means and how food can shape experiences, moving beyond the individual and towards collective food interactions.

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