The Sensory Interactive Table:
Exploring the Social Space of Eating

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Figure 1: Left: The Potato Eaters, van Gogh (1885); middle: sharing a meal at a table; right: sharing a meal at the SIT.

ABSTRACT

Eating is in many ways a social activity. Yet, little is known about the social dimension of eating influencing individual eating habits. Nor do we know much about how to purposefully design for interactions in the social space of eating. This paper presents (1) the journey of exploring the social space of eating by designing an artifact, and (2) the actual artifact designed for the purpose of exploring the interaction dynamics of social eating. The result of this Research through Design journey is the Sensory Interactive Table: an interactive dining table based on explorations of the social space of eating, and a probe to explore the social space of eating further.

CCS CONCEPTS

• **Human-centered computing → Human computer interaction (HCI)**; **Interaction techniques**; **Interaction design**;

KEYWORDS

Design for behavior change; interaction design; commensality

1 INTRODUCTION

Healthy eating is an important topic in this day and age, among the general public as well as in academic discourse [23]. Adopting a healthier diet is not trivial. There are many trackers and diet plans that can support you in changing your eating behavior as an individual [15]. However, people's eating habits are not only personal, but also influenced by their social environment: the social space of eating [11, 12, 20]. Eating has many communal aspects [5]. Whether it is sharing the breakfast with your partner, the lunch at work with colleagues, or the meal cooked by family or friends. The experience of eating together is more intricate than just what you put in your mouth, and supporting dieting choices is more complicated than just telling an individual what to eat. We are missing insights into the social implicit dynamics that influence our individual eating habits in fundamental ways [2].

Figure 2: Understanding a meal: serving pie (left), sharing finger food (middle), synchronizing over soup (right).

To further explore the implicit social dynamics when eating together, we need new ways to surface and represent this broader experience and interact with those undergoing the experience. This requires exploring the social space of eating and designing and developing artifacts that go beyond functional objects but are mediators that sense and interact with this space [19]. We use a Research through Design [24] approach, where design is used as a means to do research and produce knowledge on the topic of social eating [10]. We explore the implicit social dynamics involved in communal eating and guide our design rationale for aspects such as form, materials, modularity and the sensing and interacting involved to shape this research probe. To us, a table is an ideal lens through which to explore the social space of eating. In many cultures, tables in food and dining experiences serve as surfaces that afford sitting at and eating from. Tables also fulfill a social role as an artifact to gather around and socialize. The table is an ideal everyday artifact to redesign into a probe, to explore sensing and interacting with food experiences in new ways [1, 3, 13, 17, 18].

Togetherness around eating or 'commensality' [16] is a relatively new direction for HCI research [6, 7]. Recent work has distinguished 'digital commensality' [21], eating together through digital technology, and 'computational commensality' [14], physical or mediated multimodal interaction around eating. Our work focuses on commensality mediated by embodied technology in the context of supporting people in their dietary choices.

The aim of this paper is to introduce (1) our exploration of the social space of eating around a table and (2) the subsequent journey of designing, engineering and developing our probe, designed with the idea of further exploring and potentially redefining healthy eating in the social setting: the Sensory Interactive Table (SIT).

2 THE SOCIAL SPACE OF EATING

To get a better understanding of the social aspects involved in eating around a table the first and second author together with colleagues started with sharing several meals. During these dinners, we reflected on all the conscious and unconscious ways this process is different from the individual eating experience and how the presence of people might influence eating behavior. Through this process we learned that sharing a meal can involve overt social aspects such as serving yourself or someone else food, passing on plates or serving trays, and adjusting your overall dining time to

table partners. There are also some more subtle or covert social aspects involved such as going in for seconds or thirds, synchronizing bites or eating speed, and synchronizing eating or serving quantity. Many of these aspects are considered crucial in supporting healthy eating [4, 22]. Moreover, you can also look at these aspects in terms of the locality they take place in. Some aspects are within diners own personal space, such as eating speed or overall dining time, and some aspects cross or are outside of personal spaces, such as passing on plates or serving for seconds or thirds. It is these aspects and more that guide our design choices for the table.

In Figure 2 we highlight three prototypical scenarios that, to us, illustrate the social space of eating: serving pie, sharing finger food, and synchronizing over soup. Passing on a plate of pie encompasses more direct, more forceful social dimensions of sharing, but also of feeling obligated to partake. Sharing finger food illustrates more subtle unconscious positive or negative social dimensions where diners can try or feel obligated to try a bit from all dishes, but at the same time feel that they cannot take a whole dish. Synchronizing over soup shows that there are also other social dimensions to eating than just sharing food, such as the unconscious synchronization of some of the bites being taken over the course of a meal.

3 THE TABLE AS A LENS

The interactions that we envision can differ in how much you want the diners to reflect on, be informed, or be persuaded, and this interaction in a sense should feel commensurable: enabling people to almost bodily feel, sense and relate to the artifact [8]. We envision a table employing behavior change strategies to support people in their diet choices, and a table that offers people the opportunity to reflect on their eating experience. By using the table as a lens to look at these interactions, we found that direct and natural interacting with the table is through the surface of the table. Moreover, also sensing is natural through the surface of the table. We envision that the surface of the table functions as a mediator [19].

The three scenarios are further explored in Figure 3, where interaction for serving and passing on a plate of pie is a more direct, conscious, behavioral steering with the idea to highlight, for better or for worse, who has been served pie and who has not. The pie is tracked through blue dashed rings that light up and red arrows point out the next diner. For sharing finger food, interaction is a more direct, reflective, informative feedback to reinforce the idea

Figure 3: Sensing and interacting during a meal: serving pie (left), sharing finger food (middle), synchronizing over soup (right).

of sharing all dishes in a more chaotic setting. The finger foods are tracked per person. Arrows from plate to food highlight foods still up for grabs. For synchronizing over soup, interaction is more unconscious, metaphorical, experiential guidance to explore the idea of synchronizing and being more mindful together. The spoonfuls of soup are tracked and synchronization of diners is represented through a calming heartbeat on the surface of the table.

4 DESIGNING THE TABLE

The table should afford a range of interactions as well as unobtrusively measure aspects of eating with the table itself. The surface of the table is particularly suitable for interaction with light. Light can embody the metaphors that we explored to highlight implicit social dynamics explicitly. Combined with the right sensing capabilities, light interaction is natural and dynamic. Additionally, the surface of the table is particularly suitable for embodied sensing, which in the context of eating has a natural fit with sensing weight and weights shifting around the table. Re-exploring the social space of eating at a table that embodies sensing and interacting will open-up new ways to look at social dining or commensality. Therefore, we designed the table to be as flexible as possible with a modular setup giving the option for adding future sensing and interacting modalities.

4.1 Form

We explored the most suitable form for a table in the space of social eating. A round table lends itself to social settings, every dinner guest can look each other in the eye. Moreover, a round table does not assume any hierarchy at the table, in contrast to, for example, a rectangular table, dinner guests are seated as equals, at least in the eyes of the table. Lastly, the round shape is suitable for a flexible number of diners, in contrast to a square table, which is most suitable for four diners. Whereas the round table can easily suit, depending on the size, two to six diners (see Figure 4).

4.2 Modularity

We designed a table where the modules are replaceable, and contain sensors as well as feedback modalities. Within the modular setup we explored modules sizes and shapes. A hexagon shape fills out the round form with maximum coverage. The granularity of the table is crucial because it will determine the resolution of the sensing

Figure 4: An illustration of the envisioned SIT, with modules for a modular setup, light interactions, and weight sensing.

data that we can gather. The resolution in turn limits the range of interactions we can implement. Illustrated in Figure 6 are six versions of granularity of the table with a hexagon-shaped module. Through understanding the table and the social space of eating we see that each part of the table, central, near the diner, or in between, has an important role in the space of eating. There are behaviors around and on the table in different relative locations or spaces that we want to sense and explore as accurately as possible. The most granular option of 199 modules fits our design rationale best.

4.3 Loads and LEDs

We instrumented the surface of the table with force sensors (Figure 6) that measure locality or spaciality of social eating behaviors in terms of weight distribution on the table and give insight into behaviors by measuring related factors, such as weight of meal on a plate, weight of bite picked up by a fork, or eating speed over the course of a meal. We also implemented the table with LEDs to embody light as interaction modality to accommodate the range of interactions we envisioned. Furthermore, we explored the best way to diffuse light from LEDs as to provide the most natural experience fitting our scenarios, balancing pixilation and blurriness.

Figure 5: Dining at the SIT: serving pie (left), sharing finger food (middle), and synchronizing over soup (right).
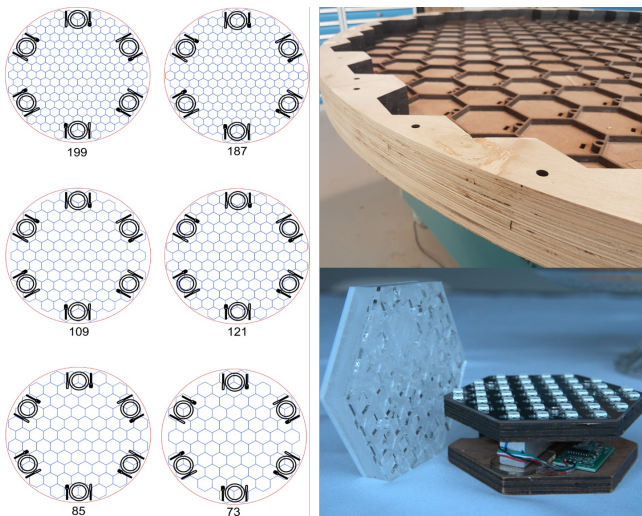

Figure 6: Six versions of granularity (left), the base of the table in progress (top right), a module with the base, load cell, LED matrix, and diffusor (bottom right).

5 THE SENSORY INTERACTIVE TABLE

Our resulting probe is the SIT, a dining table that is embedded with load cells and LEDs, just below the surface of the table top (Figure 5). 199 load cells are able to measure aspects of eating behavior such as weight shifts over the table or social interactions between diners. Simultaneously, 8358 LEDs afford a range of interactions with diners ([9] for more technical details of the table).

Based on the interactions explored through sketches on the whiteboard-like table we ran the three scenarios on the functional SIT (Figure 5) with sensing simulated and interaction implemented. The implementations for the three scenarios are slightly different to the sketched versions. For the serving pie scenario we implemented a full circle instead of a dashed ring to make it more perceptible on the SIT. We removed the red arrows to make the implementation less forceful and steering, but still direct. For the finger food scenario we thickened the arrows slightly to make them more perceptive in comparison to the sketched version, but which serves the same supportive idea. For the synchronizing soup scenario we opted for a beating heart represented through growing and shrinking

in contrast to the beating heart represented through moving in the sketched version. The growing and shrinking represents the intended calming, mindful idea better in this SIT implementation.

6 CONCLUSIONS

This paper described (1) our exploration of the social space of eating around a table and (2) the subsequent journey of designing, engineering and developing our Sensory Interactive Table. As we believe that the concept of healthy eating involves more than what you put in your mouth or what you know to be healthy, we argue that we need new ways to understand the social space of eating and open up the concept of healthy eating in a social context. The SIT is designed with the idea of further exploring, interacting with, and potentially redefining healthy eating in the social setting.

In the paper, we walked through our exploration of the social space of eating through the lens of a table. We highlighted social aspects of eating around a table and presented these through three illustrative scenarios: serving pie, sharing finger food and synchronizing over soup. These scenarios formed the basis for our exploration of how the table might embody sensing and interacting in these situations. This effort informed our design rationale for aspects such as form, materials, modularity and the sensing and interacting involved to shape our research probe. The result is the Sensory Interactive Table, a dining table embedded with load cells and LEDs, just below the surface of the table top. 199 load cells measure aspects of eating behavior such as weight shifts over the table or social interactions between diners. 8358 LEDs afford a range of interactions with diners, potentially designed for reflection or change, more conscious or unconscious, more direct or indirect.

Our next steps are focused on the iterative effort of developing the algorithms needed to do the automatic classification of relevant events highlighted in this paper and on exploring the suitable light interactions through the LED surface of the table. We expect that this new artifact can be used as a means to do research and produce knowledge on the topic of social eating and will provide new ways to surface the experience of healthy eating in social setting.

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