

Celebratory Technology: New Directions for Food Research in HCI

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ABSTRACT

Food is a central part of our lives. Fundamentally, we need food to survive. Socially, food is something that brings people together—individuals interact through and around it. Culturally, food practices reflect our ethnicities and nationalities. Given the importance of food in our daily lives, it is important to understand what role technology currently plays and the roles it can be imagined to play in the future. In this paper we describe the existing and potential design space for HCI in the area of human-food interaction. We present ideas for future work on designing technologies in the area of human-food interaction that celebrate the positive interactions that people have with food as they eat and prepare foods in their everyday lives.

Author Keywords

Food, eating, cooking, smart homes, domestic technology.

ACM Classification Keywords

H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

INTRODUCTION

Food is a central part of our lives. It is obvious that we need it to survive. But it is important socially too: food brings people together—in its preparation and in its consumption [2,22]. It is hardly surprising either that food is fundamental to culture as well, with food ‘practices’ reflecting our ethnicities and nationalities [3]. Given the importance of food in our daily lives, it seems equally important to understand what role technology currently plays with regard to food and indeed what roles it can be imagined to play in the future. While some researchers within HCI have explored the role of technology in eating (e.g. [24,31,35]), there has been relatively little research in the general space of interactions with and around food. That work which has

been done has focused primarily on the problems that people have planning meals and preparing and consuming food. This is a perfectly legitimate line of research, and in fact the authors have embarked on projects of this ilk themselves [16]. However, in this paper, our goal is to explore a different path for food research in HCI, one that focuses not on the problems that individuals have with food, but rather on the ways in which people find pleasure and success in their interactions with food.

More particularly, while there are a number of ways that one could examine previous work on food within HCI, we examined these projects by reflecting on the type of ‘human-food’ interactions that they attempt to address. We also looked at the resulting designs and the role the technologies in question were meant to play in users’ lives. By examining the previous research in this way, we began to see that much of it focused on treating what are perceived as kinds of problems individuals have with food. These include such things as uncertainty, distraction, inexperience and inefficiency and, most frequently, a lack of nutritional knowledge. In our reading, it seemed that researchers sought to examine how technology might alter human-food interaction such that, for example, uncertainty would be turned into certainty, inexperience into aptitude. In our mind, the resulting systems are *corrective technologies* insofar as they attempt to fix undesirable behaviors.

While these research endeavors are both fruitful and important, it seemed to us that the HCI community can begin to imagine another, much neglected path of research: one in which individuals’ current experiences with food are seen not as undesirable, but as positive, productive, even delightful. We certainly agree that individuals do encounter problems in their interactions with food, but it is also true that at times, indeed if not most the time, they enjoy their food, relish the practice of making it, and above all celebrate the sharing of it.

Our goal in this paper is to explain that the orientation of much prior research in HCI represents just one way of conceiving of the role that food plays in people’s lives – namely, an orientation that emphasizes how it presents a challenge for them. In this paper, we want to highlight a whole other line of research that has for the most part been

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neglected within HCI to date. That is, we will discuss how treating individuals' interactions with food as positive, as something in which they delight and find pleasure, excitement, and fondness opens up a very different space for technology design. This design space is characterized by what we call *celebratory technology*; technology that celebrates the positive and successful aspects of human behavior.

The contribution of this paper is its explication of the existing and potential design space for HCI in the area of human-food interaction. As we move, albeit falteringly towards Weiser's [36] vision of ubiquitous computing, it is important that HCI researchers adequately understand the richness of the human experience that HCI is attempting to enhance technologically. This paper represents a step in this direction by illuminating which aspects of human-food interaction have previously been addressed in HCI and which have received less attention. In particular, by highlighting the relatively untouched space of celebratory technology design (as compared to corrective technology design), we hope to encourage a more comprehensive research agenda within HCI to design technologies around food practices.

We structure the paper as follows. We overview existing projects in HCI and, using literature from social science that describes the positive ways that people cook and eat food we will present ideas for future work on designing celebratory technologies in the area of human-food interaction. We will discuss the differing perspectives on food's place in people's lives that result from designing corrective versus celebratory technology and remark on how the types of designs that result from the two lines of research differ. We will conclude by describing the challenges that are raised when designing celebratory technology in the realm of human-food interactions.

PREVIOUS WORK: TREATING THE PROBLEMS

It is our view that much of the prior work on technology and food is motivated by a desire to fix the problems that individuals are thought to have with cooking, eating, or understanding what food can do to them. In what follows, we describe existing efforts to design technology around these problems and structure our discussion by pointing out what some of the various problems are thought to be, and following on from this, the designs that offer various kinds of solutions to them. We do not claim that these are the *only* issues being addressed by these research projects nor will we be arguing that the issues we describe are mutually exclusive. More importantly, when we describe the problems that are addressed, we are not speaking of problems that users have with technology, but rather the perceived problems that they have with food itself. By examining how existing projects have treated individuals' relationship with food we hope to show the overwhelming trend within technology research to design applications that

act as a remedy for the problems that individuals have when it comes to planning, preparing, and consuming foods.

Uncertainty

One issue that some researchers have tried to address is uncertainty. With regard to food, some people may, for example, be unsure of what to prepare for dinner. This uncertainty may result from not knowing what one has in the refrigerator or from being overwhelmed by the choices provided by online recipe databases. Some researchers have addressed this uncertainty by developing applications that assist users in choosing meal recipes. Svensson *et al.* [31,32] argued that choosing a recipe online is sometimes difficult, in part due to the sheer amount of recipes available on the Internet. To address this problem, the researchers designed an application that allows users to socially navigate a recipe database. *Kalas* supports decision making by allowing users to leverage information such as others' recipe choices, comments and ratings as they decide which recipe to choose.

Thus, this project supports individuals who need help in effectively making decisions about food. So, for example, the kind of individuals that are being designed for are those who might sit down to search the Internet for recipes only to realize that there is an overwhelming number of options that await them. The social data provided by *Kalas* helps these individuals overcome the difficult task of data mining on the Internet.

Svensson *et al.* [32] present a number of motivations for this work, including advancing social navigation techniques and exploring ways to make data mining a more pleasurable experience for end users. However, our focus here is not with these technical motivations, but rather with how the researchers characterized individuals' interactions with food and the design decisions that resulted from this characterization. By basing their work on the premise that people may need help selecting recipes online, they orient their work towards helping individuals who are uncertain about what to cook.

Of course, this is an issue that many of us occasionally encounter, whether it is because we are overwhelmed by recipe choices or simply because we are unsatisfied with our current repertoire of dishes. That it is commonplace, though, is only part of what interests us in trying to understand what motivates Svensson *et al.* It seems to us that by examining the fundamental human characteristic addressed by this research, namely a desire to alleviate uncertainty about what recipe to choose (by providing assistance and guidance in the decision making process through social data), we encounter our first instance of how HCI research has been motivated by concerns which have to do with essentially human frailties rather than, say, system interaction. HCI solves problems in interaction design with food not because people have problems with computers but because people have problems with themselves. This approach, one that emphasizes aspects of

human nature, obviously has its merits. In this case, the approach identified aspects of individuals' interactions with food that might need fixing (uncertainty about what recipe to choose) and designed technology to do that fixing, thereby improving the food-related behavior (selecting recipes).

Distraction

Uncertainty is only one form of human frailty, needless to say. Individuals can also be distracted when interacting with food. For example, a mother preparing lunch for her children may find herself leaving the kitchen multiple times to tend to the kids, answer the door, or any number of other interruptions. This is precisely the concern that researchers at Georgia Tech have addressed with *Cook's Collage*. Tran *et al.* [34] designed this system to help individuals follow recipes accurately even in the midst of all of the distraction that may occur. Cook's Collage captures a visual record of cooking activity and thus if the cook is interrupted he or she can view this record and be reminded of what step in the cooking process they have reached.

Distraction may not only come from external sources, such as kids or phone calls. Distraction may also be self-created when individuals try to cook a number of dishes simultaneously. To address this problem, Hamada *et al.* [17] designed a system to help novice cooks "cook several recipes in parallel without failure". Their focus is on optimizing the cooking experience and to help the user prepare foods "perfectly and comfortably".

These projects are guided by the assertion that while cooking, individuals can be distracted by a number of different factors. Here the food-related problem is that of designing for multitasking, and the goal of these projects is to improve the cooking experience by introducing technology that tames the chaos that can sometimes envelop cooking.

Inefficiency

Not everyone is a well organized chef and so it is hardly surprising that some people struggle because they don't know how to efficiently prepare meals. Some so-called smart kitchens have been designed to help correct this. As a part of the Counter Intelligence initiative, for example, researchers at MIT augmented a conventional kitchen by projecting information onto various surfaces such as refrigerator doors, cabinets, and drawers [5]. One feature of this project was to make interacting with the refrigerator more efficient. Bonnani *et al.* argue that refrigerator doors stay open too long and too often because individuals do not know what is in the refrigerator and where exactly the items are. Consequently, these researchers designed a system whereby the refrigerator contents are projected onto its door to minimize the time spent standing in front of the fridge with the door open, and to allow users to view refrigerator contents remotely (*e.g.* while in the supermarket, trying to remember if they need to buy more milk). The researchers

also addressed efficiency by augmenting the cabinetry, such that information about where utensils and other items is projected onto the front of the cabinet. This added information is meant to reduce the time spent searching through cabinetry for kitchen items needed while cooking.

These projects represent an attempt to address what is seen as a problem of inefficiency in food preparation. The goal is to increase efficiency by providing users with additional information such that they might waste less time either in the kitchen or elsewhere when gathering food for the kitchen.

Inexperience

Another way to examine individuals' interactions with food is to look at how their inexperience impedes the process of cooking. One approach to supporting the inexperienced cook was taken by Nakauchi *et al.* [25], who designed a system that uses sensors and human activity recognition software to provide support for individuals preparing food in the kitchen. This support is provided in the way of an LCD screen where recipe steps are displayed. In addition, a robot uses speech and gestures to suggest to the user what they should do next in the cooking process (*e.g.* by saying that the sugar is in the cabinet whilst simultaneously pointing to the appropriate cabinet). These suggestions are based upon what the system has inferred that the user's next step should be.

The CounterActive [19] application is another attempt to help users as they go through the food preparation process. CounterActive is an augmented reality system that moves beyond basic text-based instructions to also include pictures and video as a way of helping users learn to cook new dishes. This system thus provides a rich multimedia experience that is designed to help the cook their food in a lively environment.

In both examples, the problem is inexperience. Researchers here try to compensate for the individuals' lack of experience by displaying recipe steps and other relevant information, and supporting users in completing those tasks.

Lack of Nutrition Knowledge

Wellness is a growing research interest within the HCI community, and some researchers have begun to examine how technology might be used to help people eat more healthfully. For example, Mankoff *et al.* [24] developed a system that uses grocery receipts to analyze what the individual has purchased from the grocery store and to subsequently suggest how he or she might make healthier selections. Mankoff *et al.* were interested in improving users' understanding of how many nutrients they were currently consuming and how they might eat a more nutritionally balanced diet. Chi *et al.* [9] also attempted to provide users with a better understanding of the healthfulness of their foods. As individuals cook in the kitchen, Chi *et al.* used sensors to detect what the users

were doing (*e.g.* chopping bacon). Their system then provided feedback to users regarding the nutrition facts of the ingredients being used. Their goal is that if presented with such information, users might be able to make healthier decisions about what they include in their meals (*e.g.* using less bacon to reduce the saturated fat content). In designing this system, Chi *et al.* argue that providing this type of support is important because individuals feel a sense of self-satisfaction when preparing healthy foods for the family.

Other research on increasing individuals' awareness of eating practices includes work that has used photography as a medium for reflection [6,15]. For example, Smith *et al.* [30] designed a visualization system whereby diabetes patients could view their blood sugar levels in the context of digital photographs taken throughout the day (*e.g.* pictures of meals). The hope is that by reflecting on this visualization, individuals would begin to see the relationship between habits such as eating practices and their physiological state (*i.e.*, blood sugar levels) and subsequently make healthier choices in the future. Brown *et al.* [6] also tried to increase individuals' awareness of their eating habits by designing a system that allows users to keep photographic diet and exercise journals using camera phones. In this project the goal was to help users see the relationship between their diet and exercise patterns in a visually meaningful way.

All of these projects focus on helping inform individuals. The users here have limited knowledge about the healthfulness of the foods they are consuming and so, to improve it, the researchers introduce technology that provides expert nutrition information or helps users gather data about their current dietary practices.

CORRECTIVE TECHNOLOGY

There may certainly be more problems addressed by HCI researchers than this, but we use these examples to highlight the fact that in most of HCI-related research, the technologies designed around food interactions have been designed to address problems. By 'problems' we mean research has focused on the aspects of interaction or, more particularly, those who are doing the interaction with food, that are less than ideal, things that could use improving or modification.

The orientation towards the undesirable aspects of human-food interaction is a very fundamental one in which researchers direct their focus towards the gaps, limitations, and struggles that individuals have. Such an orientation also necessitates identifying the desired state of affairs, that is, the ideal that has not yet been achieved. In attempting to reconcile this discrepancy between the current and ideal states, researchers design technologies of a *corrective* nature. The corrective technologies attempt to ameliorate the undesirable aspects of the *human* in the interaction with food. They inform individuals (to reduce inefficiency, increase nutrition knowledge, and compensate for

inexperience, for instance); they assist and guide individuals (to reduce uncertainty and compensate for inexperience); and they tame the environment (to reduce users' distraction).

While the problems focused on thus far in HCI research are important ones, we highlight some challenges that this type of research creates. First, corrective technologies are designed on the premise that the state of affairs should be changed or that users might want them changed: if change were not desired then there would be no need to introduce devices and applications that fix human-food interactions. Since food is such an integral part of our everyday lives, it seems to us that it is important that researchers ensure these assumptions are valid.

Second, it is important to understand what is lost when corrective technologies are introduced into the food landscape. For example, when introducing technologies that speed up the time spent cooking in the kitchen by increasing an individual's efficiency, it might be that same technology will reduce the amount of experiential knowledge that individuals gain as they go through the process of making "mistakes" in their cooking. Mistakes of adding too many chocolate chips to the cookie recipe may produce confectionary bliss, for example, while adding too much cumin to a stir-fry may result in a dish that the cook finds delicious. It is often through meanderings and inadvertent veering from recipes that people produce their personal culinary masterpieces, their signature dishes, or simply tastes that they had not yet experienced. Our point, then, is that when introducing corrective technologies, it is important to understand what may be given up for the sake of the "improved" experience.

NEW DIRECTIONS: UNDERSTANDING THE POSITIVES

While the majority of HCI research related to food has focused on the problems individuals have with food, there are some notable exceptions to this research trend. For example, Terrenghi *et al.* [33] designed a kitchen appliance that fosters social bonds and intimacy amongst friends and family members. They developed the *Living Cookbook*, a tablet PC-based device that allows individuals to record themselves preparing meals and to also share those recordings with loved ones. Terrenghi *et al.* call these recordings 'kitchen stories' and argue that the stories have a distinct emotional quality to them because they are created by and for loved ones. The researchers' goal in this project was not to fix or reverse individuals' current cooking practices, but rather to take an existing and valued practice (sharing cooking experiences) and provide a new way of engaging in it.

Similarly, Bell & Kaye [4] argue that there is a lack of socio-cultural sensitivity in existing kitchen technology research. They argue that some researchers have seen the kitchen as simply another site where digital artifacts might be introduced, and that such approaches have failed to acknowledge that kitchens are also places where people

create meaning. Furthermore, they point out that many approaches to the design of kitchen technology have focused on the value of efficiency and have consequently ignored other eating related values such as the ways in which food is tied to national and regional identity. They argue against limiting technology design to improving efficiency and advocate examining other social and cultural aspects of food when designing kitchens of the future.

In this paper we extend this argument by describing how studying the positive aspects of people's interactions with food can lead to designing very different types of technologies. By drawing from social science research on how people live with, consume, and conceive of food, we come to suggest six positive aspects of human-food interaction that can be designed for. These aspects are creativity, pleasure and nostalgia, gifting, family connectedness, trend-seeking behaviors, and relaxation. Of course, many of these things are interrelated and rarely occur in isolation; however, for rhetorical clarity, we discuss one aspect at a time. In each instance, we describe how we might design technology to address the aspect of human-food interaction being discussed. We do not provide these design examples as blueprints to be followed precisely. Instead, we provide these examples a way to make more concrete our suggestions for new directions for food research in HCI. The design ideas we put forth are thus provided as a way to encourage the reader to imagine, with us, future possibilities for HCI. The design examples are merely a starting point, from which we hope researchers within HCI will be inspired to embark on more research projects that attempt to understand and design for the positive interactions that people have with food.

Creativity

For some, preparing meals is a way of expressing creativity. In her study of individuals living in Australia, sociologist Deborah Lupton [22] found that individuals who approached cooking as a creative and an intellectual experience were typically professionally-employed and economically privileged. For these people cooking was not an arduous task but rather a chance for them to explore exotic tastes and ingredients. Other researchers have noted the creative cooking practices of individuals in less economically privileged contexts as well. For example, Abarca [1] describes how working-class Mexican women exert their creative prowess by "putting their own spin" on traditional dishes such as enchiladas. She argues that, rather than simply being seen as inauthentic adaptations, these new recipes are indicative of cultural exploration and growth.

If we acknowledge that for some cooks preparing foods is a way for them to try their hand at new recipes, to see how they can make commonplace dishes their own, then we begin to see that such interactions are very different than the undesirable ones we have discussed thus far. Instead of being characterized by some deficiency, these cooks are

characterized by how they use the cooking process as a way to express themselves imaginatively. We also see that rather than introducing technologies that fix the way that these individuals cook, we can imagine designing technologies that assume an adept user who enjoys expressing their creativity through cooking.

In terms of technology design, to acknowledge the fact that some individuals currently use cooking as a creative outlet is to imagine, for example, technologies that support them in adapting recipes to fit their personal tastes and personalities and applications that help them explore new flavors and cuisines. For example, one idea would be to have an awareness display that shows individuals what other members of their social group are eating for dinner. This application could serve as a stimulus for creativity: as individuals observe the eating practices of others, they may be inspired to create new meal ideas. Short [27] studied English cooking practices and describes how individuals gain inspiration from one another informally. One woman in her study noted how she might gain ideas for altering her cheesecake recipe when observing how her friends prepare their own cheesecakes. Thus this display would further facilitate social observation of cooking practices and the subsequent inspiration that such observation provokes.

The point here is that the technology is not reversing or mending individuals' interactions with food. The fact that some cooks use food preparation as a creative outlet is not something that needs to be fixed. Instead, by assuming that for some individuals cooking is a creative process that is valued, we begin to imagine designs that celebrate aspects of human behavior, rather than correct it.

Pleasure & Nostalgia

Smelling, preparing, touching, and tasting foods, and even remembering past food experiences can evoke emotional responses. For example, the aroma of baked bread often evokes a sense of comfort in individuals whereas the tactile qualities of chocolate (the way it melts in one's mouth) are part of what contributes to the pleasure that many people feel while eating it [22]. In addition to these sensual experiences, foods can also hold symbolic meaning whereby they embody past experiences [22]. When we smell certain aromas, memories of childhood experiences may be conjured up; for example, the smell of freshly baked cookies can remind us of time spent baking treats with our parents as children. The aroma of popcorn may remind us of going to the movies with friends as teenagers. These memories can bring with them feelings of nostalgia and fondness for the past.

Many of the foods that individuals value from their childhood can be classified as *comfort foods*. Comfort foods are those delicacies that evoke positive emotions. Locher *et al.* [21] describe four different categories of comfort foods: nostalgic (associated with a special time and place in one's history), indulgence (*e.g.* because of the expense incurred or the richness of the food itself), convenience (gratifying

needs effortlessly), and physical (*e.g.* warm foods) comfort foods.

Macht *et al.* [23] note a whole range of other reasons for why individuals find food pleasurable. They examined how individuals subjectively characterize hedonic eating experiences as well as what conditions were needed for eating to be pleasurable. They describe how the features of the physical environment, the nature of the social interaction that surrounds the eating process, and feelings of relaxation can all contribute to individuals feeling that their eating experiences are pleasurable.

All of the research presented here suggests that there are many factors—culinary and otherwise—that lead to individuals feeling pleasure when consuming foods. These different reasons for and ways in which people find pleasure in food can all serve as springboards for technological design ideas that reflect or augment the ways in which people find pleasure in foods. For example, understanding that the physical environment can be an important aspect of pleasurable meals suggests that technologically augmenting tables, chairs, or dinnerware might be a way to provide new hedonic eating experiences for people.

We have also discussed the way in which individuals have emotional responses to foods (that is, feelings of pleasure) that are associated with past experiences. One design idea that would reflect this relationship between memories and food is the concept of a *memory microwave display*. Normally, when individuals use a microwave they stand around waiting for their food to finish warming up or tend to other tasks. With the memory display, activating the microwave could trigger the display to show photographs from a digital photo album. For example, imagine heating up a meal and having related photographs be displayed (*e.g.* pictures of grandma are displayed when heating up dishes that she often used to prepare).

The memory microwave display could augment the process by which foods trigger memories and subsequently emotional responses (such as pleasure) by providing another visual dimension for memories. This is not done through the artfully constructed narratives that Terrenghi *et al.* highlight, but through the use of images which can tell their own story. With this type of design idea, the goal is not so much to improve the ways in which people have emotional responses to food, but rather to provide a new way for individuals to experience these emotions.

Gifting

Food acts both literally and symbolically as a gift. Literally, individuals give gifts of food at holidays and other special occasions, such as in the Jewish celebration of Purim (honoring events in the biblical book of Esther). Shuman [28] describes how in the communities she studied women would prepare cookies, pastries and other baked goods and assemble them in gift baskets to be distributed during the

festival of Purim. Food is of course provided as a gift at many other times, for example at Valentine's Day in Western countries, it is common for chocolates and other confections to be exchanged.

Symbolically, even when it is not presented as such, food can be a gift. For example, scholars studying the role of gender in food practices have often argued that for some women, the preparation of meals for the family is a means of symbolic gift giving whereby individuals express their love, affection, and sense of caring [8,22]. Furthermore, food is seen as the ultimate gift because it is both literally and symbolically consumed [22]. When food is prepared as a gift, the cook often takes into account the likes and dislikes of the intended recipients and as such, the identity of the preparer and consumer of the food become embedded in the gift [22]. One study of Swedish women found that at times the entire process of preparing a meal (from deciding what to serve to the presentation of the meal) was considered a gift [29].

If we acknowledge the ways in which food acts as a gift we begin to see how food and the sharing of food can be viewed as precious, as something of symbolic value. Viewing food in this way does not suggest technological ideas that treat food as an obstacle, or ideas that treat human-food interactions as something that need to be fixed. Instead, focusing on the way in which preparing food is symbolic of gift giving suggests ideas that reflect the value of food.

One design idea we have considered is creating a way to augment the gifting activity that occurs when someone has friends or family over to their home for a meal. When they are preparing to leave, guests could take with them a jewel for the augmented jewel box in their home. When they place the jewel in the box, a photograph from the meal would be shown on the display (*e.g.*, the photograph and jewel might be linked via RFID tagging of the jewel). Thus, as individuals enjoy more meals with others, their jewel collection would grow and subsequently so would the content displayed on the jewel box display. The jewels become an embodiment of the gifting process and would offer a whimsical way of allowing people to remember and treasure the meal gifts received from others. This idea is a reflection of the growing trend of sharing pictures of meals with family and friends on websites such as www.flickr.com.

Family Connectedness

The family is an important unit of analysis when considering the social nature of eating. The meal is one way in which individuals build up what it means to be a part of the family, as Charles & Kerr [8] note. Families often have established patterns of eating (*e.g.* when meals are eaten, the definitions of proper meals, etc.) and it is in part through these patterns and eating norms that families define their identity.

Shared meals are important to families not simply because they are a time of biological replenishment, but because they are social occasions. At the dinner table, parents attempt to socialize their children by teaching them what is and isn't edible, appropriate preparation methods, and proper eating etiquette [2,13]. In addition, during meals families have the chance to catch up on what has gone on in each other's lives, and to strengthen the bonds that hold the family together. For example, during mealtime, parents have the opportunity to find out about their children's day at school [3].

Since a part of what makes some shared family meals so important is that they are a time for the family to catch up with one another, one design idea is a table display whereby family members post aspects of their day. This display could be embedded into the kitchen table and would allow individuals to share aspects of their day. For example, family members could send content to the table such as pictures, text messages, video clips, or other media. This could be content that was created during the course of the day (for example a son forwarding a humorous video clip that he came across) or could be a short message written in summary of something that happened during the day (for example a mother informing the family of a job promotion). This display would serve as a conversation piece and as a way to augment the discussion with different forms of media. Thus the goal here would not be to fix family communication but rather to augment it by providing a different type of way to engage in social interaction around the dinner table.

Our own project, HomeBook, is an example of such a display. Here, each member of a family has a space on the screen they can call their own and they can message content to it at their leisure. Early studies have discovered that it is used as a kind of multi-person blog site, with content being selected to provoke conversations with fellow family members. Such conversations, of course, can often become the bread and butter of dinner table talk.

Trend-Seeking

Some individuals use cooking as way to express how hip they are. Riding the waves of culinary trends is a way to show others that one is cultured and modern. Bugge [7] explored this phenomenon when she studied the cooking patterns of middle class women in Norway. She describes how the growth of the urban middle class in Norway has paved the way for people to spend more time and money on food preparation. Bugge examined the ways in which people identify as a gourmet or trendy cook by studying how various media outlets discuss food and also how middle class women describe their cooking attitudes and behaviors. She describes how the use of garlic and extra virgin olive oil are trademarks of the gourmet home chef's cooking repertoire in Norway. Other signifiers of the gourmet chef are cooking dishes that are international and exotic.

The status of cooking and culinary fashion has grown in other parts of the world as well. In various parts of the Western world for example, the emergence of new domestic cooking gadgets, cooking television programs, celebrity chefs, and slick cookbooks can be readily seen [3]. Technologies, media outlets, and media personalities are frequently responsible for setting the trends and influencing consumer behavior. Whether or not this is a positive relationship between the producers and consumers of media and technology is a debate we do not take up here. Rather we wish to point out that there are a number of people who are embracing the current trends in domestic cooking by preparing chic dishes, purchasing fashionable kitchen gadgets, or watching cooking programs on the television.

If we assume, then, that some individuals already seek out and follow the current trends in the culinary world, then we can imagine a technological artifact that provides a visual representation of the trends that one samples. For example, one design idea is a simple electronic scrapbook that allows individuals to document the trends they have been excited about. A small display situated in the kitchen could allow people to draw a quick sketch of their current obsession (such as olive oil as in the case of Bugge's Norwegian study participants). The trend that an individual is currently following would dominate the screen space, whereas their previous interests could be shown as faded drawings in the periphery. Such a display could be a fun way for an individual to reflect on the fads that they have participated in over time and might also serve as a whimsical talking piece for people visiting that person's home.

Relaxation

While there has been a significant amount of work written, particularly in gender studies, about the taxing nature of food preparation (e.g. see [12]), for some individuals cooking and eating are methods of relaxation. For example, the website www.chowhound.com is an example of an online community devoted to blogs, message boards, and multimedia content about food. On this website discussion threads have been created where individuals discuss how cooking and baking help them relieve stress [10]. Part of what can make cooking relaxing is the physical actions that go into preparing foods. For example, the motion of kneading dough or chopping vegetables can itself be therapeutic [21]. Furthermore, intimate conversations with friends and family can occur in the kitchen while meals are being prepared, something that Locher *et al.* [21] term 'kitchen therapy'. It is in these over food and through these conversations that the stresses of the day can be diffused.

The process of eating food can of course also be relaxing. Earlier we discussed comfort foods, and this is one class of food that people often use to relax. For example, when Locher *et al.* [21] interviewed individuals in the southeastern United States, their participants noted the soothing effects of drinking tea and coffee. These beverages relaxed the participants because of their warming effects on

the body, and because of the soothing aroma that they produced. One woman noted that drinking a cup of coffee in the morning gave her a few moments of time to be still that helped her feel ready to take on the day. Thus, food and beverages can help facilitate relaxation through their various properties and also through the atmosphere they create.

Music can often help in setting a mood—a mood that appropriately accompanies activities and in so doing adds to the experience of relaxation that eating can provide. Thus, we see potential in exploring systems that couple music with food in a variety of ways. For example, imagine searching for recipes for a night of Mexican food with friends, food including mole poblano and salsa verde. As the search continues, our system remembers the genre of food being reviewed, and simultaneously seeks out appropriate music from the online collection. Other variants could include a system that seeks music with certain beats and rhythms—food associated with parties and large events having pop and rock, haute cuisine tending towards classical music.

TOWARDS CELEBRATORY TECHNOLOGY

The examples in the previous section are just some of the ways that we can begin to think about the positive ways that people interact with and conceive of food, and how technology might play a role in that interaction. Identifying the unproblematic aspects of individuals' interactions with food comes from examining successes in action and the ways in which current practices are valued. That is, by looking at how individuals prepare foods without a hiccup, how they purchase their groceries without failure, or how they find pleasure in a meal shared with friends, we can begin to understand the positive aspects of the human experience with food. It is at this point that we can begin to design *celebratory technologies*; technologies that celebrate the way that people interact with foods.

With this orientation to food, the idea is not to determine when people are uncreative and subsequently introduce technology to make them more creative. Nor does this orientation suggest determining that people are stressed and in turn designing technologies that relax them. Such approaches may be useful and would fall under the category of corrective technologies. Instead, approaching design from the celebratory orientation involves assuming competency, assuming that individuals have interactions with food that do not need to be fixed or improved. Designing celebratory technologies entails creating technology that works in tandem with individuals' existing interactions and attitudes towards food, rather than trying to reverse or replace them. In contrast to corrective technologies, applications and devices that celebrate human-food interaction would be designed to augment current practices, that is, to provide new ways of experiencing valued behaviors and expressing valued attitudes.

Challenges

There are a number of challenges that may arise as researchers design celebratory technologies in the realm of human-food interactions. We describe some of these challenges below.

Determining When to Introduce Technology

The natural question that arises when considering the design of celebratory technology is, 'Might we just be introducing superfluous technology where it is not wanted?' The answer is that yes, this is certainly a concern that needs to be seriously considered. Indeed, when we examine the ways that people are happily moving through their lives, we uncover situations in which the best design decision may be to not design anything at all. These aspects of life that fade into the background fade for a reason and perhaps should not be exaggerated or augmented by technology. Still, uncovering areas in human life that are best left alone can help us understand human competency, values, and attitudes more thoroughly. With this increased understanding, we may develop new ideas for how to design effective (by whichever metric is applicable) technologies in situations where the introduction of technology does make sense. In addition, as we understand specific instances where technology may not be needed, we can understand more generally how we can design technology that is unobtrusive.

Not only may we introduce technology in places where it is unwanted, but by introducing a technology in areas of human life that are already positive we may even negatively affect the existing state of affairs. To mitigate against this possibility, extreme care should be taken in the early design stages to ensure that the behavior being addressed is well understood, so that it is clear how technology might have an adverse affect. Of course, HCI has in its evaluation toolbox a number of methods that can help mitigate against such negative consequences. Formative evaluation techniques such as interviews and observations may prove useful, as well as other approaches that focus on understanding user values such as outlined by Friedman *et al.* [14].

Identifying a Research Project

Just as it can be difficult to determine *when* to introduce technology, it can also be hard to figure out *how* to introduce celebratory technologies. When we are not trying to design a technology that would fix a problem, it can become difficult to identify what types of technologies would be beneficial by complementing and enhancing an already positive experience.

One way of overcoming this challenge is building on existing work around the study of routines in the home [11]. For some time now, researchers have been interested in understanding the routines of actions and interactions that make up home life. One finding that emerges in a number of studies is the centrality of the kitchen as a place, not just for cooking, but for family life, and further studies show that some activities, such as family communication are

particularly well-suited for the kitchen space [26]. One line of future research might examine those routines and their proximity in time and place to food-related happenings, to see whether there are possibilities of bringing food and family together in novel ways.

Of course, food and the experience of eating also migrates outside the home into places including parks, fields, schools, churches, the workplace, and restaurants. Although our examples in this paper have focused on the home as a contextualizing example, HCI research on food could of course expand outside of the home. As technology goes mobile, it suggests more possibilities for celebratory technologies. For example, we can envisage building on geo-caching and tagging applications, to generate systems that allow picnickers armed with mobile phones to find “good spots” and perhaps even access stories about what made that space special for other people who ate there. Over time, one would acquire a history of eating at the space, making each meal part of a bigger experience of eating.

Evaluation

When designing corrective technology, an obvious metric of success is determining how well the technology has fixed the problem at hand. When we design celebratory technologies, the metrics for evaluation become less clear. Evaluating technologies that are meant to augment aspects of human-food interaction such as creativity, pleasure and nostalgia is an important challenge to consider. Other researchers have discussed this challenge, arguing that traditional HCI methods may not be well suited for these experience-focused research endeavors (as opposed to more task-oriented ones) [20] and proposed new methods for evaluating such projects [18].

One line of research that focused on routines coined the expression *unremarkable computing* [34] and suggests one possible metric by which we might measure the success of celebratory technologies. Unremarkable computing highlights how technology does not have to visibly disappear to blend into the household. A host of technologies already exist in the home (*e.g.*, alarm clocks and telephones) that people rarely think of in instrumental terms, but which have been instead ‘worked into’ their everyday experiences of home. Our celebratory technology agenda has largely been to create applications that embrace the positive, pleasurable, and delightful aspects of food and eating as a social experience. Thus, one metric we would aspire to is designing the experience of our application such that the technology is “lost” in the moment.

CONCLUSION

In this paper, our argument has been this: it is one thing to examine the social world and identify the gaps, limitations, and struggles that individuals have when it comes to engaging in their daily lives. It is a very different thing to look at that same social world and identify the ways in

which people are succeeding in their actions, valuing their current practices, or even not paying attention to these practices because of their commonplace nature. In the first endeavor, the goal is to find a remedy, a way to improve the state of affairs. In the second case, the goal is to design technology that might augment the state of affairs. Notice that augmenting something is not the same as improving it: improving focuses on diminishing the negative, while augmenting focuses on increasing the positive. Thus, the difference between treating individuals’ actions as undesirable versus desirable is that the former generates designs of a corrective nature, whereas the latter generates designs of a celebratory nature.

We are not advocating one line of research over the other—for corrective technologies over celebratory, or vice versa. We are arguing that to engage solely in one line of research is to miss the opportunity to design for a whole host of other interactions. And yet, for the most part, this is what has happened in CHI to date as much of the technologies designed around food have been of a corrective nature. To begin charting an alternative course for our community, we have suggested a number of positive behaviors and attitudes around food that might lend themselves to technological augmentation. They are a small subset of the many ways that people interact successfully with food in their everyday lives. Yet our goal has been to show that individuals have a range of experiences in their everyday life: some undesirable and some desirable. A holistic HCI research agenda focusing on food will consider both aspects—both the design of corrective technology and the design of celebratory technology.

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