FoBo: Towards Designing a Robotic Companion for Solo Dining

Rohit Ashok Khot
RMIT University
Melbourne, Australia
rohit@exertiongameslab.org

Eshita Sri Arza
Indian Institute of Information Technology Design & Manufacturing Kancheepuram
Chennai, India
sri.eshita.arza@rmit.edu.au

Harshitha Kurra
RMIT University
Melbourne, Australia
harshitha.kurra@rmit.edu.au

Yan Wang
RMIT University
Melbourne, Australia
yan@exertiongameslab.org

ABSTRACT

Despite the known benefits of commensal eating, eating alone is becoming increasingly common as people struggle to find time and manage geographical boundaries to enjoy a meal together. Eating alone however can be boring, less motivating and shown to have negative impact on health and wellbeing of a person. To remedy such situations, we undertake a celebratory view on robotic technology to offer unique opportunities for solo-diners to feel engaged and indulged in dining. We present, Fobo, a speculative design prototype for a mischievous robotic dining companion that acts and behaves like a human co-diner. Besides tackling solo-dining, this work also aims to reorient the perception that robots are not always meant to be infallible. They could be erroneous and clumsy, like we humans are.

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Figure 1: FoBo is a speculative design prototype for a mischievous robotic dining companion that acts and behaves like a human co-diner.

KEYWORDS

human food interaction; digital food cultures; food design; robotic dining; playful commensality

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INTRODUCTION

Throughout time and in every culture, human beings have eaten together [6]. Studies show that mealtime is not only about nourishment and necessity but it is also a way of bonding with others. Commensality, the act of eating and drinking at the same table, is a fundamental social activity that fosters togetherness and nurtures familial ties [6]. Sharing meals also mean sharing experiences, establishing basic social attachment and feeling togetherness [21]. However, commensal dining is becoming increasingly difficult in todays era. Industrialization and globalization have prompted families to move away from each other and as a result of the geographical distances and the varied time zones, families find it incredibly hard to have a meal together and enjoy the benefits of commensality. Even for the co-located families, work-related commitments and irregular work hours prompt people to dine alone most of the time [19].

The act of dining solo can have a significant impact on the social, mental and the physical wellbeing of a person. Studies suggest that eating alone increases anxiety, a risk for heart diseases, diabetes, metabolic syndrome and loneliness [14]. Besides, eating alone is also less motivating and the results are consistent across various age groups. A study by Salvy et al. [20] shows that children who ate alone consumed less than children who ate with their siblings. Whereas another study by McAlpine et al. [15] found that elderly peoples' food intake increased by 60% when they dined with others. So far in the literature, solo-dining has been approached from a variety of angles, starting from the use of interactive media to using virtual telematic dining [2] to even using pets [7] and stuffed animals to make solo dining less distressing and pleasurable. To the best of our knowledge, robotic technology has rarely been explored as a dining companion to support solo-dining. Given the rapid advancements in domestic and personal robotic technology, we, however, envision that it won't be long before we see such technology at a dining table. In fact, efforts are already being made in the form of Obi [11] that assists diners with physical disability in eating. However, the predominant stance taken by these technologies is to assist or to correct the user's dining behavior, and people rarely look at this technology as a companion or a co-diner. We are motivated by the Grimes et al. [10] view on designing celebratory technology which emphasizes on the need to be more playful with dining technologies to

allow individuals "to make food choices without experiencing guilt or an ethical dilemma". Drawing on this, we argue for designing celebratory technology that utilizes positive aspects of technology to make the solo dining experience more indulging and playful.

We present FoBo (Fig 1), a speculative design [3] for a mischievous robotic dining companion that acts and behaves like a human co-diner. Since it is a co-diner, it participates in the eating activity by consuming batteries and tries to converse with the diners through beeps and purrs. Like humans, it behaves irrationally, it burps and its belly expands if it overeats the batteries. With this work, our aim is to introduce HFI to a new design opportunity that combines robotic technology with the process of eating for an engaging solo-dining experience.

EXISTING APPROACHES TO TACKLE SOLO DINING

Virtual dining companions. Numerous works within HFI have investigated the use of video communication technology for tackling the solo dining problem. For example, Wei et al. created a dining table embedded with interactive subsystems to create a sense of coexistence among remote family members [22]. However, for such a system to work, dining participants must be available at the same time to eat together. Because of time-zone differences and other such contingent factors, this condition can often be hard to fulfill. As a remedy for such a situation, Nawahdah et. al [18] developed a system called KIZUNA, a time-shifted dining system which enables people to enjoy a meal together in a virtual environment. A person can enjoy a meal while watching an earlier recorded video of a remote person's dining. Through this kind of virtual responsive setting, the authors observed that the individual might feel less alone when eating alone. Barden et al. [2] designed a virtual telecommunications platform that supports remote people in experiencing a sense of meaningful and playful mealtime experience within the practices of a traditional dinner party. Similarly, Grevet et al. [9] developed a technology probe which provides social awareness during mealtimes to help alleviate the loneliness of dining alone. From these works, we learn that video-based communication technologies could be a potential medium to connect remote diners together, however, such technologies do need a remote presence (either live or recorded) of another person to function.In absence of it, people often rely on static multimedia and social media content mediated through television and smartphone devices to feel engaged in a solo dining. For example, Ferdous et. al [4, 5] presented TableTalk and Chorus, which transforms personal devices into a communal shared display on the table to enrich mealtime interactions and experience. Mehta et al. [16] created Arm-A-Dine, a robotic dining system to engage co-diners with the food and each other, whereas Arnold et al. [1] created a virtual reality-based social eating experience. ActuEating is another system by Nabil et al. [17] that uses actuating, dynamic material to develop a dining table which changes shape and color in response to diners' actions. These works teach us that technologies can enrich our social eating process, which we aim to draw towards supporting solo dining experiences.

Co-located dining companions. A variety of works explored the use of co-located dining companions to support solo dining. For example, a famous Hotpot restaurant in China provides a group dining service to solo diners. Waiters will bring in a virtual character, a stuffed Teddy bear as a companion which enables the solo dinner to feel that he/she is sharing the hotpot with the co-diner. The idea is to make the solo dinner feel less lonely by making the teddy bear enact the role of a dining companion. A similar idea is also implemented in a Japanese restaurant called Moomin cafe in Tokyo, where diners get the company of giant stuffed animals. The stuffed animals are the characters from a Finnish picture book series. Besides stuffed toys and virtual characters, a few restaurants like Cat cafe, Therpup cafe enable people to have their food with pet dogs and cats roaming around. The popularity of these restaurants suggests to us that non-humans could be dining companions. Drawing on these works, we wonder whether we could potentially use a robotic technology as a dining companion.

When it comes to robot-food interactions, most of the existing works revolve around the use of robots as a cooking and serving aid for the elderly and people who require assistance [12]. However, in these works, predominantly, robots are fixed on the table and support an individual in picking and serving food, replacing a caretaker. However, from an experiential perspective, we know very little about how such a technology can be used in a dining context where it serves as a friendly companion, which motivated us in designing Fobo. Furthermore, we were also motivated by works like JoggoBot which uses the drone as a jogging companion for people who do not want to jog all by themselves [8]. We draw on this work, to explore the use of robotic technology as a playful companion to dining. Playfulness to us is a mindset where people approach mundane activities with an attitude similar to that of "paidia" - as something not serious, with neither a clear goal nor any real-world consequences [13]. We believe that by harnessing a playful attitude towards solo dining, we could further expand on the design space and offer complementary benefits through a playful engagement between robotic technology, solo-diner, and the food.

FOBO

FoBo stands for Food Bot. It has a plastic body and two robotic arms with attached grippers to hold the forks. We use Arduino to control its movements and use sound synthesizers to generate eating specific sounds. We envision FoBo's role in dining in the following way.

Eating: FoBo gives an actual company to a diner by participating in the eating activity. Since it is a robot, it consumes batteries (not in a literal sense). With its arms, it picks up the battery and stack it in its belly.

Burping and purring: FoBo makes varied sounds based on the quality and freshness of the battery. FoBo also burps when his stomach is full, indicating that it cannot eat anymore (Fig 2). The sounds are prerecorded and triggered with FoBo's arm movements while the freshness of the batteries is identified using the weight sensors.

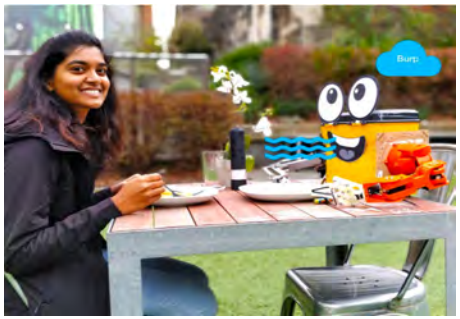

Figure 2: Fobo burps when full, indicating that he canâĂŹt eat anymore

Figure 3: Fobo can also mimic the co-diner's eating actions to make dining more playful.

Bulging of the belly: FoBo also has an inflating stomach similar to a balloon that expand in size with overeating.

Mimicking diners' actions: Finally to make dining more fun, Fobo periodically also tries to mimic the diner's eating actions in terms of movement, speed, and errors (Fig 3). For example if the diners accidentally drops food then FoBo would also drop the battery.

FoBo is still a work in progress and not all the above-mentioned functionalities are fully implemented as yet. However, through FoBo, we aim to initiate a research focused critique and a discussion over the form and the functionality of a playful dining companion. With the gathered feedback, we aim to finish the development of FoBo, and then study its use in a variety of different solo dining contexts, that include home, restaurant and the workspace.

CONCLUSION

The field of domestic and personal robots has grown rapidly over the course of the last few years. However, besides the traditional views geared towards efficiency and assistance, we see limited instances of human-robot integration, where robots undertake a playful role and we see this as a missed opportunity to augment the eating experience. As a step towards this, we aim to illustrate how robotic technology can support solo dining in a playful manner, allowing people to find moments of pleasure through a company of mischievous robotic dining companion. Even though Fobo is not yet fully developed, it outlines interesting ideas and structure to display its playfulness. We invite more explorations on robot-food interactions that contribute a rich dining experience and enrich our understanding of Human-Food Interaction.

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