Toaster Bot: Designing for Utility and Enjoyability in the Kitchen Space

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Introduction

The preparation and consumption of food is not solely for survival purposes, but also for enjoyment and pleasure. People of all ages, genders, cultures, and disabilities require access to food and thus benefit from food technologies. We seek to take previous ideas of assistant kitchen technologies [1] and to expand upon them by addressing users of all ages and capabilities. With benefits such as motivation for cooking, increased socialization, and boosted self-esteem [2][3], culinary technology like the toaster bot makes food preparation and healthy eating accessible to diverse groups of users while simultaneously providing them with practicality and amusement in the kitchen space.

Design & Application

In our design process, we asked ourselves the following questions:

- How can the toaster bot communicate its intention and express its state (e.g., mischievousness or happiness) given its low degree of freedom?
- How can the toaster bot resolve or minimize conflicts between multiple users sharing a toaster?
- How may users understand different toaster bot behaviors?
- How can we implement certain toaster bot behaviors to contribute utility and enjoyability to the toast-making experience?

The outcome of these workshops was a series of storyboards that depict how users may interact with the toaster bot.

Storyboards

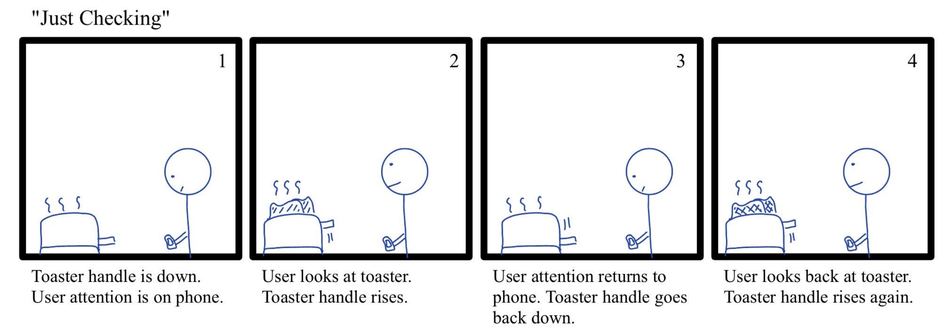

Figure 1: *Example scenario from action-reaction based interactions category.*

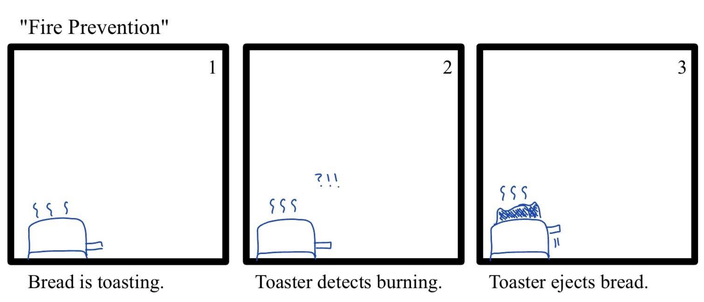

Figure 2: *Example scenario from safety implementations category.*

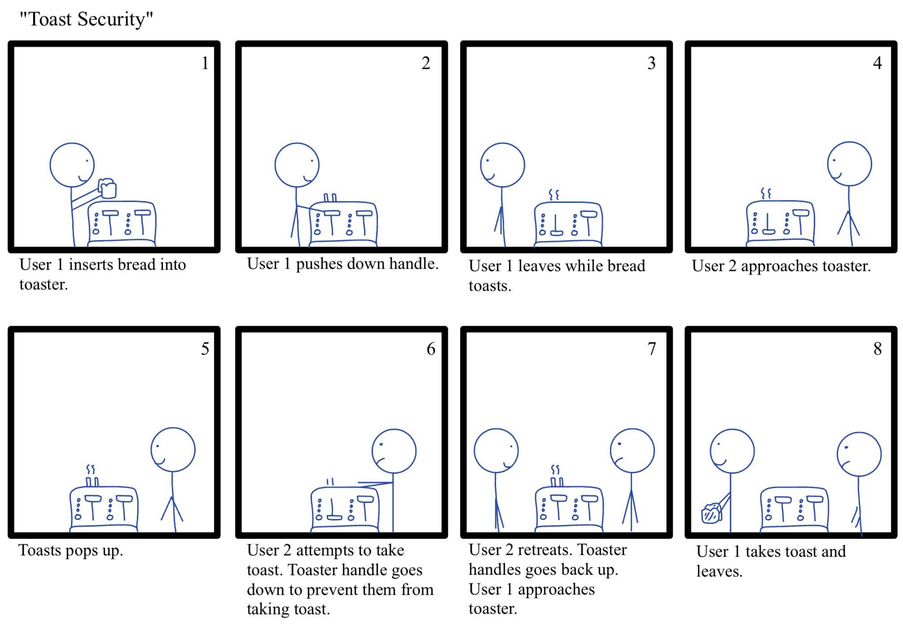

Figure 3: *Example scenario from multiple users category.*

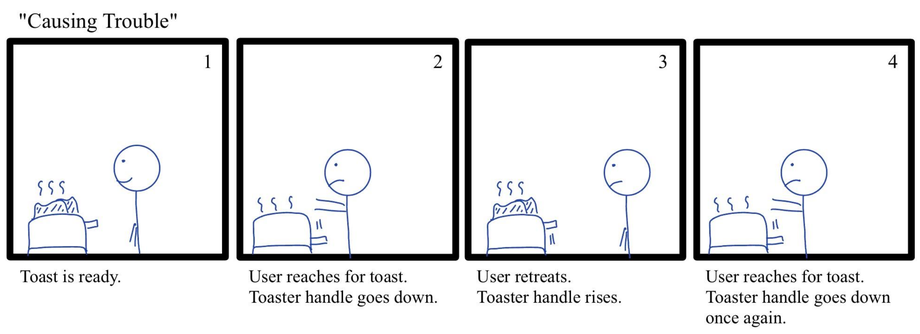

Figure 4: *Example scenario from playful behavior category.*

Implementation

All materials we used can be purchased commercially online or in store.
Early prototypes were designed as an add-on component that could be attached to any two slice-slotted toaster to convert into a toaster bot. This quick proof-of-concept prototype was constructed of supplies we already had in our lab (except for the toaster itself) and cost about fifty dollars.

Figure 5: *Iteration 1. Prototype of toaster bot as an add-on component to a two-slice slotted toaster.*

Figure 6: *Iteration 2. Prototype of built-in two-slice slotted toaster bot.*

This first functional iteration of the toaster bot primarily considers current toaster-owners who would like to benefit from the technology without purchasing a new toaster. Thus, the toaster bot is presented more as an enhancement of the user's current toaster rather than a replacement, minimizing any learning curve or adjustment phase that users may encounter with new technology.
Though this was a functional prototype, we found that its movements could be more precise and its frame more robust. Consequently, later prototypes made the toaster handle automation mechanism a built-in component to the toaster bot. We adapted this design to fit both two-slice and four-slice slotted toasters (see Figures 6 and 7) for the two-slice and four-slice slotted toasters respectively). Iterations 2 and 3 still each totaled below one hundred dollars.

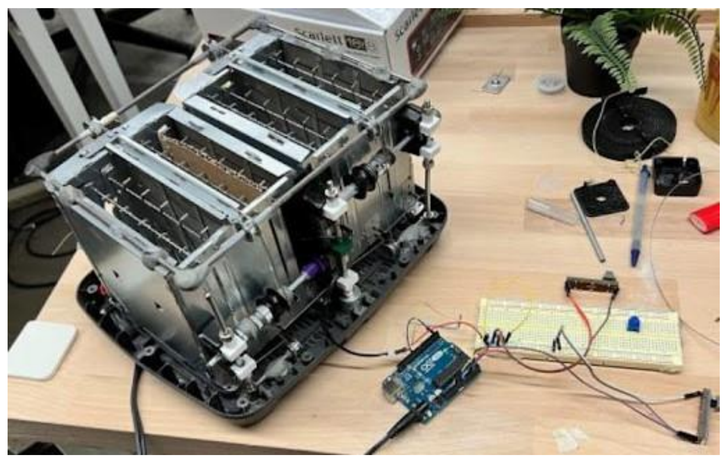

Figure 7: *Iteration 3. Prototype of four-slice slotted toaster bot.*

Discussion & Future Work

Vignettes portraying the toaster bot were compiled into an online Qualtrics survey and shown to around 100 adult participants to gather initial feedback on how the toaster bot's behaviors are perceived. The preliminary analysis of the responses shows that most participants understood the usage context and the toaster bot's intention from the vignettes. These findings validate that the toaster bot can communicate its intention and express its state even with a low degree of freedom.
The next step for this project is to develop a fully autonomous prototype to be deployed in the real world. The most recent prototype enables the toaster handle to be controlled remotely using a Wizard-of-Oz technique. However, we intend for the toaster bot to ultimately function without any human intervention. Through the development of a robust, fully autonomous, prototype of the toaster bot, we will be able to investigate user perceptions in the wild [4].

References

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[2] Rubén Blasco, Álvaro Marco, Roberto Casas, Diego Cirujano, and Richard Picking. 2014. A smart kitchen for ambient assisted living. *Sensors* 14, 1 (2014), 1629–1653.

[3] Nicole Farmer, Katherine Touchton-Leonard, and Alyson Ross. 2018. Psychosocial benefits of cooking interventions: a systematic review. *Health Education & Behavior* 45, 2 (2018), 167–180.

[4] Malte Jung and Pamela Hinds. 2018. Robots in the Wild: A Time for More Robust Theories of Human-Robot Interaction. J. Hum.-Robot Interact. 7, 1, Article 2 (May 2018), 5 pages.