MS Digital Media

School of Literature, Media, and Communication
Georgia Institute of Technology

Student Name: Zixuan Wang
Project Title: Using Motion Sensing in Cooking
Committee Chair: Michael Nitsche
Committee Members: Dr. Nassim Jafarinaimi

Thesis Abstract: In daily life, people usually have a hard time following the cooking instruction with their mobile phone or tablet if their hands are dirty from typical cooking activities such as mixing flours. The current design of mainstream cooking apps is a series of step-by-step images with instructions on what to do, which allows users to swipe across the screen to look through them. However, touching and swiping on the screen could lead to a dirty screen which will cost users a lot of time to clean it up. Messy fingers might not register on the screen or trigger unwanted effects. The typical screen-based interaction model does not work in this particular condition. Additionally, it could also take a longer time for users to read the textual instructions which is disrupting when cooking. In my project, I explore digital media to present recipes effectively and navigate through them on a laptop/tablet while cooking using motion based (or related) interfaces.

Statement of problem: The current design of most digital cookbooks requires touch-based interactions in terms of pressing a button, swiping to next, pressing and holding, double clicking, etc. which requires users to either click next buttons or swipe across the screen in order to look through these instructions one by one. However, users are sometime not able to or unwilling to perform this kinds of action because they don't want to mess their phones up or their phones do not recognize the interaction due to the wet/sticky fingers. Thus, we face an interaction design challenge based on technology. Meanwhile, the mainstream format of presenting instructions mostly focuses on images and texts, which may create unenjoyable experience for the user because they might get lost with textual instructions if they go back and forth between the food and the mobile phone. They don't want to read the long instructions from beginning once again. In this case, something that could save their focus by bridging the gap between foods and cooking instructions could create an enjoyable kitchen experience for almost everyone who suffers from the paying attention to instructions at all times while cooking.

Proposed Solution: There are two main aspects to be considered in my case in order to solve the problem. The first problem I am trying to solve is how to keep the mobile clean? The other problem is how to make the cooking instructions easy to follow and provide better user experience? In the first question, I am looking at wearable devices or other motion sensors to replace the touch-based interactions which are necessary in the cooking app. By reducing the direct contacts between dirty/wet hands and mobile phone screens, it becomes easier for the users to interaction with the phone and the cooking app since they no longer need to drop off the food, clean up their hands and wait for a minute until they become dry. They could even hold the food when they want to interact with the app. Secondly, I will design a digital cookbook/ recipe app to present recipes in a more effective way for the cooking process itself. My purpose is to provide better cooking and learning experience for the user, in terms of easy to follow recipe instructions, clear navigations, etc. So, being able to switch back and forth between contents, pull up necessary contents at any time, as well as perform other actions without keeping in mind of where they are at all times, could be really helpful with creating an enjoyable experience for people in the kitchen.

Review of Existing Material: There are several mainstream interfaces that helps with creating the no-touch based experience. One is Leap Motion, which is basically a motion sensor which detects user's hand movements. Another interesting equipment which is being widely used in robotic control as well as giving presentation is Myo, which is basically an armband that detects user's arm movements as well as muscle movements when holding fist and stretching fingers. These two equipments are the best fit for the project in my perspective. Both equipments have its pros and cons. The former one connects laptops with a line which leads to a portability problem. The latter one is tied with user's arm, which means it moves all the time. I need to tell Myo when to actively recognize arm movements and when to sleep. In the last semester, I also created a virtual gallery of NBA players using Leap Motion, where users are able to communicate with the virtual world by different gestures (basically finger and hand numbers). I will test both options for my project.

In terms of projects related to digital cookbooks, the current design of basic functions involve photos of what it supposed to be like, reviews, nutrition facts, ingredients, as well as video tutorial and textual directions. Users click, drag and swipe on the screen to navigate through the application. For example, the tablet version of Allrecipes displays step by step cooking directions as well as video tutorials of cooking. Users have to either scroll down the screen to read next steps *[Figure 1 left]*, or swipe across the screen to view next chapters *[Figure 1 right]* - which does not work when your hands are dirty. Another example is Betty Crocker Cookbooks, which only has textual

directions of cooking *[Figure 2]*. The page is packed up with texts which sometimes makes users hard to follow it step by step. In addition, various pieces of information are all displayed in one page, which could potentially be a problem if the user is busy with making food and has no chance to wash his/her hands in order to swipe on the screen.

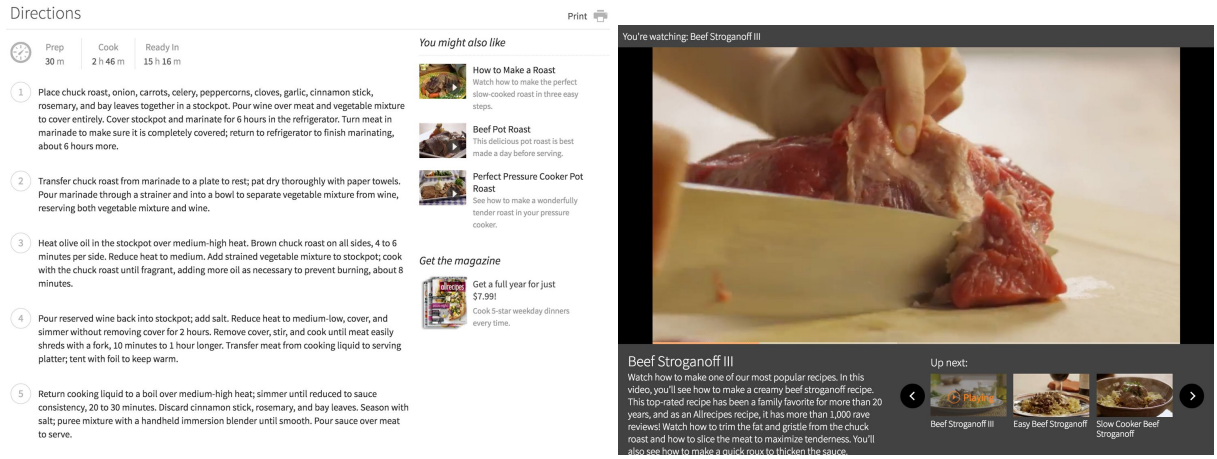

Figure 1. Allrecipes.com Recipe Text/Video Instruction Page

Figure 2. Betty Crocker Cookbooks Cooking Instruction Page

All the interactions are touch based which means users have to physically touch the screen to communicate with it. What I am going to do is break down the contents and

reorganize them so that is more accessible and easy to follow for the sake of better user experience through and be optimized for a hand-free interaction design.

Deliverable: By the end of next spring semester, I am going to accomplish a project that helps bridge the gap between practical and messy interaction conditions for the user during a cooking experience and instructional cooking application in the kitchen. Practically, I will implement a basic cooking app including two recipes in my project for prototyping and testing. I will focus on the hand-free interactions and how the interactions activate contents. For example, in order to make the content/ tutorials more accessible and easy to follow, users may use different gestures to pause/play the video tutorials, pull up/hide directions for details and switch between sections. I have yet decided which tool that I will use as the motion sensor, one is Leap Motion, and the other is Myo. Either one, I will use it to replace touches to finish the necessary communication between people and the cooking app. In terms of the platform, it should be launched on the laptop first. Whether rolling out a mobile version depends on the schedule and how the project goes.

Resources: I am going to make use of two main resources to accomplish the final project. The first one comes from the official online tutorials on the motion sensor side. For example, Leap Motion has its own online community where coders and artists talk about technical issues as well as other ideas. It also has numerous tutorials with fully functional codes. I am going to look at them to figure out the best and the most helpful sample code for my project. On the other hand of contents, I am going to create a cooking app that will include videos, audio tutorials, as well as images and texts as supplementary contexts. I am going to look for help from my friend to act as a chief in the video or I could try editing video cooking tutorial from online like Youtube and Vimeo. Other resources regarding to the construction of the application, like HTML, CSS, Java Script are also necessary for my project.

Timetable: The schedule will be divided into research part, implementing part, and iterating part.

1	~ Aug. 2016	*Research and Data Collection* By the end of this summer, I will be finishing the research on the project which involves people's expectation for the no-touch based interactions, their perceptions no-touch based experience, as well as the contents as tutorials that do not

		upset them. In August, I will figure out the direction of the content forms as well as interaction patterns.
2	Aug. 2016 - Dec. 2016	*IRB* Since I will conduct user research and observe people's behavior, I will need to acquire an IRB Preapproval to conduct such research on human subject. Also, if I am going to adopt and edit video clips from Youtube or other sources, I will let them know and accredit them in my work.
3	Aug. 2016 - Sep. 2016	*Design of Interaction* In August, I will be working on the draft version of the interactions design.
4	Sep. 2016 - Oct. 2016	*Content Design & Preparation* In September, I will find one or two recipes w/ video tutorials and start curating the content of my project.
5	Oct. 2016 - Nov. 2016	*Hardware/Interaction Prototype* In October, I will be focusing on the hardware interactions of my project, in terms of the hand gesture recognitions and interface reactions.
6	Nov. 2016 - Dec. 2016	*Fully Functional Prototype* By the end of fall semester, I will complete a fully functional prototype to conduct user testings.
7	Jan. 2017 - Feb. 2017	*User Testing* In the first month of spring semester, I will test the prototype and collect feedbacks to figure out the problems.
8	Feb. 2017 - Apr. 2017	*Final Project* From February to the end of spring semester, I will continue working on the final project based on the feedbacks and problems identified earlier.
9	Mar. 2017 - Apr. 2017	Presentation

		In March, I will also pay attention to the final presentation and DEMOs on that day.
10	Mar. 2017 - Apr. 2017	*Documentations:* My project will be completely done prior to the final presentation include running code, documentations, as well as other necessary information.

References:

1. akhilveeraghanta. (2016). Universal Accessibility Vehicle (UAV). Retrieved from https://developer.leapmotion.com/gallery/universal-accessibility-vehicle-uav
2. dplemmons_leap. (2015). Planetarium. Retrieved from https://developer.leapmotion.com/gallery/planetarium
3. SamsungGulf. (2012). Samsung SmartTV Retrieved from https://www.youtube.com/watch?v=VyZ-MZ4q_Q4&feature=youtu.be
4. Julie Rico, Andrew Crossan, and Stephen Brewster. (2009). Gesture-Based Interfaces: Practical Applications of Gestures in Real World Mobile Settings. Retrieved from http://www.juliericowilliamson.com/papers/RicoCrossanBrewster-Chapter.pdf
5. Thomas Joos. (2013). Beyond The Button: Embracing The Gesture-Driven Interface. Retrieved from https://www.smashingmagazine.com/2013/05/gesture-driven-interface
6. Paul Bernhardt. (2015). Myo SDK 0.9. Retrieved from https://developer.thalmic.com/docs/api_reference/platform/script-tutorial.html
7. John Corpuz. (2016). 15 Best Recipe Apps. Retrieved from http://www.tomsguide.com/us/pictures-story/634-best-recipe-apps.html
8. Lucas Goraieb. (2015). Pushing Boundaries: Interaction Design for Touchless Recipe Browsing. Retrieved from http://blog.leapmotion.com/pushing-boundaries-interaction-design-for-touchless-recipe-browsing/