SHAPE Voice Interaction Report

Patrick Bowling
Andrew Lewis
Nick Strazis
Jonah Simon
Aaron Kwan

Concept And Research

In order to make interaction with the wall more natural, we wanted a way to interact with is through voice. To accomplish this, we needed a powerful, natural, and flexible voice API. After researching many different voice APIs,We decided on using Amazon's Alexa. Alexa had the most accurate recognition and very clear documentation. In addition to a voice API, we needed a way to send the changes to the wall. To accomplish this we used node.js. Node.js is a framework that allows for Javascript to be run server side. It is Amazon's recommended language for building Alexa Skills. For hosting, we decided on using AWS Lambda. It is free for up to 1 million requests per month and easily configurable with Alexa.

Development

Developing voice interaction was a very difficult process. None of us in the group had ever worked with any Voice APIs or node.js. To begin, we started by reading through Amazon's documentation and tutorials. The first step to creating an Alexa skill is writing the Intent Schema. The Intent Schema is the phrases and functions you would like your skill to support. Using a JSON format, the Intent Schema maps phrases to certain functions. Given that we had all used JSON format in the past and that the documentation was very detailed, we did not have any challenges writing the intent schema. The next step in writing the Alexa App was was creating the sample utterances. The sample utterances are what Alexa should be able to respond to. For our app we created move it (direction)(amount), make it (size)(amount), submit, and make a window. Sample utterances are formatted as just simple lines of text. The final step of the Alexa app was to create a node.js backend. The node.js code is responsible for sending changes to the wall. The code works by first asking the server for the current window position, interpreting the user's speech text, and sending the new coordinates for the window back to the server. Developing the node.js application contained significant challenges. Unlike other programming

languages, nearly everything in node.js runs asynchronously. This make coding in node.js very tricky since code does not run in order. As a result, our application would report that it was done before it actually was. In order to make code run in order, we found that we had to use callbacks. Callbacks are essentially a way of calling a function when another is finished. We had to use callbacks extensively to make the Alexa Skill work. The biggest challenge with callbacks was setting them up to run in the right order. Once we mastered callbacks the code began to work nearly perfectly.

Current State

The app in its current state supports-

- Move it (left, right, up, down) (a lot, a little, normal)
    - Simply moves the window in the desired direction for the desired distance
- Make it (bigger, smaller, wider, thinner, taller, shorter) (a lot, a little, normal)
    - Simply resizes the window in the desired way for the desired amount
- Make a window
    - Makes a new window in the center of the wall
- Submit
    - Submits the wall to grasshopper from the preview

Future Plans

The Alexa app currently supports nearly all of the features we plan to support. The only missing features are moving the window diagonally and supporting multiple windows. Due to the rapid timeframe for development, we did not have time to tune the distances to the design specs. Additionally, the app has a few bugs. If it mishears a phrase it will sometimes submit the wall. We are confident that with more testing and time we will be able to fix these bugs, fine tuning issues, and implement the missing features.

Requirements/Environment and Instructions to Run

The Alexa Skill requires only an Alexa enabled device to run in addition to the items required for the wall (Computer with Rhino, Server, and Internet Connection). Acquiring an Alexa device is easy. Amazon sells multiple configurations, starting at $39.99.

To run the voice app, first enroll in the SHAPE Wall beta on the Alexa Skill Store. Then, boot the app by saying “Alexa, Ask Shape Wall’. Now just listen to Alexa’s prompts.