# User Interface: Usability Testing Results

In the efforts to make the best use of our testing, we followed a number of steps to standardize our process. We first created a uniform testing script and testing instrument for both appliances. These documents ensured that each test participant would hear the same instructions and allowed us to collect more accurate data. After creating these instruments and scripts, the tests were performed by users. The findings were recorded and analyzed. After gathering data, we performed analysis to determine the changes that need to be made to the applications.

Interfaces in Both Applications

Weather Forecast
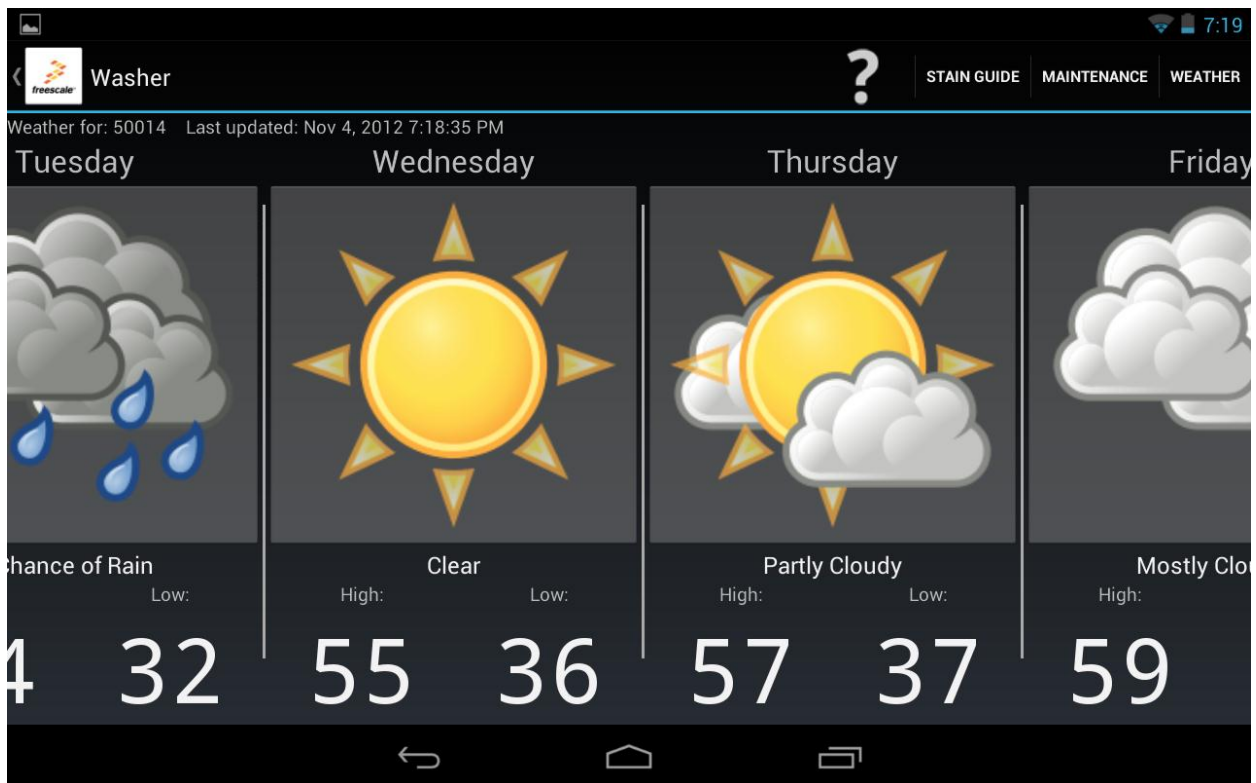
The Weather Forecast shows weather predictions from Weather Underground for the next 10 days. A weather image as well as high and low temperatures are displayed for each day. Users can view detailed forecasts by clicking on the weather image.

Task Performed

The tasks performed for the weather involved having the user open the Weather Forecast activity and viewing detailed weather information for a few days in the future. The task tested the visibility and functionality of the Weather Forecast activity.

Data

Minimum time to find weather forecast: 5
Average time to find weather forecast: 20 sec
Maximum time to find weather forecast: 1 min

Feedback

The overall response to the Weather Forecast feature was very positive, even surprising some users, "Oh, weather!" Users also made comments on how "the weather could be useful to plan your settings".

Improvements

On testing, we noticed a few implementation problems with the Weather Forecast activity. First, there needs to be some kind of graceful notification when the device does not have an internet connection. Secondly there are a few missing weather icon graphics to match all of the differing conditions. Users noticed that there was no graphic for the condition of "ice pellets".

Interfaces in Washing Machine Application

Main Screen
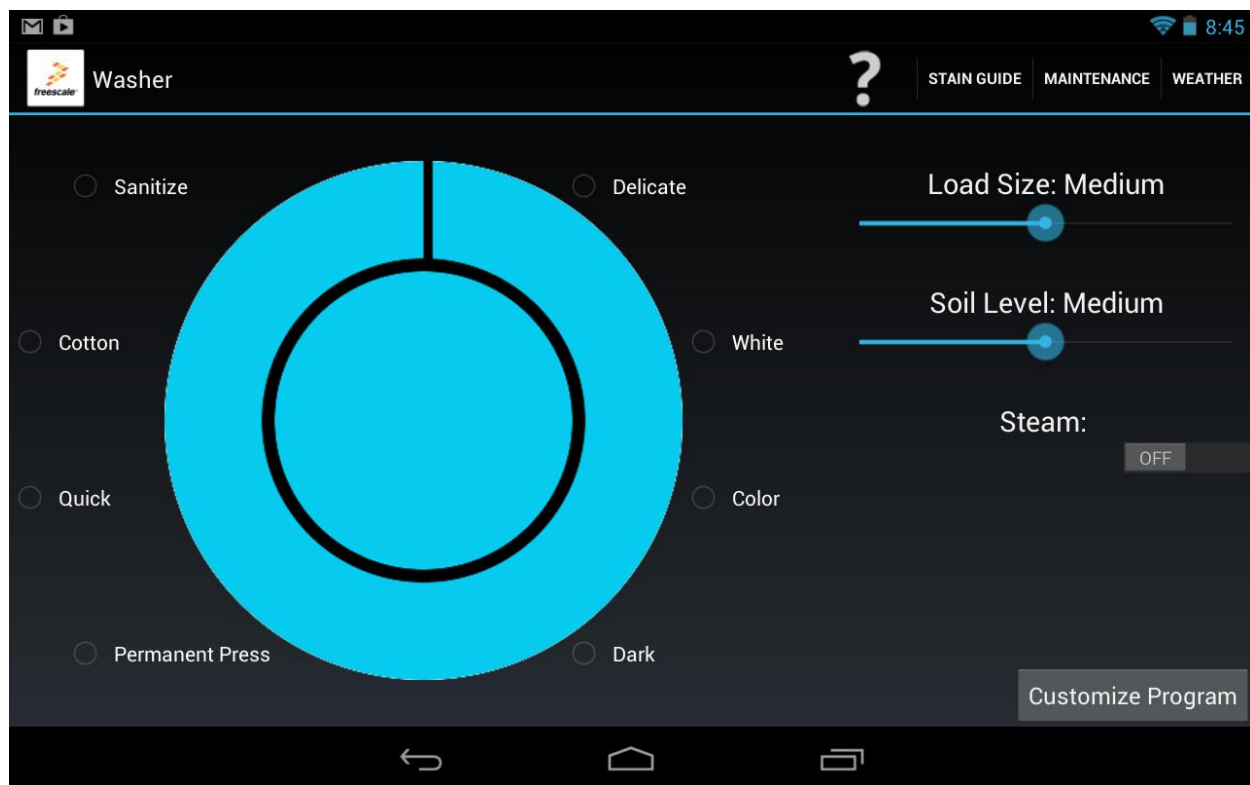
The Washing Machine Application opens with the wash program settings screen. On the left, is a dial controlled by finger movement in the outer ring, which is used to select the wash program. Selecting the center of the dial starts the currently selected wash program. On the right, are slider selectors used to select load Size and Soil Level as well as a switch to turn steam on and off. In the lower right, is a navigation option to move to the customization screen.

Task Performed

The user's first task was to start a cotton wash cycle with a medium sized load, medium soil level, and no steam. This task tested the user's ability to use the dial for program selection as well as starting the wash.

Data

Minimum time to start wash program: 15 sec
Average time to start wash program: 31 sec
Maximum time to start wash program: 1 min 15 sec

Feedback

"looks like traditional controls"
"Customize program was unclear, 'More Settings' might make more sense"
"Selecting center of dial to start wash is not obvious"
There should be a 'Start' label on the dial.
Should offer the user recommendations of what program to use for different kinds of clothing.
"Needs more emphasis on starting wash"

"font size around the dial is too small"
Steam button is hard to see

Improvements

The main concerns on the Main Screen are clarity and font sizes. First, there needs to be some indication that selecting the center of the dial starts the wash program. Second, the program selections need to have a larger font size. Finally, the 'Customize Program' button should have a different title and must stand out more.

Menu Bar

Each application has a menu bar used for navigation. On the Washing Machine's menu bar, there is a help icon, represented by a question mark, as well as links to the Stain Guide, the Maintenance Guide, and the Weather Forecast.

Help Menu
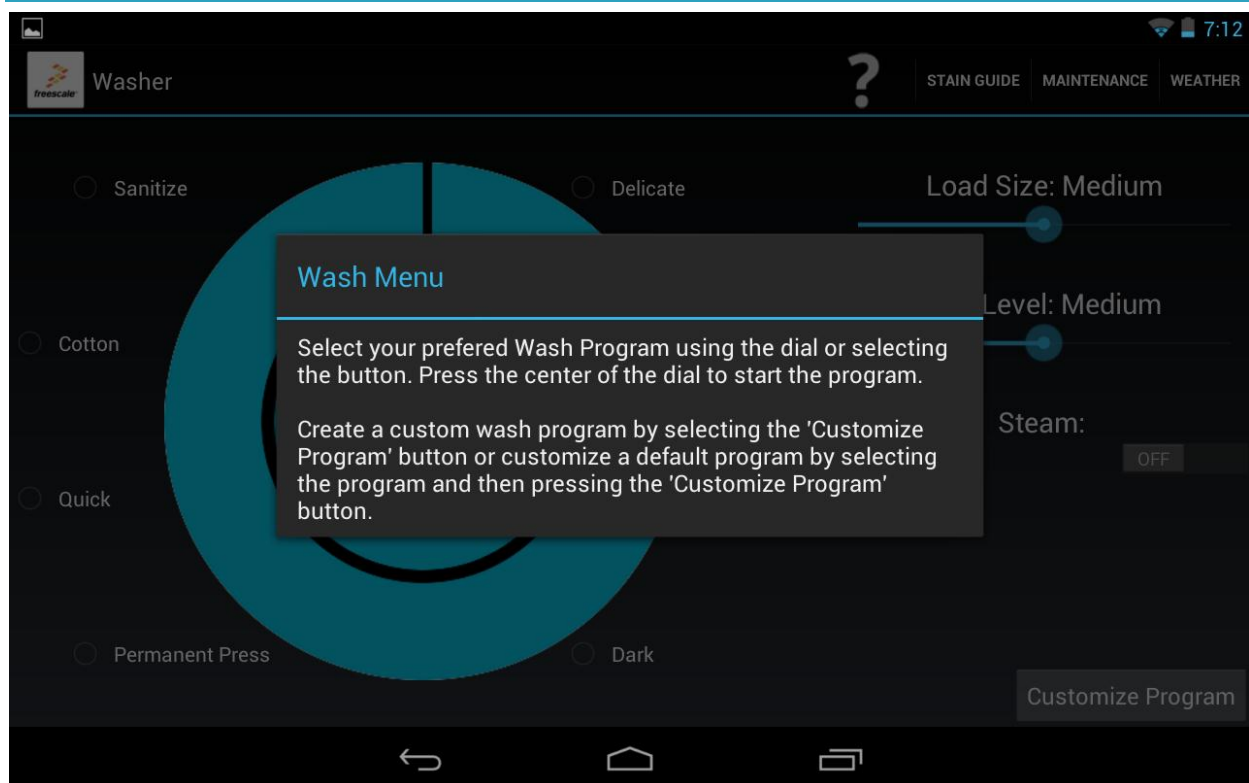
Each Activity includes instructions on how to use the current screen. These instructions are accessed by selecting the '?' in the menu bar.

Task Performed

One of our testing metrics was the number of times the user opened the help menu, although we created no tasks that required the user to open the menu. Very few users opened the help menu during testing and a few asked what the help icon did when they were done.

Data

Out of 7 testers, only 2 referenced the help guide.
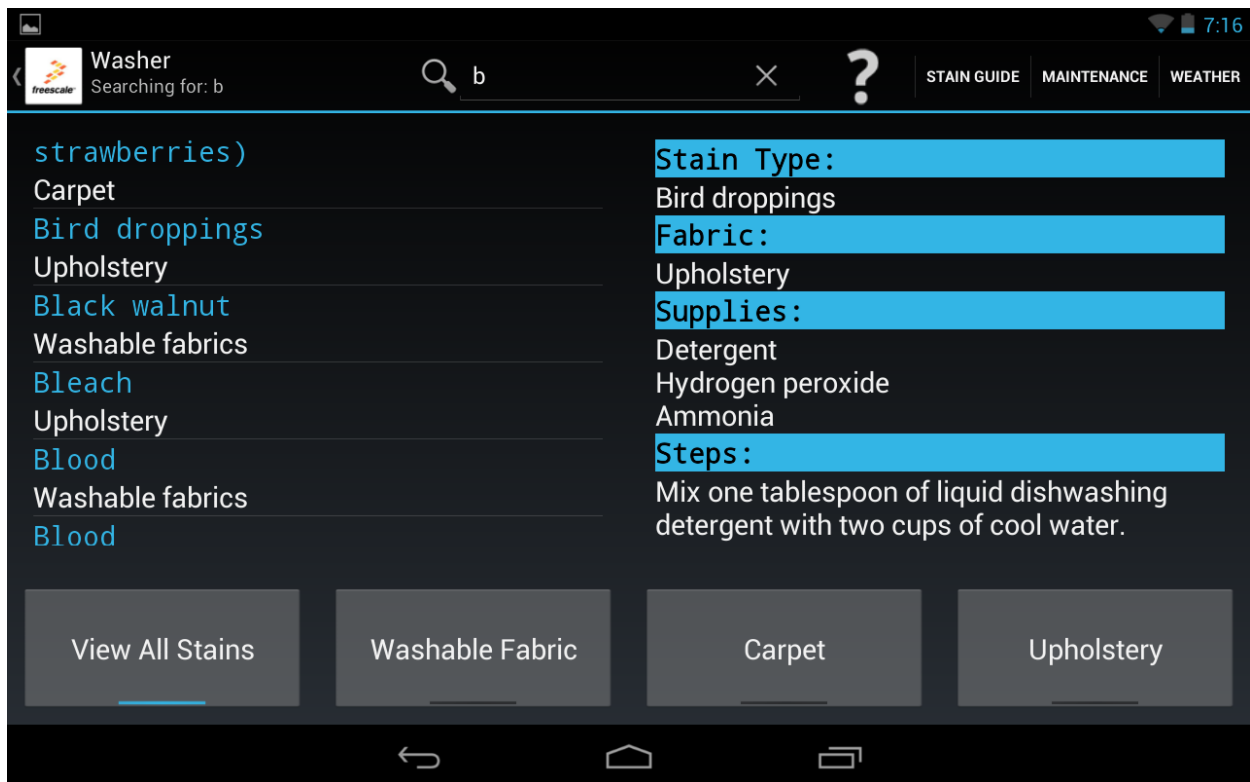
Feedback

"Change ? to 'help'"

Improvements

The word 'Help' should be added to the button for the help menu, to make finding the menu clearer.

Stain Guide

The Stain Guide contains 4 major components: stain selection on the left, stain view on the right, stain search in the menu bar and fabric type selection at the bottom of the screen. The left screen can be scrolled up and down and each item can be selected. When an item is selected in the left panel, the stain removal instructions appear in the right panel. Users can search for stain types by entering text in the search field at the top of the screen. The left panel is updated after each change in the search field. Searches can also be limited by selecting a fabric type at the bottom of the screen.

Task Performed

For the user's third task, they were asked to "Find out how to remove a nail polish stain from washable fabric." This task verified that the user could: find the Stain Guide and navigate the list of stains. (Many users also used the search function as well as the fabric type selection."

Data

Minimum time to find stain removal instructions: 40 sec
Average time to find stain removal instructions: 1 min 40 sec

Maximum time to find stain removal instructions: 5 min 24 sec

Feedback

Fabric type buttons were easily overlooked.
Item listings were confusing. Stain type should be a larger font size than the stain fabric.
"[I would like to] type in vinegar and see the things that vinegar cleans."
"[I've] never seen a washing machine with a stain guide."
"not real familiar" - user did not realize the list scrolled.
"I'm not finding menu of stains."

Improvements

The fonts used in Stain listings needs to have greater contrast to aid the user in finding the correct stain. The fabric selection buttons at the bottom of the screen must have more contrast, so that they are more easily noticed.

Maintenance Guide
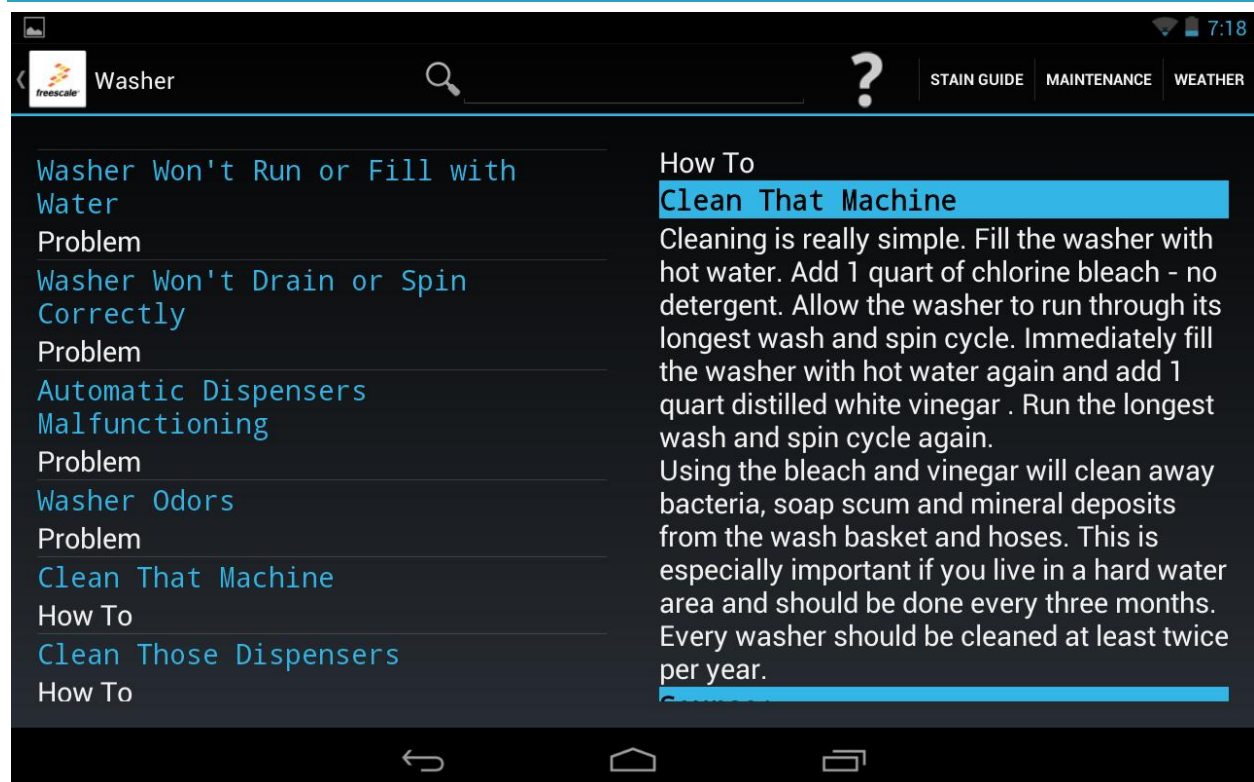
The Maintenance Guide functions very similarly to the Stain Guide. There is a maintenance selection on the left, maintenance view on the right, and maintenance search in the menu bar. When maintenance entries are selected in the left panel, the maintenance view is updated with maintenance instructions. Users can search for maintenance items by entering text in the search field at the top of the screen. The left panel is updated after each change in the search field.

Task Performed

Users were given the task to find out how to level their washing machine. Since this task was completed after a similar task using the Stain Guide, users were able to accomplish the Maintenance Guide tasks without much trouble.

Data

Minimum time to find maintenance instructions: 7 sec
Average time to find maintenance instructions: 20 sec
Max time to find maintenance instructions:45 sec

Feedback

Add buttons to limit search, like in Stain Guide.
Have washer alert user when maintenance is needed.
"That was kinda nice, the maintenance guide", "wouldn't have to go back and find that" [extra guides that came with washer]
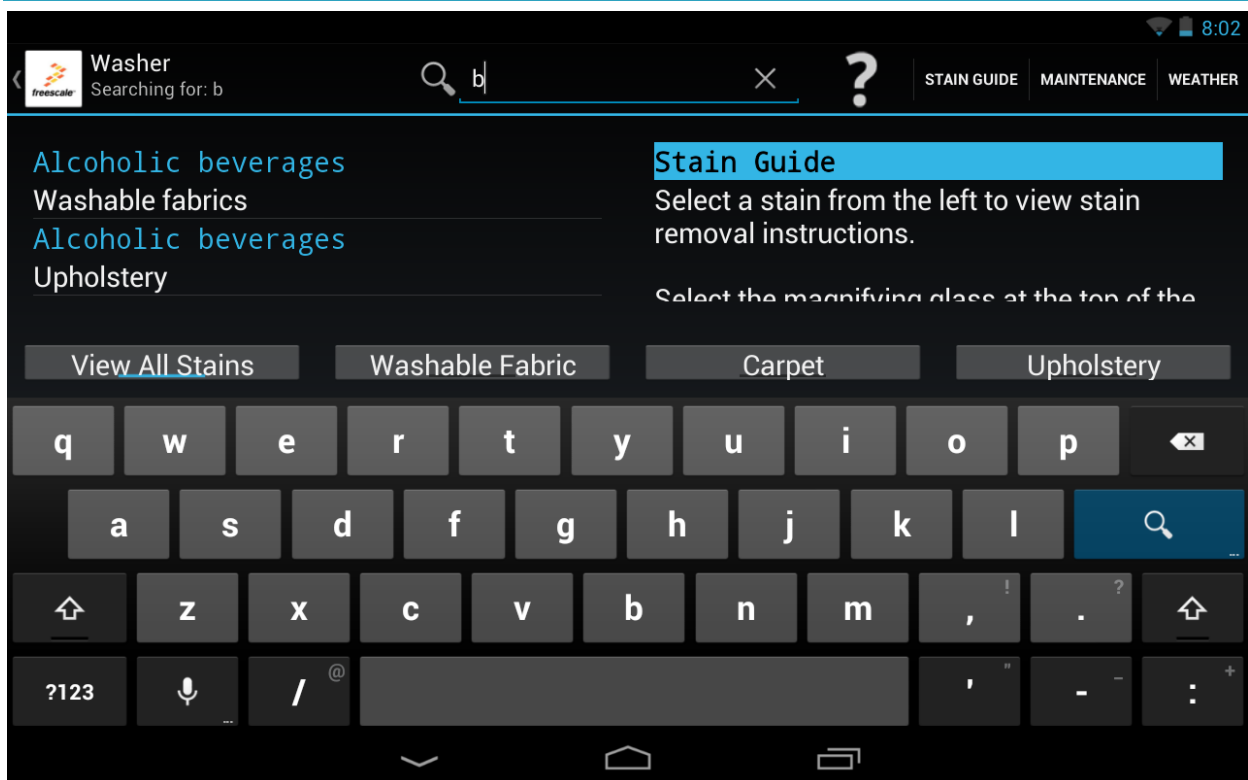
Improvements

Like in the help menu, buttons should be added to allow the user to narrow their search based on search topic.

Android Keyboard

The keyboard built into the Android OS was used for text entry into the search fields for both the Stain Guide and the Maintenance Guide.
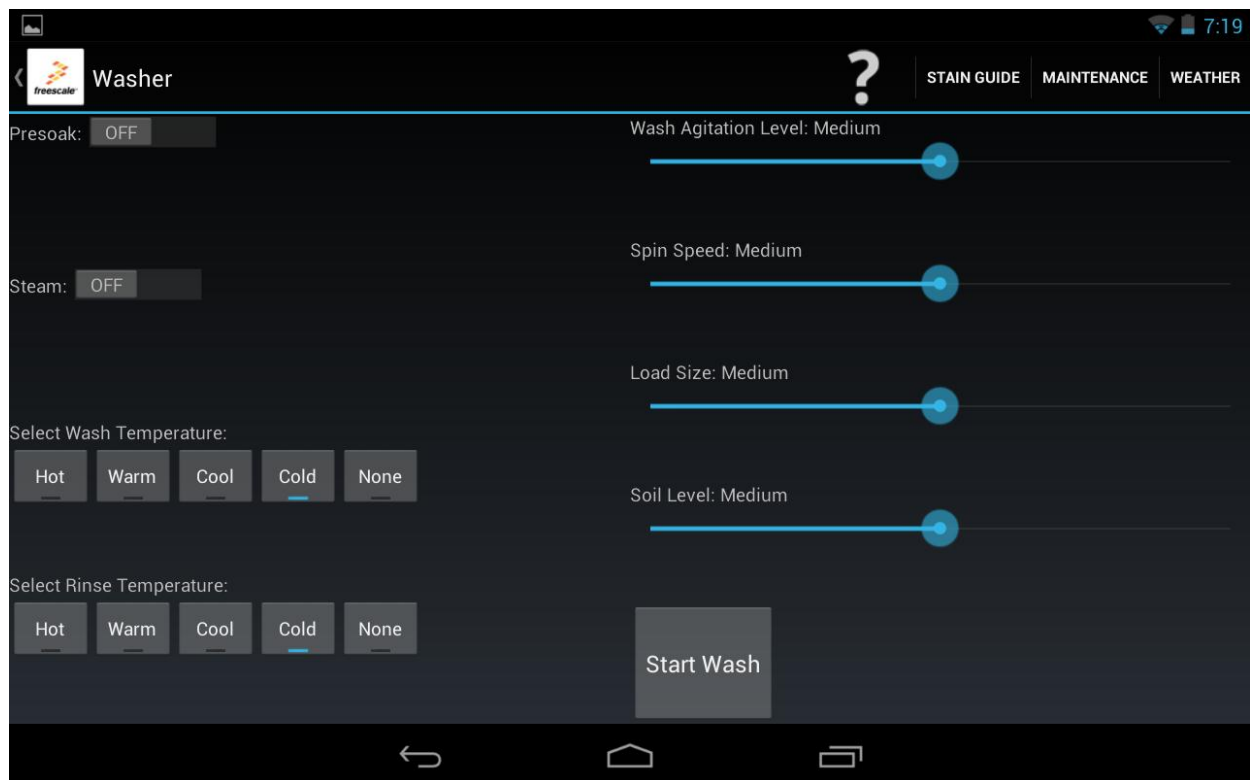
Feedback

The user should be able to exit the keyboard by selecting the search icon on the keyboard or by selecting the screen away from the keyboard.
"I need to 'Enter'"
"The keyboard made me panic"
The full sized keyboard is too big.

Customization Screen

Users can customize the wash cycle by making selections from this screen. If a wash cycle was selected before selecting Customize Program on the main screen, the program settings are automatically adjusted to be customized by the user.

Task Performed

The user was asked to start a custom wash cycle with the following settings for their fifth task: presoak, hot wash temperature, high agitation level, and XSmall load size. Many users spent upwards of 30 seconds looking for these settings on the main screen, but eventually moved onto the Customization Screen.

Data

Minimum time to start custom wash program: 42 sec
Average time to start custom wash program: 1 min 1 sec
Maximum time to start custom wash program: 1 min 54 sec

Feedback

"Needs more emphasis on starting wash"
"not real familiar" - some components were difficult to use like, seekbar and switches

Improvements

The 'Start Wash' button needs to be larger and have more contrast.

Program Progress

When a wash is started, the progress screen opens and displays the remaining time for the current wash cycle as well as the details of the wash program.

Task Performed

Users had no problems accomplishing the taskThe only task for this activity was to cancel the current wash.

Data

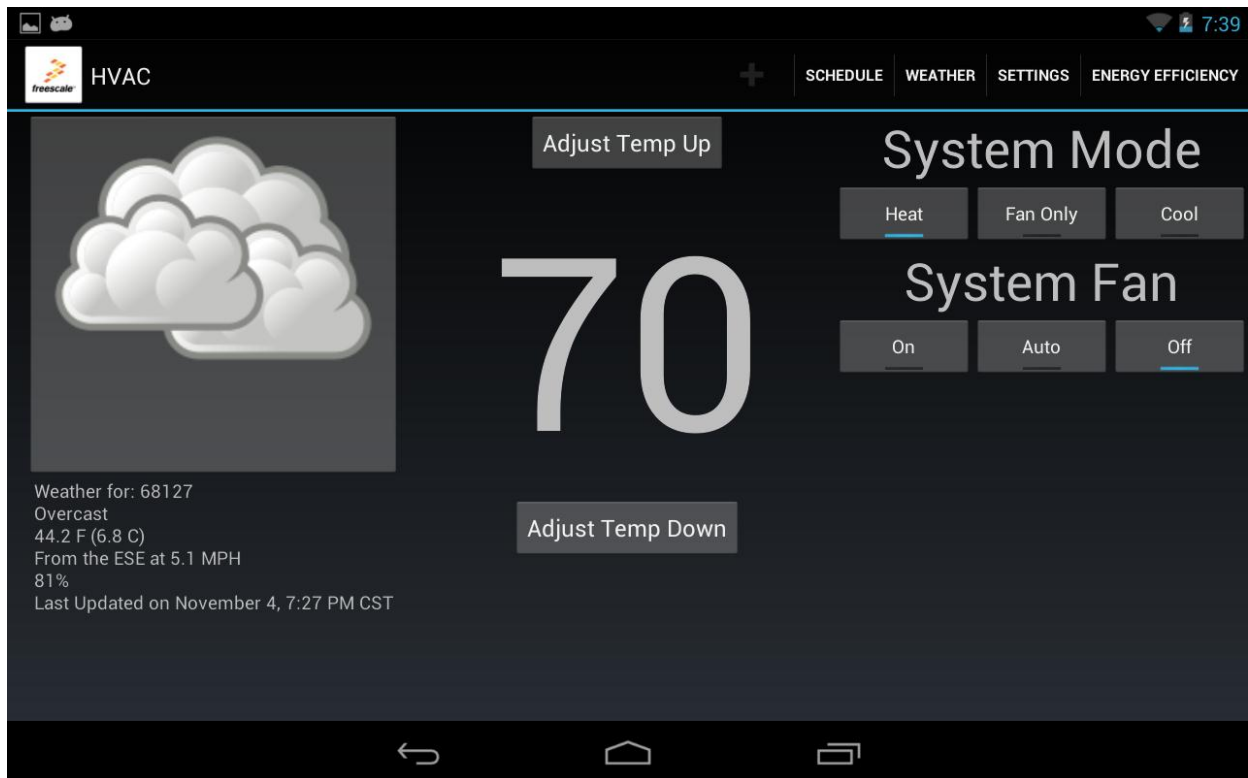Average time to cancel program: 2 sec

Interfaces in HVAC/Thermostat Application

HVAC Homescreen

This is the main screen for the HVAC system. It is the screen that initially appears to the user and is the base for many basic functions. The home screen allows the user to view the current temperature, adjust the temperature up or down, check the current weather, set the HVAC system settings to Heat, Fan, or Cool and On, Auto, or Off.

Task Performed

The first task asked of the user was to turn up the thermostat by 5 degrees, turn on the "Heat" and set the fan to "On". This task demanded that the user be able to change basic thermostat settings on the home screen.

Data

Minimum time to change the thermostat and settings: 10
Average time to change the thermostat and settings: 11.5
Maximum time to change the thermostat and settings: 12

Feedback

"up and down arrows would give the thermostat some graphical emphasis"

Improvements

Red up and blue down arrows on temperature adjustment buttons to indicate hotter/colder
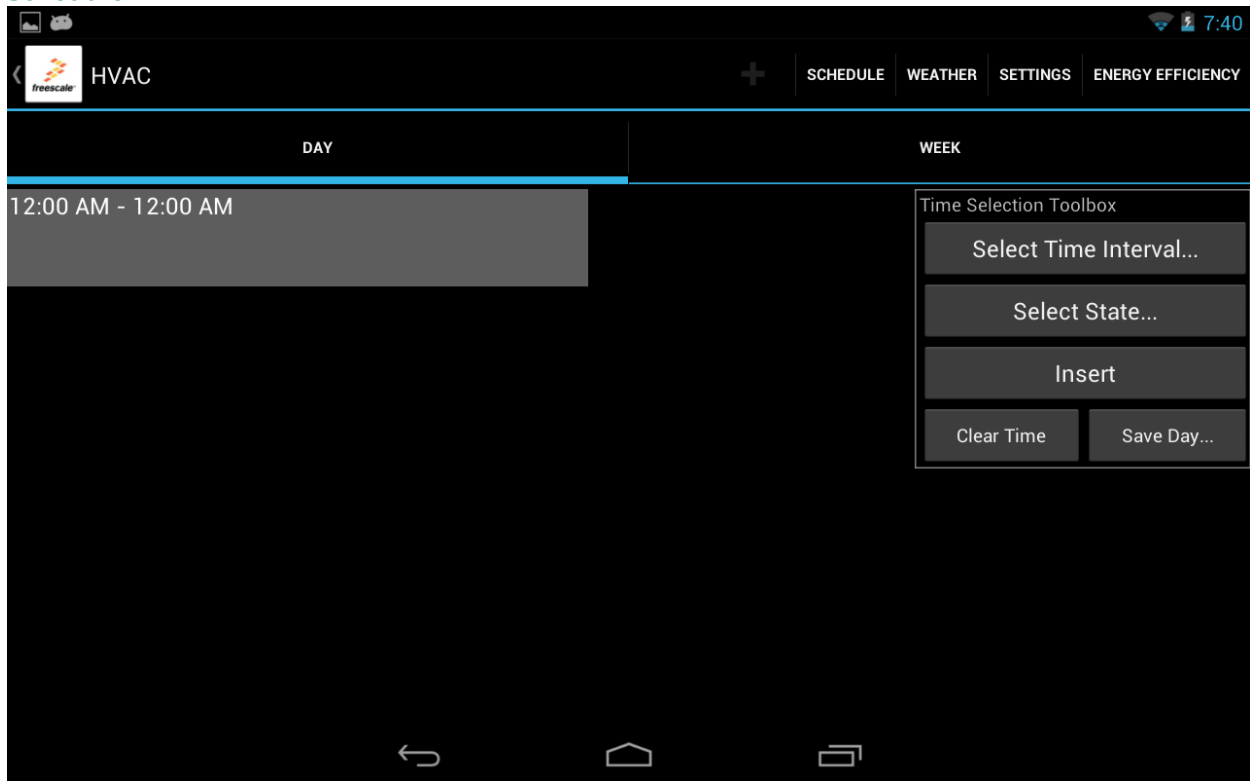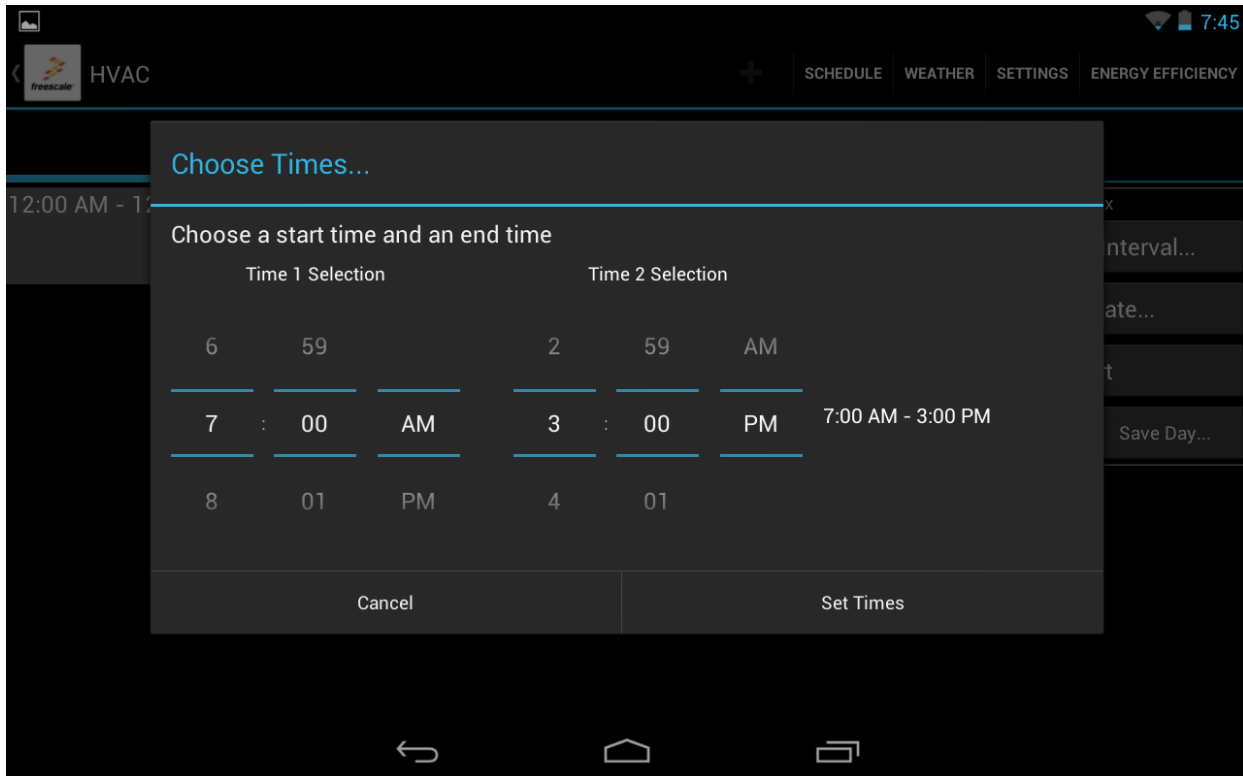Scrollable control for temperature adjustment

Menu Bar

The Menu bar displays the basic screen options to view the help button, the schedule, weather, the settings menu, or the energy efficiency screens.
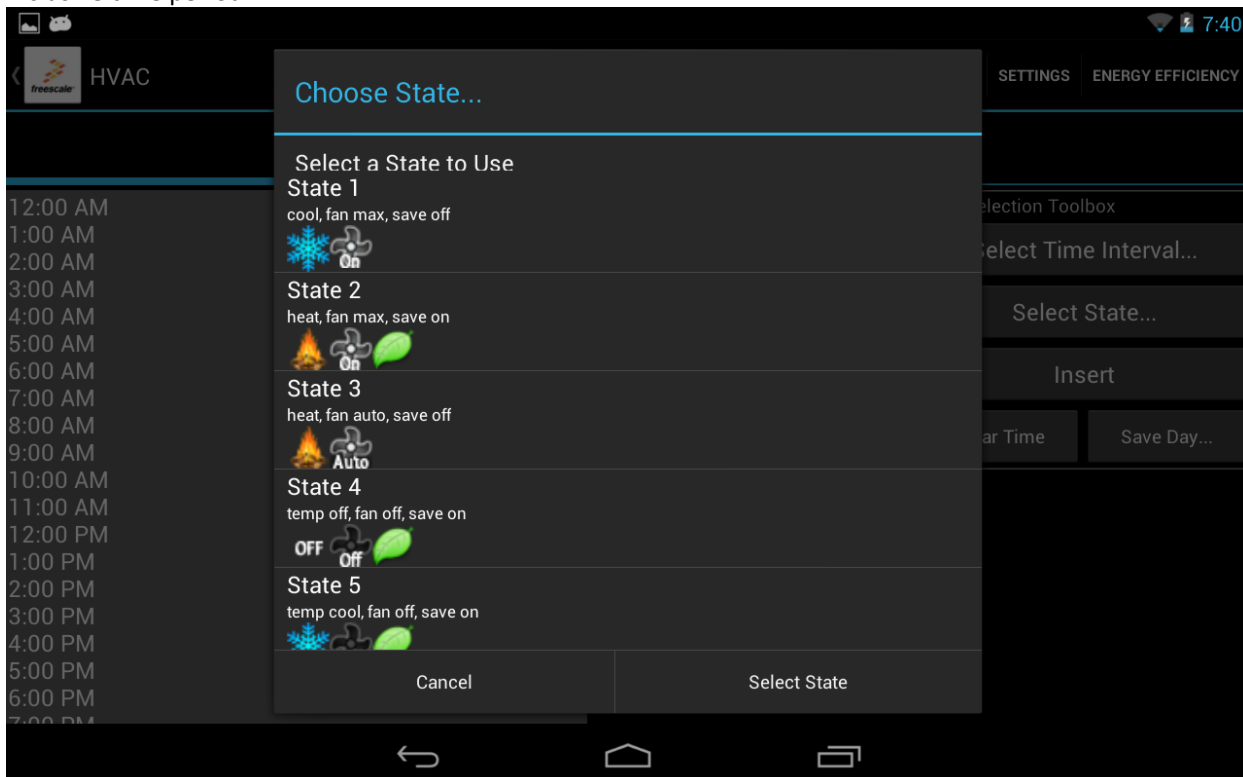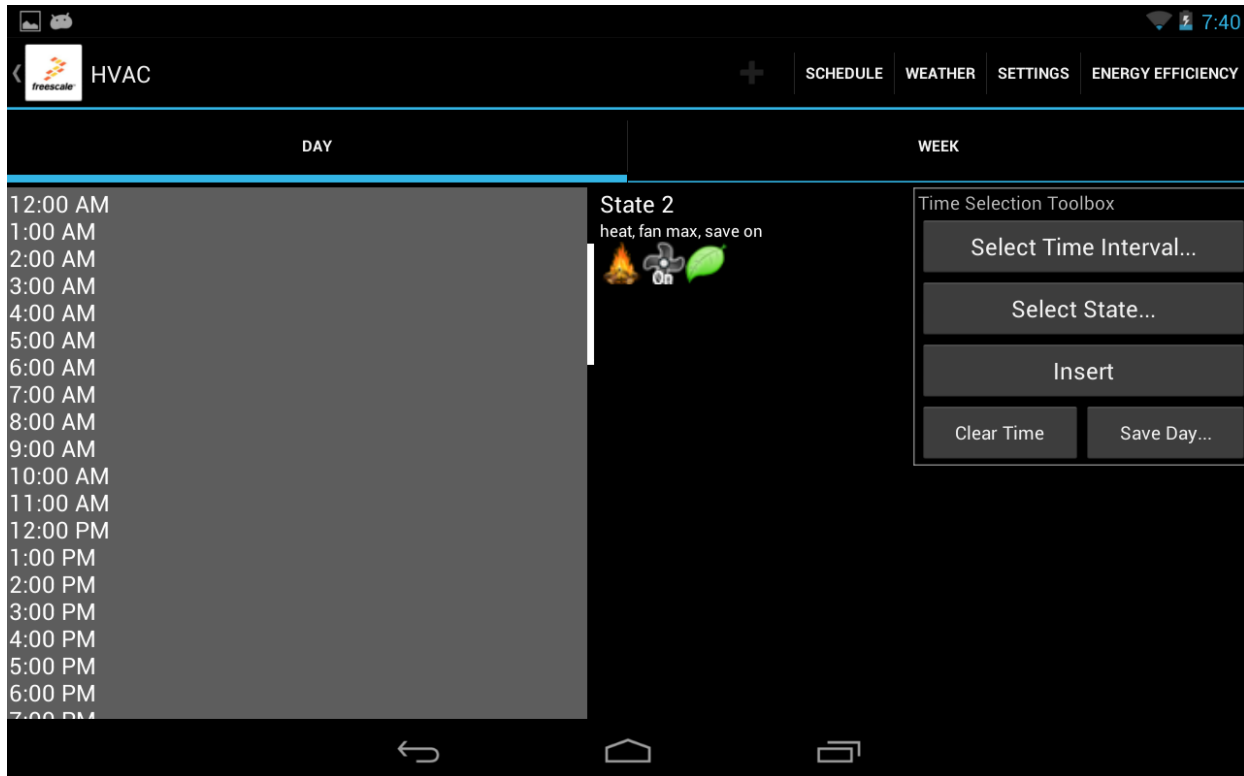
Scheduler

The scheduler is the interface used to program the HVAC. The view above is the first screen the user sees of the scheduling (Calendar) component.

After the user has tapped "Set Time Interval...", the dialog allows them to choose two times that denote an inclusive time period.

On selection of the "Select State..." button, a dialog comes up prompting the user to select which state they would like to use. This state is then linked to the selected time interval.

This is the scheduler screen after a time and state have been selected. Note the expanded time view and the state preview to the right of the gray area. When the user "Inserts" the preview, the preview shows up on the top right location in the gray area under the selected time.

Task Performed

This task was certainly the most challenging of the HVAC tasks, asking that the user set the schedule for a day by choosing times and selecting a system state in order to set a 24 hour cycle. Note: This feature was not completely implemented in the first round of testing.

Data

Minimum time for scheduling a day: 1 minute, 45 seconds
Average time for scheduling a day: 4 minutes, 10.5 seconds
Maximum time for scheduling a day: 7 minutes, 45 seconds

Feedback

Most users had never before programmed a thermostat, so the learning curve on this portion of the HVAC application was a bit more steep. Generally, after a period of a few minutes, the test users figured out the workflow and were able to set the day. Feedback reflects this point, ranging from "I'm confused," before figuring out the system, to "That's not so bad," after exhibiting success.
A user noted, "I like being able to set different temperature settings for different times [of the day]."

Improvements

The biggest improvement the team can make is to finish implementing the functionality we desired. Even so, we received some feedback such as putting the two time pickers in the same dialog, and not attaching both to the main screen. We also will need to redesign or remove components that do not mesh with the final design, such as the white time interval indicator to the right of the gray area.
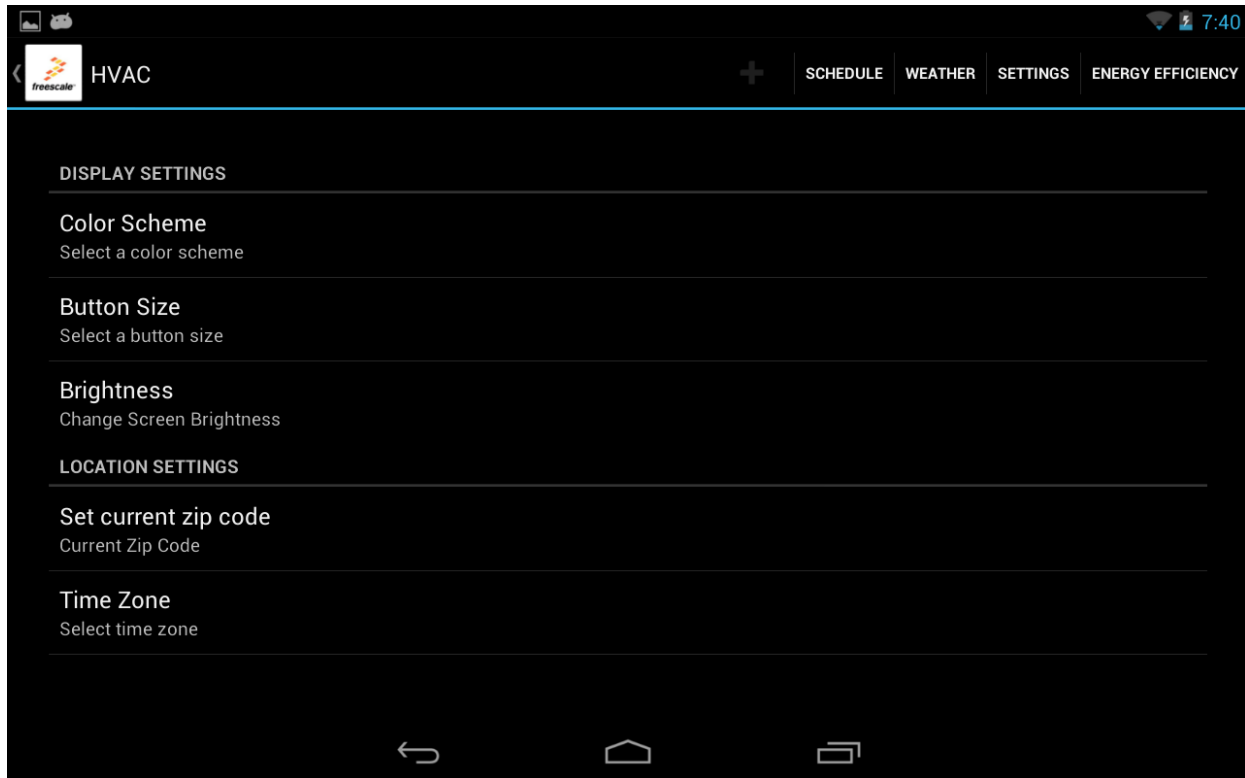
Energy Efficiency

The energy efficiency screen should allow user to view graphs that display their daily, weekly, monthly and yearly energy usage. However, during the time of testing, this module was nonfunctional.

Settings Menu

The settings screen allows users to change different settings for the HVAC device.

Task Performed

In the task associated with settings, the user was asked to change the current zip code to their hometown's zip code.

Data

Minimum time to change zip code: 10 seconds
Average time to change zip code: 29.25
Maximum time to change zip code: 1 minute

Feedback

"In the zipcode a number pad would be useful"

Improvements

Change the input keyboard to numeric keypad and highlight text to overwrite.

Task Performed

Finally, the user was asked to return to main screen and refresh the weather. This was to indicate that the zipcode had indeed changed and new weather information had been downloaded.

Data

Minimum time: 2 sec
Average time: 15 sec
Maximum time: 30 sec

Feedback

It generally was not clear to users that they could click the weather graphic to refresh the weather on the homescreen. Users ended up navigating to the Weather Forecast activity, which, for the purpose of the test, showed that the zipcode was properly changed.

Improvements

Add a refresh button to front page weather.