HomeSense

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Paper Prototype, Testing, and Refinement Report
CSE 440
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Roles

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Problem and Solution Overview

What do you do if you're the last one out of the house, almost late for work, but can't remember if you locked the back door? With typical houses, to check the current state of anything you have to physically walk to it, no matter how inconvenient that may be. To help save time and alleviate stress when you're in a pinch, we propose an application that allows users to quickly check the status of the house. HomeSense allows people to quickly determine the state of critical areas in their home, such as windows, doors, and appliances. This can allow people to check out an individual sensor or to ensure the entire house is locked down after everyone leaves. The information stored can be used to ensure that the state you left it in is maintained until you return home, saving time and keeping your mind at ease.

Paper Prototype Description, with Overview and Close-Ups

For our low-fidelity prototype, we created a rectangular frame that is about the size of an iPad screen and a set of removable paper screens, buttons and slide bars that can be easily attached to the screen depending on what the participants touch. (Figure 1) The main pieces of functionality include a ready button that the participants can check how many sensors are in the incorrect state and go over to switch them to the correct state. Also when participants touch different floors, different floor plans will appear on the screen during a testing session. (Figure 2) Information about individual sensor is displayed after participants press the sensors that they want to inspect. (Figure 3) These interactive elements allow our participants to have a feel of what it might be like to interact with the actual system.

The person who operates the paper prototype will place the screen associated with the button

that the participant presses on to the main screen. The person would change the bar at the left of the screen according to the mode the participant is in.
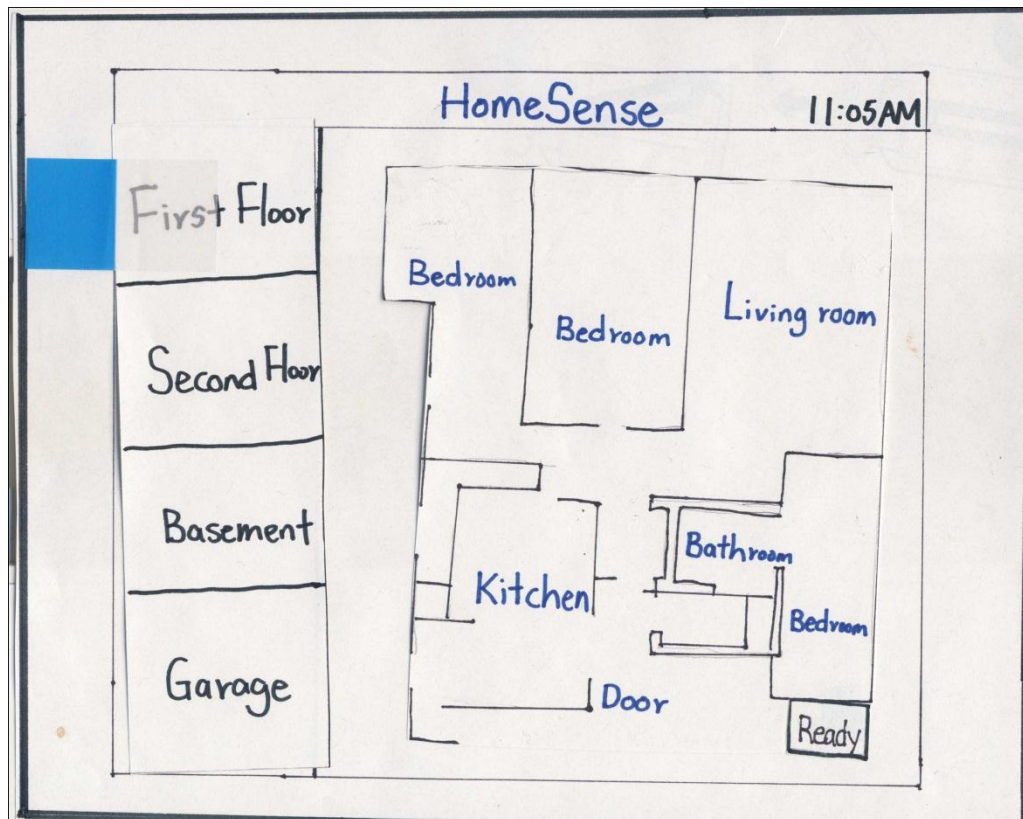

Figure 1
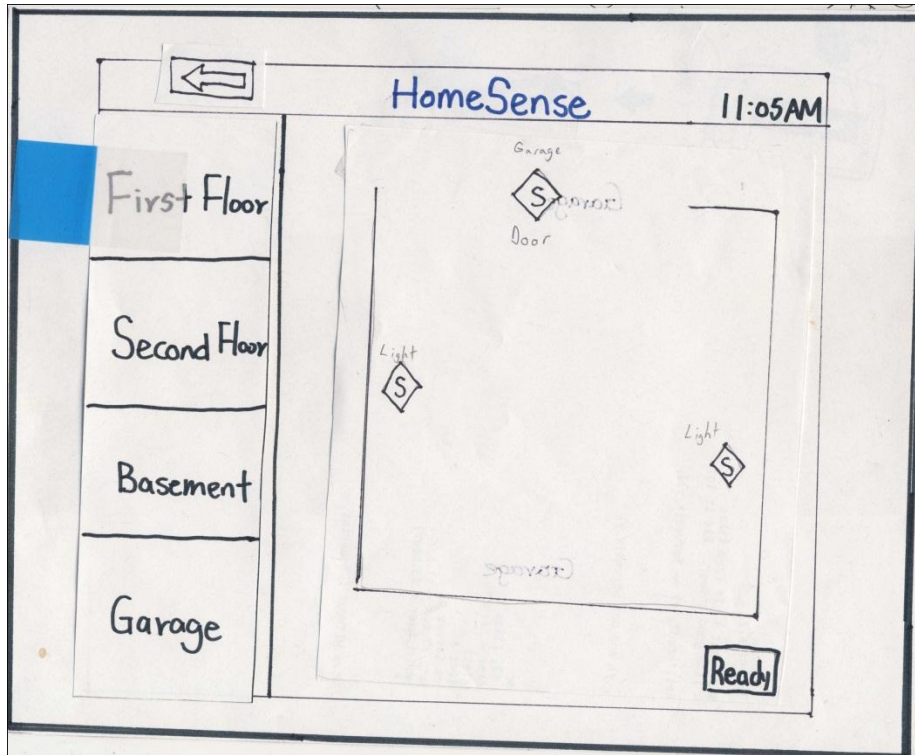Initial interface of the prototype, showing the first floor's floor plan

Figure 2
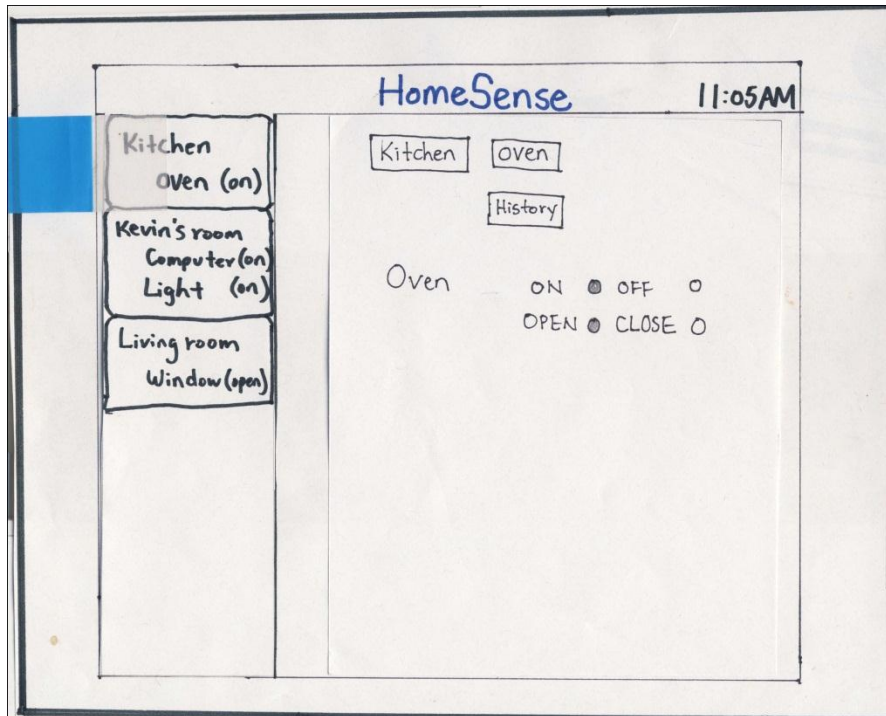Interface after the garage floor plan is select

Figure 3
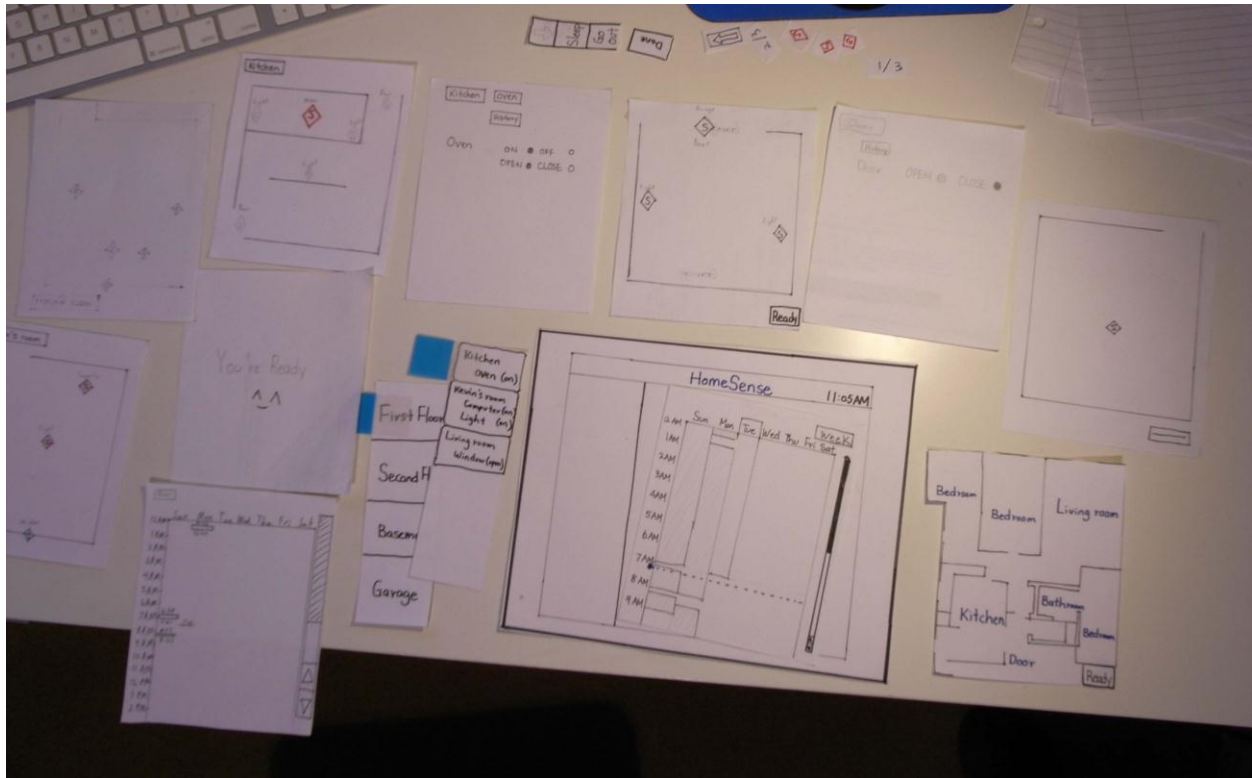Interface showing details for a specific sensor monitoring the oven

Figure 4
A photo of all pieces of the paper prototype

Testing Method

Participants

We recruited our three participants in the Suzzallo Cafe. Carol is an undergraduate living in an apartment with friends, Jason is a former UW student living in a house on his own, and Lydia is also an alumnus as well as a mother. They were chosen because they were available and willing to lend us their time, and they each had experience running or being partially responsible for a household. It was interesting that we got such a wide spread of housing situations in our participants, but our focus was more geared towards their reactions to the interface itself rather than their reception of the concept of a home monitoring device.

Environment

We carried out our testing in the Cafe, setting up the prototype on a table next to each of our participants in turn. The main screen of the interface was placed in front of them, with the rest held in an organized stack by our computer, ready to be swapped.

Tasks

As our tasks became implemented into our design, the lines between their levels of difficulty to achieve through our application started to blur, and so they shall just be referred to as tasks one, two, and three rather than the easy, medium, and difficult tasks. They are still ordered such that the earlier tasks are expected to be performed more often, and thus should be more readily available to the user than the subsequent tasks. As always, the tasks were presented to the testers as high-level goals to be achieved with the prototype in front of them.

First Task

Task number one asked our testers to identify any issues around the house that would need to be fixed before leaving. As this process starts with the "Ready" button on our application, the word "ready" was carefully avoided.

Second Task

Next, we directed our testers to determine whether or not the detached garage's door was open.

Third Task

Our final task asked our testers to figure out what time their imaginary child got home (presumably through the front door) the night before, given that today is Monday.

Procedure

Jared acted as our computer, running the prototype and answering any questions the tester had, while Austin observed and took notes on his laptop. We explained the concept of a paper prototype and stressed that we were testing the prototype, not them; and any difficulties they come across would be useful data for refining our interface and not a mistake on their part. We also emphasized that in order to fully understand their interaction with and reactions to our application, they should try to step through their thought processes out loud as they work through the system.

We had them treat the paper as a touch pad, with Jared changing screens or adding popup menus in response to their presses. If they pressed somewhere that wasn't actually a button or widget of any kind, we let them know that nothing happened. We used a blue sticky note to represent the selected item on the menu along the left side, and otherwise just laid each item over the main screen in its proper place.

Test Measures

As we tested, Austin paid special attention to the participants' comments, trying to record the important ones verbatim. These included everything from confusion at a particular button's behavior to mused suggestions of a better way to lay out the information. Additionally, we

tracked where the user deviated from the expected route to accomplishing the goal of the task or was otherwise hesitant about how to continue from a given point of our interface.

Testing Results

Given that each of our tasks focuses on exploring a separate part of the interface, it makes sense to discuss the results from each task across all users. The users' comments and responses to each task revealed some consistent issues with our design as well.

Each of our testers quickly noticed that the "Ready" button was important for the first task, and were able to follow the expected "Ready->To Leave" route through our application to bring up the issues with the house. Two tried – for various reasons – pressing the down arrow to close the Ready menu before actually pressing "To Leave", but they continued without difficulties.

The problem arose when our first tester was actually presented with the room-level view of the sensors distributed across the living room, and was confused as to the meaning of the diamond-encased S's scattered about. These were labeled with the type of device for the second two testers.

The second problem, common to most of the tasks but especially noticed in the first, was that our testers were unaware that the task was effectively complete once the required information was displayed. (In particular, the list of problem sensors along the left pane) Our first tester, for instance, started selecting the problem sensors in the graphical view to see what would happen.

The second task proceeded similarly: once the sensors were appropriately labeled, our users had no trouble navigating through "Garage->Door" to check the garage door. Once there, though, they hit a couple snags.

Each of them thought that this part of the application would actually give them control over the door, and they pressed the "Close" label as though it were an action button. This was due, they explained, to the simple fact that "Close" (and "Open", as Jason attempted) is an action verb, and for our purposes "Closed" would be much more appropriate.

And beyond that, one tester suggested, we could easily just make more use of all of the extra space on the screen to explain the button and labels a little more thoroughly. For example, a picture of an open door with the words "The door is open" to the side would fit comfortably in the given area, and would avoid any confusion as to the function of one-word labels. Two of our testers also suggested displaying the total hierarchy of the current item (i.e. "Kitchen->Oven" rather than "Oven", and "Garage->Door" rather than "Door"), perhaps across the top, so that they wouldn't have to remember from which room they reached the current "Door."

Our final task gave us some feedback on the calendar-esque design of the log, and the testers were not impressed. Displaying such close together events as the opening and subsequent closing of a door on a screen showing these events over an entire week resulted in too cramped of data. One tester suggested an option for looking at a particular day at a time for more precise determinations of state changes, while another suggested scrapping it for a text log (or at the very least a text log option) of the times of each state change.

Interface Revision Sketches
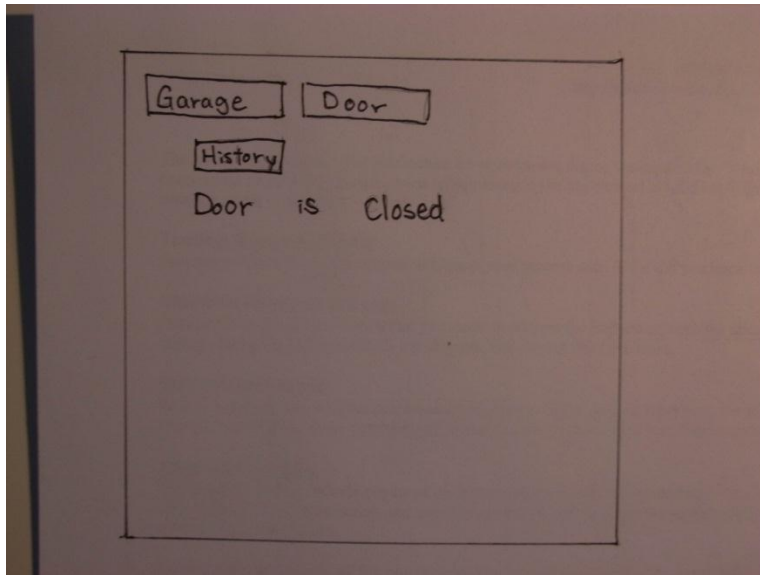
When viewing the status of a sensor, we've changed the interface to use a more wordy description. Instead of using radio buttons to show whether the door is open or not, we'll instead use a line of text "Door is Closed." The interface is large because it has to fit the entire floor plan, which leaves much unused space for the sensor details page. Sometimes participants were confused when looking at the history of front door because the actions (opening or closing the door) weren't clear enough. This is fixed by showed that "the door was closed at 11:00 pm."
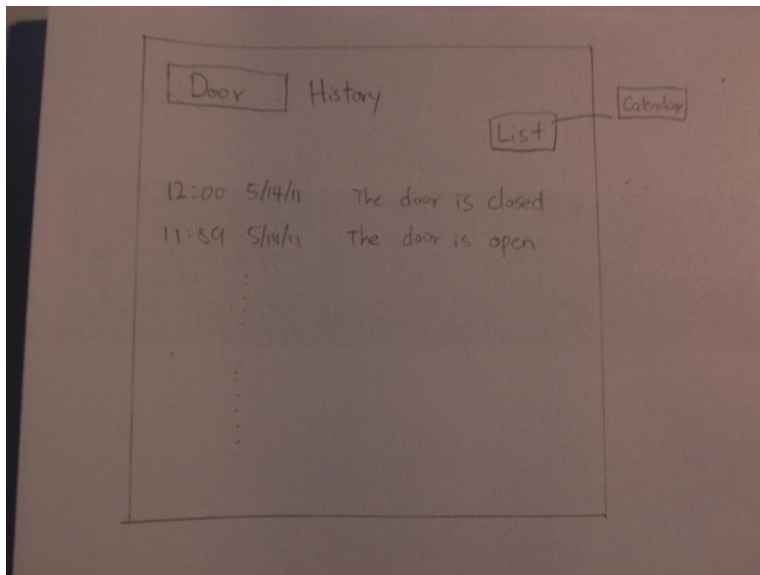
Being able to switch between a calendar and list view was something we realized was very important. Having a graphical calendar does help the participant quickly get an idea of roughly

when the state changed, but checking exactly when the door was last opened is accessible much faster using a list of recent state changes.

There are a number of minor changes that will be taken into consideration with further iterations of the prototype.

- The 'S' for each sensor on the floor plans are unnecessary and adds clutter to the floor plan.
- More labels at the top of each screen, including "Kitchen->Oven" and "Garage->Door", etc.
- Consistent depth of sensors
- Easily accessible back button on ALL screens.
- Remove forward and back arrows, and the ⅓, ⅔ indicator.

Summary of Discussion and Lessons Learned

Getting our design in front of people who were outside of our team proved to be a valuable step for developing our interface. As a team, we handle so many questions pertaining to our overall design that some small details easily escape us. Finding fresh sets of eyes in front of which to place our prototype clearly highlights the overlooked details.

One lesson we learned is about how the interface can define the system for the users. The choices that we made when displaying information had implicit clues to the functionality of the system. For example, our prototype used radio buttons to indicate whether a door is open. This apparently suggested to users that our system could directly modify the state of the house. One real reaction by our team was the consideration of redefining the system. It became clear, though, that it was the interface itself that was "lying", in a sense, to our users. Changing the way that we display our feedback to the user makes the capabilities and limitations of the system more clear.

We also learned that we have to make choices as a team regarding which user suggestions would be implemented in the design and which we were not going to be supported. One example of this is the format of our log information for individual sensors. Some early feedback led us to display the history for a sensor in a graphical schedule. However, the feedback in this round suggested instead that we display it in text form. Since the feedback was conflicting, we made a choice as a team.

Overall, we found that this was an invaluable part of the process for developing an interface. It makes sense, of course, that the interface should be informed by observations of actual users

interacting with it. However, being involved in the process and hearing the feedback on one's own designs brings the abstract into a more meaningful perspective.

Appendices

Forms Handed Out to Participants

Verbal Introduction, along the lines of: "Thanks for volunteering to test our project prototype, we hope to not take too much of your time. We will be presenting you with a paper prototype, a simple paper version of our design thus far, and asking you to perform three tasks relevant to its use. You'll treat the paper as a touchscreen, and my partner will change the screens in response to your presses as I observe and take notes. If at any time you become frustrated, feel free to ask questions, and know that this indicates a failure in our design, not in you. For testing purposes we'd like to encourage you to think out loud as you complete the tests, and remember that testing is entirely voluntary."

Raw Data

Person 1 – Carol

Task 1
Poked the down arrow on the ready menu because she didn't know what it meant
Clicked on the labels to turn the oven off. Maybe we need to make it an action thing, actually changing the state (in safe ways) of items around the house.
KEEP THE DETAILED SCREEN
S's are really non-detailed.
LABEL THE S'S!!
Text warnings along the side are sufficient, she says, the rest is just distracting.

Task 2
Clicked on the other floors before garage, apparently exploring.
"I don't know what the S's mean, but I'm going to press the one by the big opening since that looks like the door."
Clicked on "Open" and "Close" to see what would happen; change these words
Was able to read and understand that it was closed

Task 3
Was surprised that "Door", meaning the front door, was on the same hierarchical level as all of the rooms, and sort of expected clicking on it to bring her to a front entryway view.
"The front door screen looks just like the garage door screen, there should be some way to differentiate between them, some indication that I'm looking at the front door, back door, garage door, or kid's door, etc."

Person 2 – Jason

Task 1

Complained about the architecture.
SAY CLOSED, not CLOSE.
Clicked on random things to test the limits of the prototype
"House needs a bathroom"
Said that he would go fix the first error, and asked what happened; need to define behavior in this case.

Task 2

They really want the application to change stuff.
Wants it to detect other things in the house, like water filling up the basement.
Too much whitespace, "you can afford to use more words to present your information"
Did fine w/ task 2

Task 3

Figured it out
All screens should be labeled
Things should scroll
Prototype is incomplete
Maybe a more day-specific view

Person 3 – Lydia

Task 1

"Is this a button?" (@ the Ready button)
Pressing the ready button
Oven is on.
!!!Can see that all those things are on.
Read them right off the bat.
Can I use the buttons on the side to resolve the issues?
Didn't really use the graphical representation.

Task 2

Got to garage, clicked ready button instead of door
Once she noticed the menu pop back up, she closed it and clicked on the door
"Change that to 'closed' instead of 'close'."
Understood the data.
It's a big screen, use more of the space.
Maybe have the history pop up a menu, with the last few things.
Is better than going back so many times.

Task 3

"I'm expecting from what I saw before that if I hit 'door' here, I'm gonna see history."

Clicked straight on history.

"Instead of 'now', use 'you are here'" (joke)

Didn't notice the scroll bar, thought from a glance that the full days were displayed.

Was able to tell that the door was opened shortly after midnight.

->"Maybe have a list option for the history?"

In-testing revisions of the prototype

Added a back button.

Affixed the labels for the error selections.

Eventually added labels to the S's.

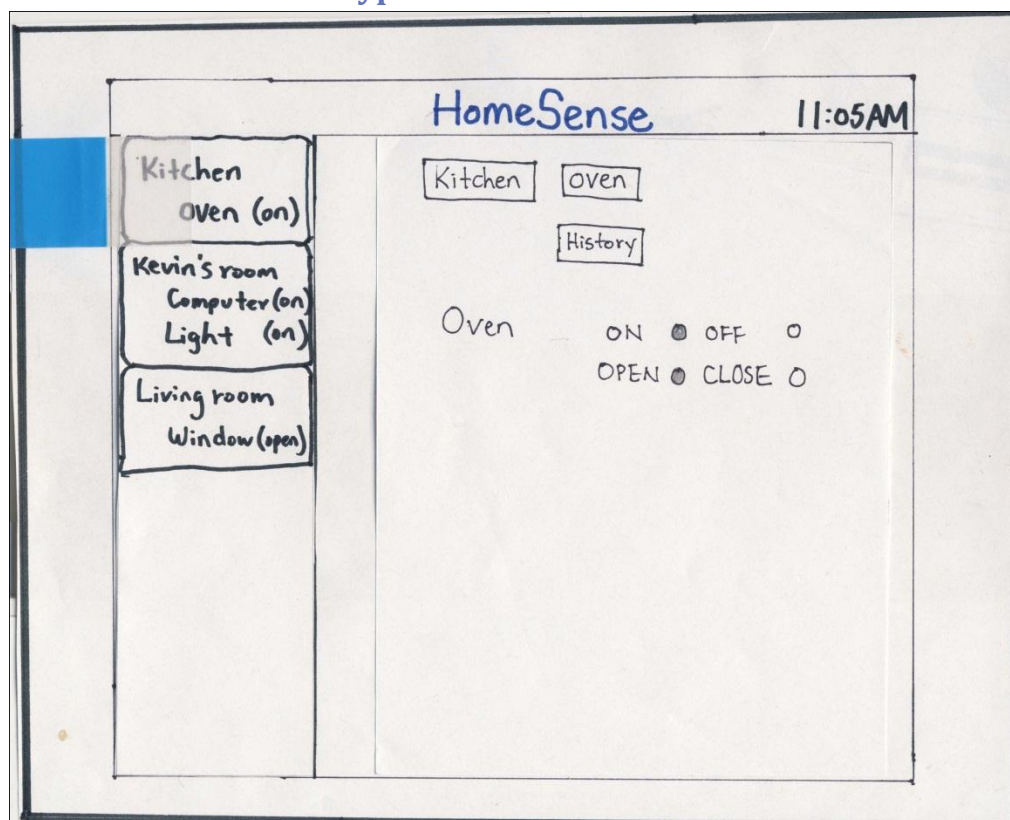Fixed the history display to intended design.

Additional Sketches of Prototype

Figure 5

When checking if the house is ready to leave, the left pane shows a list of items in the house not ready and why they aren't ready. Here, the right pane shows the state of the oven, which is on and open which is inconsistent with the ready state.
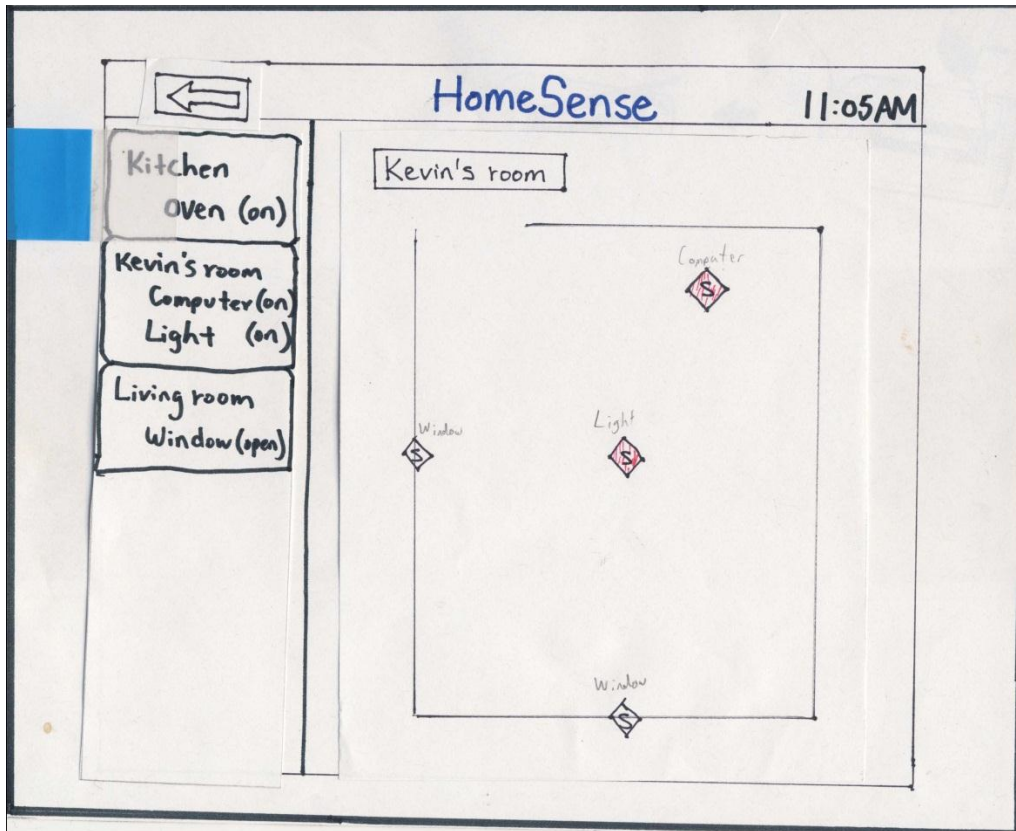
Figure 6
Kevin's room has two items that aren't ready for the participant to leave the house. After selected Kevin's room from the left pane, the room's layout is shown in the right pane and any items not ready are highlighted in red. Selecting those items brings you to an interface similar to Figure 5.
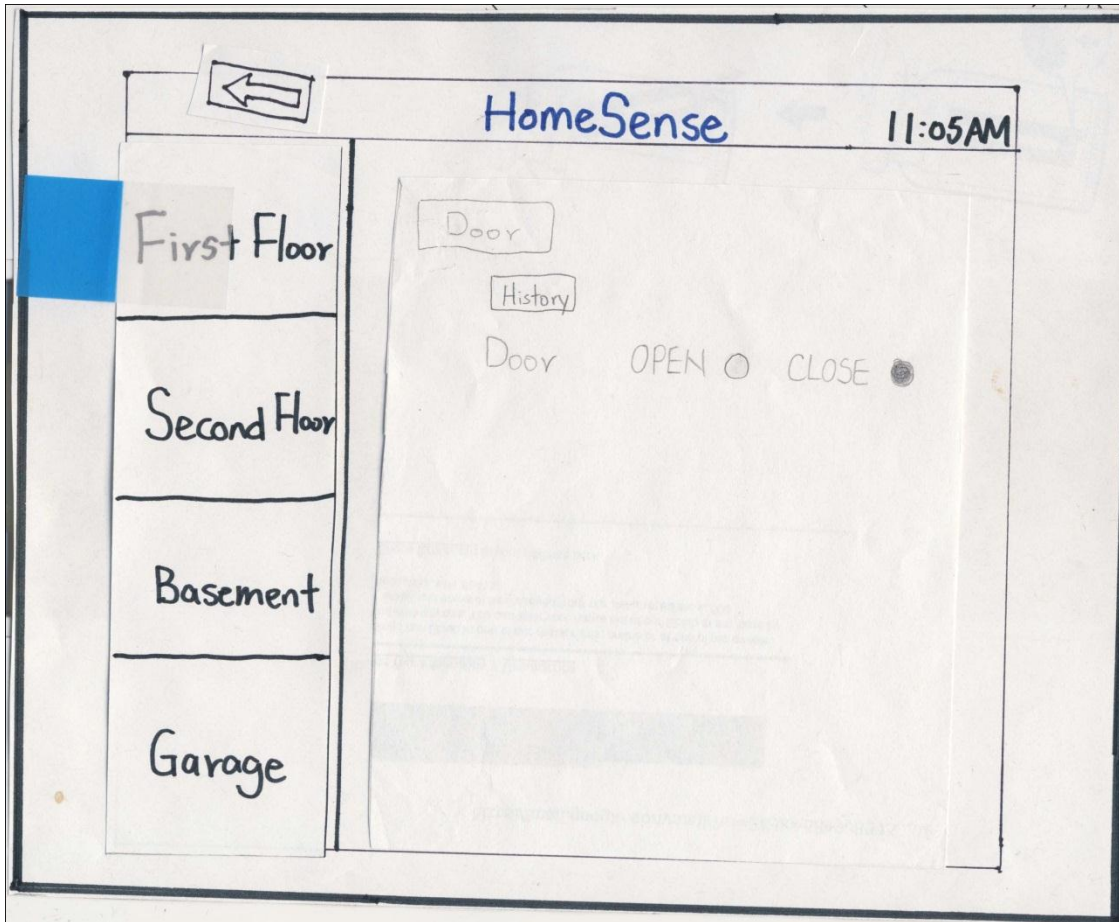
Figure 7
When inspecting a particular item, the interface shows the current state of the sensor. Viewing the history of the sensor is button available on this screen.
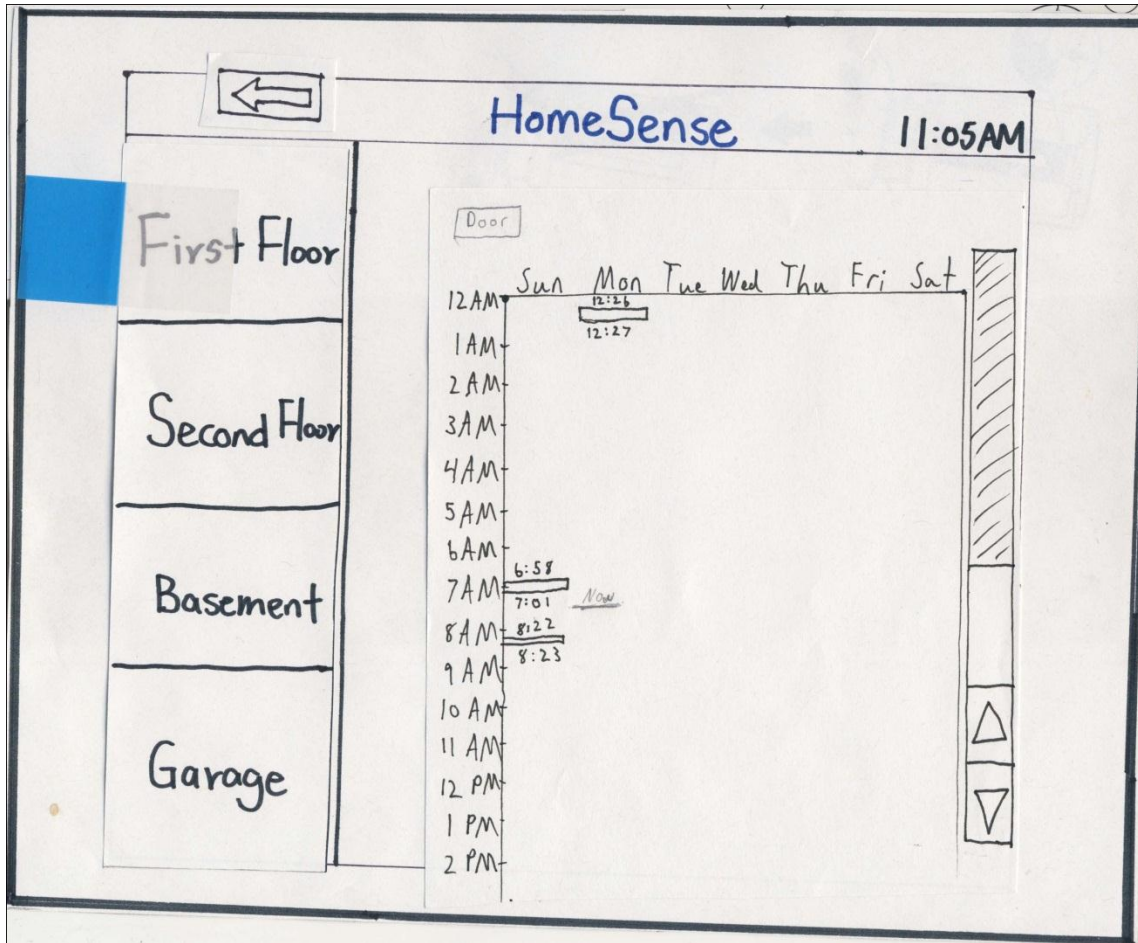
Figure 8
A sensor's history is shown using a graphical calendar. Changes in the state are labeled using the time of the change.
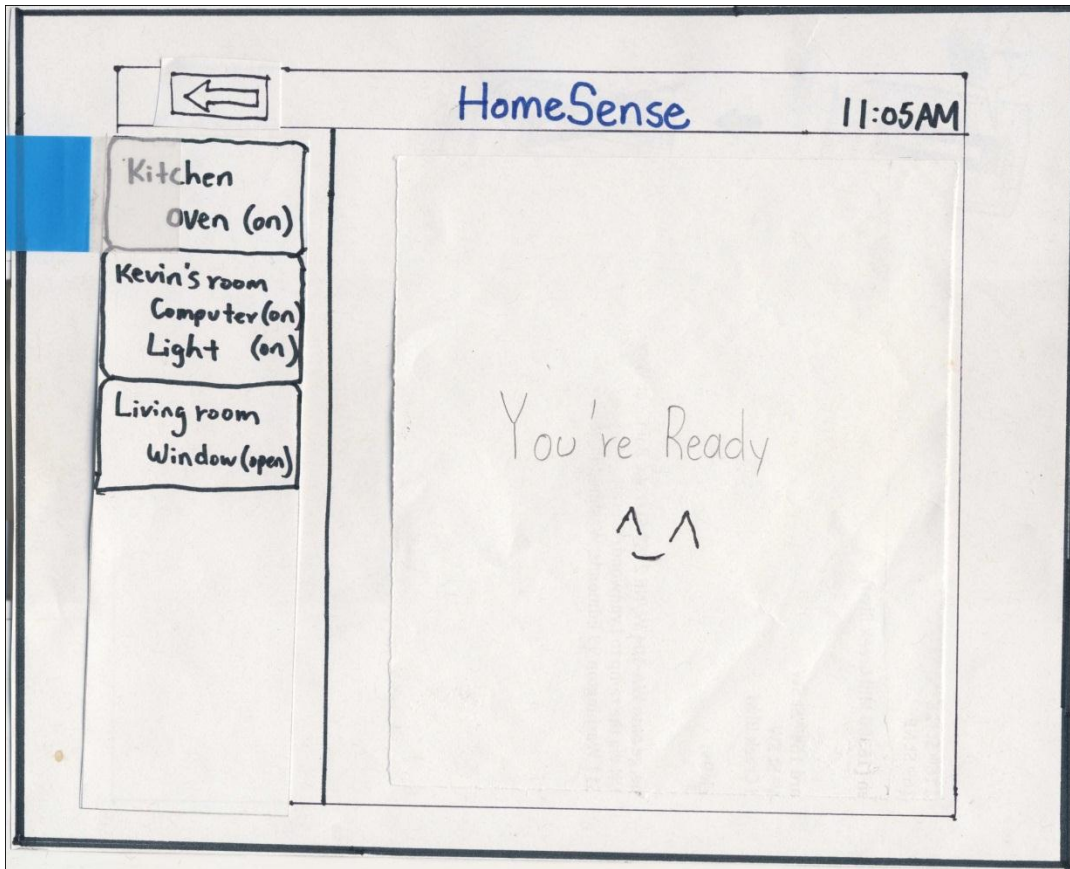
Figure 9
If your house is ready for you to leave, then checking if it's ready gives you this delightful screen.