HomeSense

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Task Analysis and Design Sketches

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, if you want to check the current state of anything you have to physically walk to it, no matter how inconvenient or far away it may be. To help save and alleviate stress time when you're in a pinch, we propose an application that allows users to quickly check the status of the house. These sensors can be more accurate than checking windows by eye across a room, giving you accurate data about your entire house all at once. This can let parents to make sure their children are actually asleep at night, and ensure the house is locked down when everyone left. The information stored can be used to ensure that state you left it in is maintained until you return home, which saves time and can keep your mind at ease.

Task Analysis Questions

1. Who is going to use the system?

The system can be setup in any house or apartment. It is targeted primarily toward homeowners, although anyone in the household can use the system. It's not supposed to be an alternative to a home security system, so houses with or without an security system will benefit from our product. Customers need not have any technical background, but they may have used a cell phone before. The product may be used by someone of almost any age or height.

2. What tasks do they now perform?

Before last person leaves the house, she checks to make sure the house is ready to be unoccupied. Specifics vary by family and person, but she will typically check doors, windows, lights or appliances to make sure they're all locked or off. Another task performed is checking whether or not a child has gone to sleep yet. This requires a parent to go to outside the child's bedroom and check if the lights, computer and TV are off. The idea is that a child will most likely be asleep if all lights and electronics are off at night because there's nothing to keep him awake.

3. What tasks are desired?

Some of the desired tasks are the same as ones already performed, such as checking the state of the house. However, the performing the desired tasks is quicker and takes less effort. This is automation is achieved with the use of a smart house sensing its current state. Another desired task is the ability to check the history of the house's state. Such tasks cannot be performed if no one is awake or present to observe the event.

4. How are the tasks learned?

Because the target audience will be the general public with no technical knowledge, little or no training will be necessary to operate the application. We are assuming that the sensors are already setup throughout the house and those certain settings are already programmed (for example, specifically what should be checked before the customer leaves the house). When a home security system is installed they demo the product for the family or business, a similar approach might be useful in our setting.

5. Where are the tasks performed?

The tasks are performed in a house, usually at night or as the customer leave the house. The customer leaving the house might be in a hurry if they are running late, and might have their hands full if they are taking something or eating/drinking something on their way out the door. It's also likely that it will be dark because the customer has already turned off the lights. When checking the system at night, the customer will be less likely to be in a hurry or to be carrying things, but it will more likely be dark. Anyone with direct access to the system in the house should have access to checking the house's status. Certain event logs might be confidential.

6. What's the relationship between customer & data?

In some cases, the data may be personal information that the customer wouldn't want disclosed. For example, the customer may not want people to know how late she gets home or how early she leaves this house. It is very likely she wouldn't want anyone outside the house to have access to that information. The customer might want to keep some logs private from their

children, so access to logs might be restricted. There may be multiple panels or interfaces to the system, which could be used concurrently by multiple people. Data could be accessed remotely to check the event logs while the customer is away.

7. What other tools does the customer have?

Computer, cell phone, consoles. A general home security system is the closest existing system to ours, but HomeSense is intended as a means of easing the collection of information, not protecting the house from intruders. Some of the information currently gathered by our system is not actual accessible to the user through any existing tool, while gathering some of the information requires the user to physically search the house; in these senses, Homesense is satisfying a previously unsatisfied need.

8. How do customers communicate with each other?

Family members can communicate the information obtained through the system with each other, but there's no need for the users of systems in different households to communicate this information. In fact, such sharing of household information outside of the household could be a security problem. Information about when a house it typically unoccupied might be accidentally revealed to a third party by younger members, so some people might need access restrictions.

9. How often are the tasks performed?

It heavily depends on the task. Checking the house before leaving or sleeping is a daily task, while checking to see if a child broke curfew might be performed less often. The tasks performed most often will be typically be done by the head-of-household, the members with the most access to the system and the more knowledgeable members of the household.

10. What are the time constraints on the tasks?

When checking if ready to leave home, customer might be in a rush to get out of house. Seeing if kid's lights/TV off maybe less rushed. Checking if son broke curfew, not really rushed at all. When the customer checks the state of the house, it's unlikely for them to also check the history of the house or to perform another task because checking the ready state of the house should be done just before the customer leaves the house or goes to bed.

11. What happens when things go wrong?

If the whole system fails, the user can perform most tasks manually by just checking the state of the house herself. Checking logs can be replaced by being there to see when the even happened if knowing if or when something happens is necessary.

Current Version of Tasks

Easy Task – Checking if the house is ready for you to leave

Jeffrey is 26 and living alone, and he's ready to go to his first day at his new job. As he's about to begin his walk to the bus stop, he realizes that he doesn't quite remember whether or not he turned the stove off after scrambling his eggs for breakfast. He also needs to make sure that he locked the back door after letting his dog in earlier. He's reasonably confident that he closed his bedroom window the night before, but he wants to be sure. Jeffrey doesn't want to be late for the bus, but he needs to secure his house before heading out.

Moderate Task – Checking if garage door is open

Homeowners Fred and Melissa returned home from Walmart at midnight when it started to rain. They parked in the detached garage and hustled to get all the bags into the house because it started to pour heavily. After bringing all their low-cost groceries and goods in the house, Melissa realized she didn't close the garage door and Fred can't remember if he closed it either. It's pitch black and wet outside and neither wants to go outside to check because the door isn't visible from any house window.

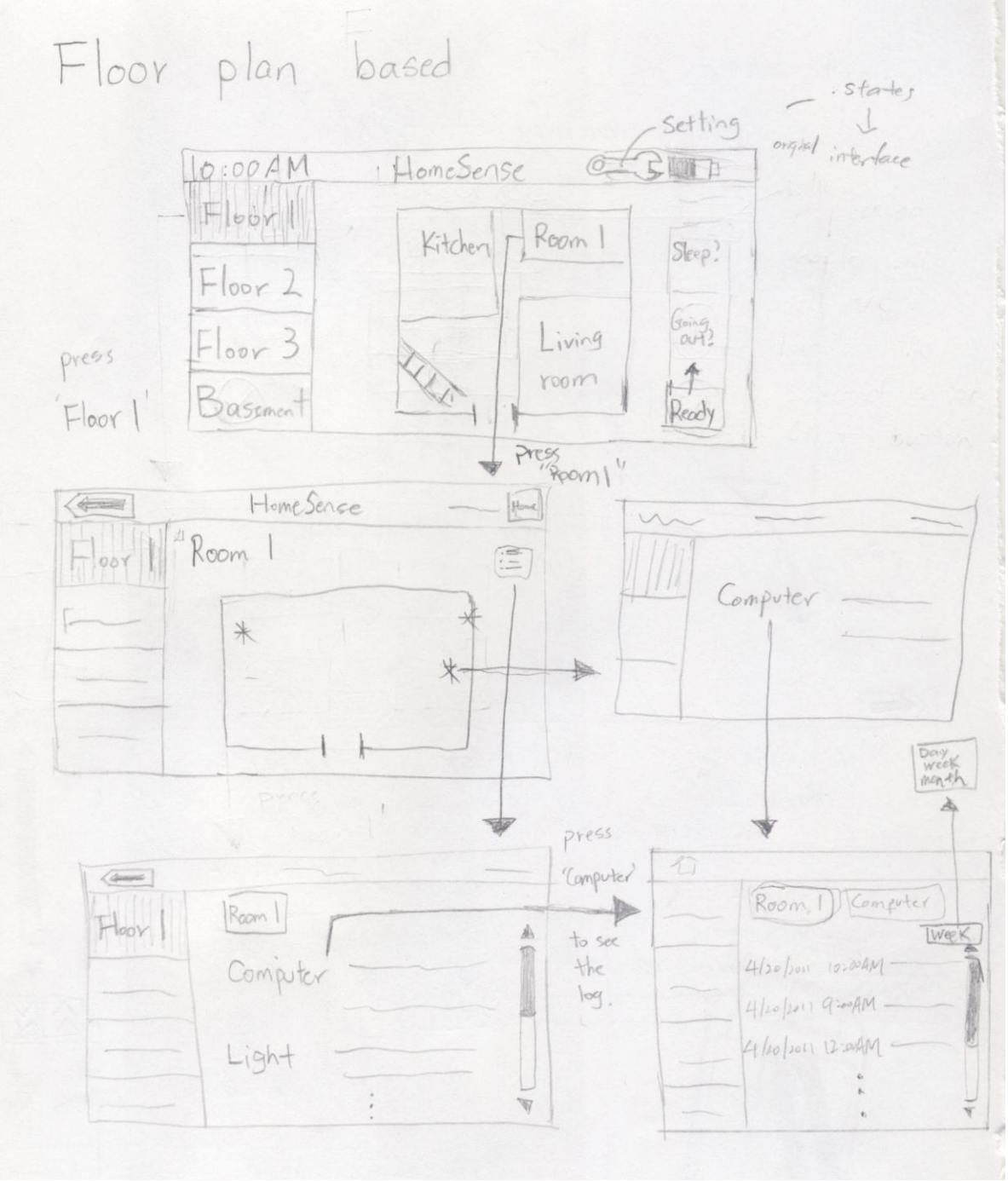
Difficult Task – Checking overnight logged events

Catherine is a single mother of two teenage boys, and her eldest son Jerry is going to a party at a friend's house this Friday evening. Jerry has always been well behaved, and his grades have been stellar recently, so she decides to allow him to stay out as late as 2AM. However, her younger son has an early morning soccer game Saturday morning. Catherine needs to figure out how to make sure that Jerry gets back safely and on time, while preferably getting enough sleep to drive to the soccer game.

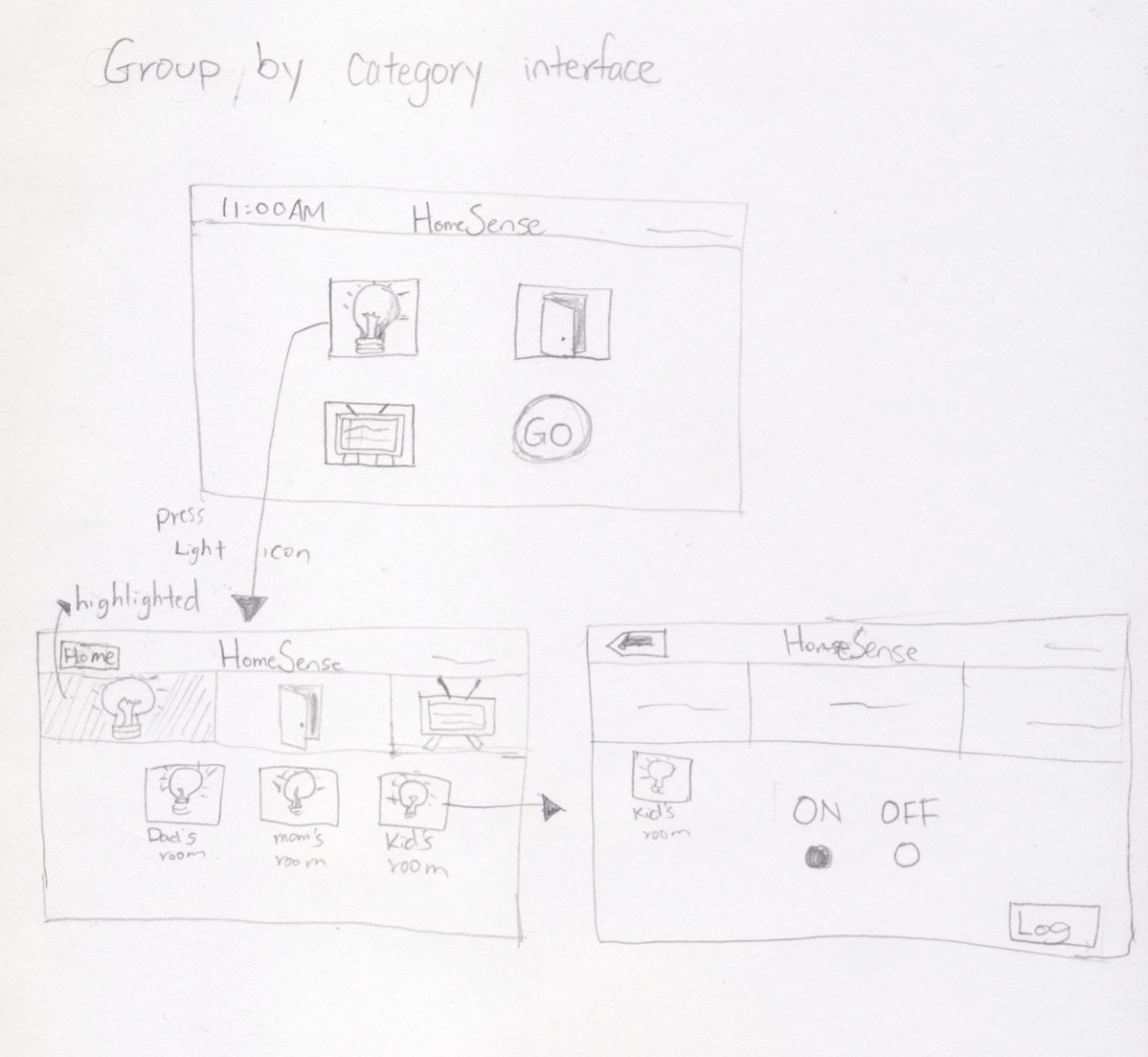
Storyboards for Three Interface Designs

These designs reflect some refined versions of the potential designs we considered. Not all intermediate designs are illustrated and the selected design is somewhat of a mix of the best ideas, but mostly coming from the floor-plan based design.

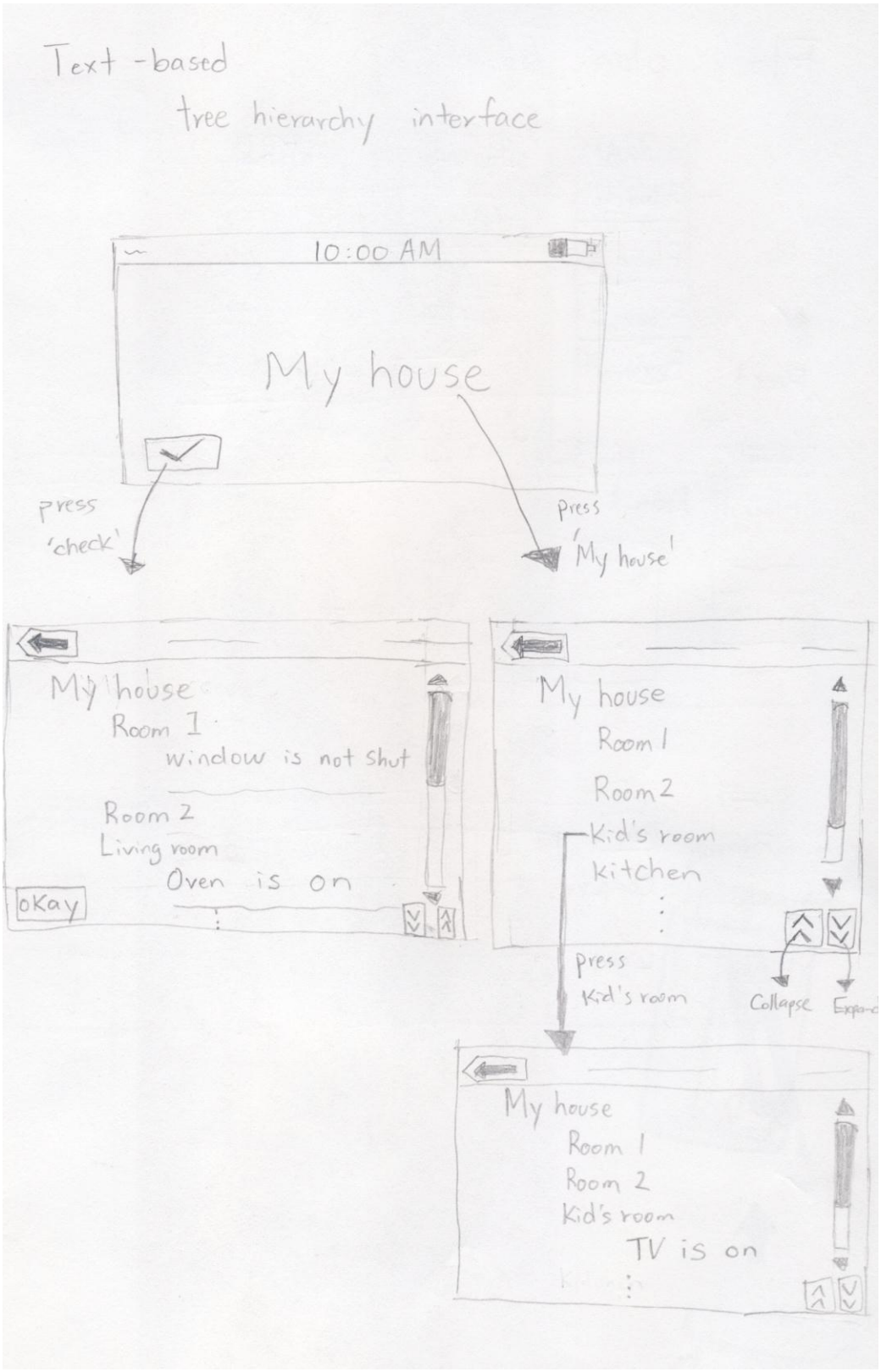
Floor-Plan Based Design



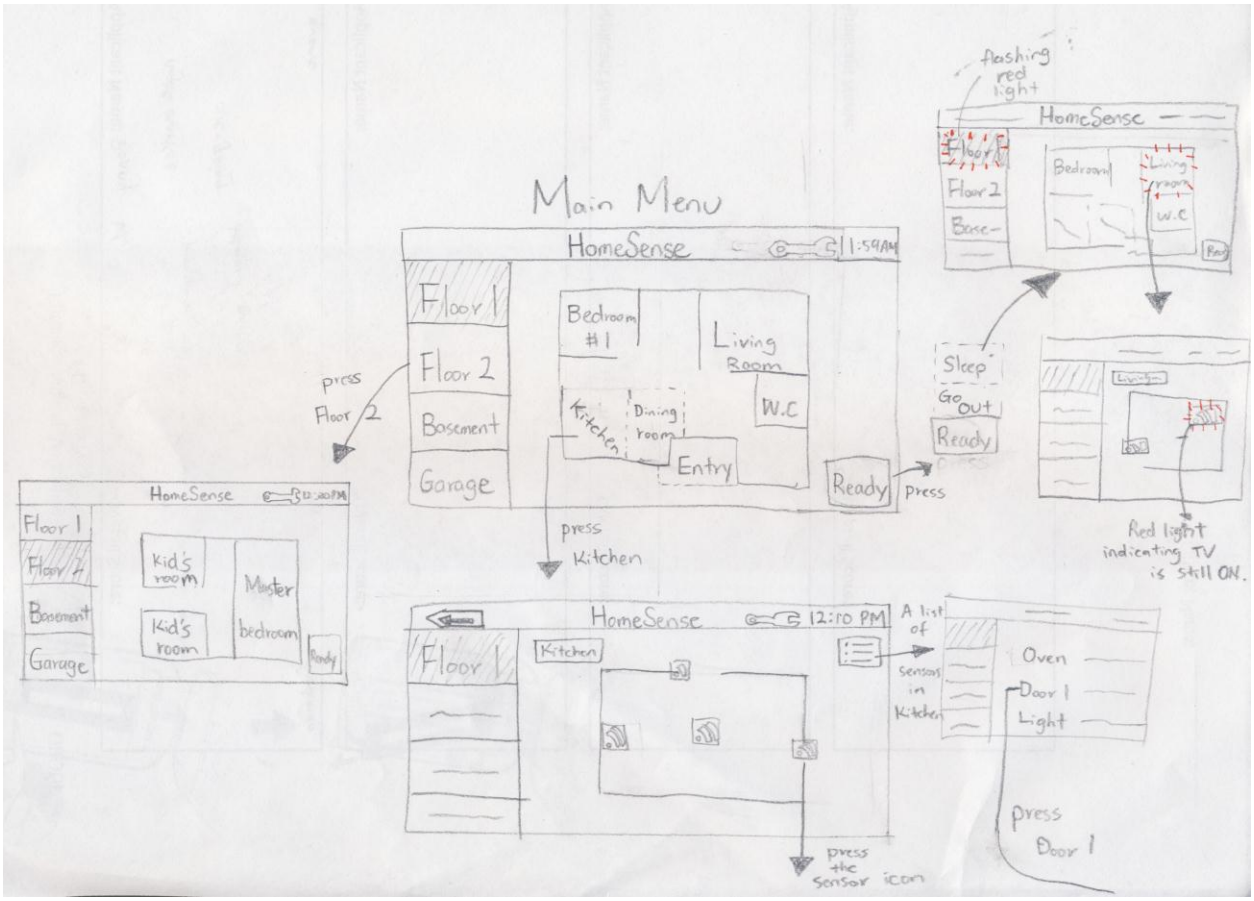
Group by Category Design

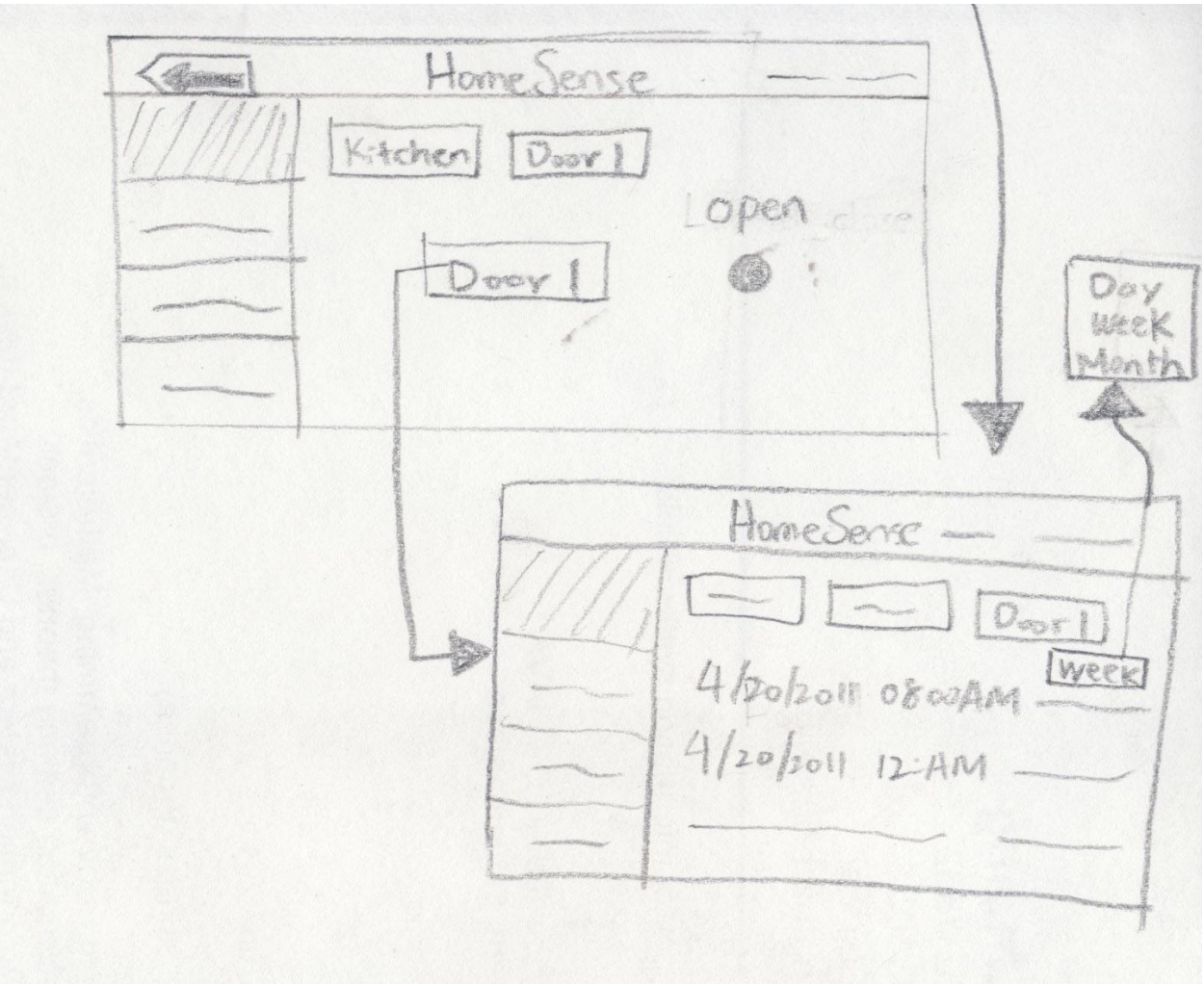


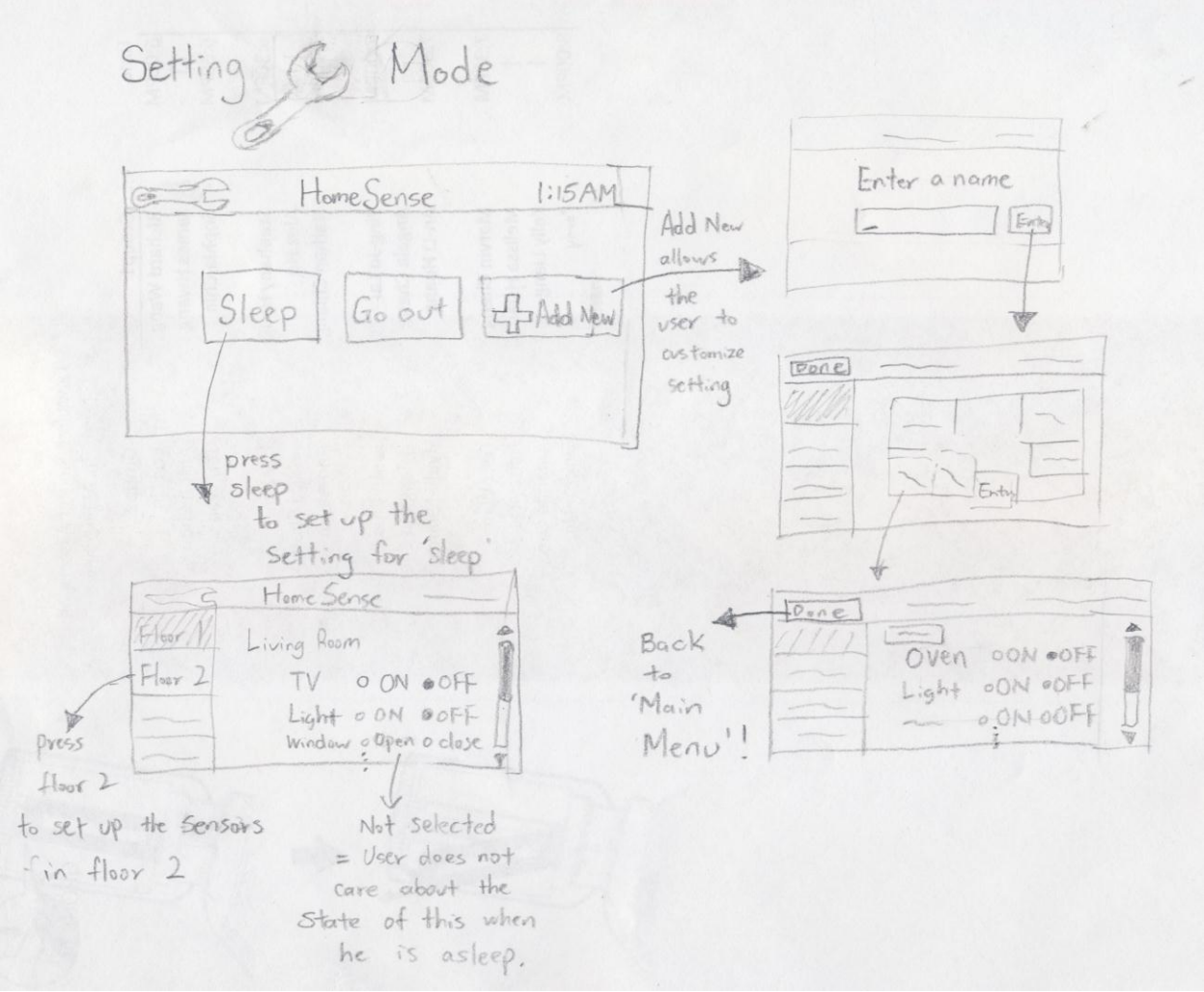
Text-Based Design



Design Hybrid (Selected)




HomeSense
Kitchen
Door 1
open
Door 1
Day
Week
Month
HomeSense
Door 1
Week
4/20/2011 08:00AM
4/20/2011 12:AM


Setting Mode
HomeSense
1:15AM
Sleep
Go out
Add New
Add New allows the user to customize setting
Enter a name
Entry
Done
press sleep to set up the setting for 'sleep'
HomeSense
Floor 1
Floor 2
Living Room
TV ○ ON ● OFF
Light ○ ON ● OFF
Window ○ Open ○ close
press floor 2 to set up the sensors in floor 2
Not selected = User does not care about the State of this when he is asleep.
Back to 'Main Menu'!
Oven ○ ON ● OFF
Light ○ ON ○ OFF
○ ON ○ OFF

Selected Interface Design

Which Design and Reasoning for Choice

We decided to continue development on the floor-plan-based interface. We liked that it provided a clear, graphical indication of problem areas in the house. This organization allows the user to inspect his entire house, a single room, or a single sensor with only the level of granularity that he desires. We've also decided to pull in aspects of the other two designs that we feel are beneficial for our design choice, such as the sensor category icons and the text-based log. In this way, we've ended up with a hybrid of all three of our designs.

The text-based interface ended up looking like a screen of text, which is not only unsightly, but would take too long to figure out what needs to be checked before leaving the house. Further, the text-based design was too focused on displaying the state of the house, and it was difficult to work in the other tasks for the system like checking if the children are ready to go to sleep. Conversely, those tasks worked very well with the floor-plan design because some tasks were room-centric and the display simply needs to show the room. The floor-plan-centric design is able to leave certain details ambiguous at a certain scale, whereas the other designs required the state of the house to be spelled out. It's like looking at a map of the United States on Google Maps, you don't need to see every city name until you zoom in close enough, and the floor-plan-based design gave us that flexibility that other designs could not.

Ultimately, the deciding factor was the ease of use that the graphical design gave us. Most people respond better to pictures of what they're looking for than a text description of it. Seeing that the kitchen is blinking with a light bulb icon, you can guess that the light is left on in the kitchen when it shouldn't be. This a lot easier to infer than having to a read a line of text, which could be just one line of text among dozens on a screen.

Functionality Summary

When checking if the house is in a ready state (i.e. ready for nighttime) the interface shows you at a glance which floors aren't ready, which rooms aren't ready, and which items in the particular room aren't ready. You can define the ready states or create new ones from the settings menu. You can check the current state of any monitored item by selected its floor and room, then selecting the item from the floor-plan. From there, you can pull up the current state of the item, or the event log of that item.

The system is only used for information retrieval. It would be interesting to work with a system that could also change the state of the house, but that would end up being a completely different project, and would end up being a remote control for the house. This system is a passive tool to help the household without significantly changing the way it does daily tasks.

Interface Description

Main Menu

The HomeSense interface starts at the Main Menu, which is shown and labeled in the center of the main sketch. A list of the floors in the house is displayed on the right and the floor-plan of the currently selected floor is displayed in the center of the screen. Determining the current state of the house is accomplished by pushing the "Ready" button in the lower-right-hand corner. After pushing this button, various user-chosen and -specified reasons for checking the state of the house appear (such as leaving, or sleeping).

Checking Ready State

After a reason is chosen, the interface will display the same view as the Main Menu except that any floors or rooms that have issues in them will be highlighted. In both this highlighted view and before any ready state is inquired after, individual rooms can be clicked for a closer up view of the sensors in that room. In the room view, each of the sensors can be clicked to pull up the activity log for that sensor. The room view defaults to a graphical layout of the room, but can also be viewed in list mode by clicking the list icon in the upper-right-hand corner of that screen.

Checking Current State and Viewing a Item Event Logs

From the Main Menu, pushing any floor from the left column will pull up the floor-plan for that floor. Pushing any room will pull up a detailed picture of that room. Monitored items from that room can be selected which brings up a screen showing the item's current state (such as locked, closed, on, off) and a list of the most recent events recorded for that item. It shows a list of what the state was changed to and when.

System Settings

Lastly, the system settings can be modified by clicking on the wrench icon in the Main Menu. Here users see the set of states that they are tracking. A user can click on an existing state to view and change the current list of sensors being tracked for that mode. Alternatively, a user can decide to add a new state to track. This involves entering a name for the new state and then choosing the sensors to track following a similar navigation to inspecting room sensors.

Three Scenarios Corresponding to Your Tasks

Checking the House

Jeffrey is 26 and living alone, and he's ready to go to his first day at his new job. As he's about to begin his walk to the bus stop, he realizes that he doesn't quite remember whether or not he turned the stove off after scrambling his eggs for breakfast. He also needs to make sure that he locked the back door after letting his dog in earlier. He's reasonably confident that he closed his bedroom window the night before, but he wants to be sure. Jeffrey doesn't want to be late for the bus, but he needs to secure his house before heading out. He presses the "Ready" button and then the "Go Out" option on the HomeSense console by the front door, and the display of his house's floor plan highlights his bedroom window and bathroom light, indicating that those two items are the only ones amiss. Jeffrey quickly steps back inside to close the window and flip the light switch, then hurries off to his bus with the knowledge that the rest of the house is secure.

Checking a Particular Item

Homeowners Fred and Melissa returned home from Walmart at midnight when it started to rain. They parked in the detached garage and hustled to get all the bags into the house because it started to pour heavily. After bringing all their low-cost groceries and goods in the house, Melissa realized she didn't close the garage door and Fred can't remember if he closed it either. It's pitch black and wet outside and the door isn't visible from any house window, but neither wants to go outside to check. Melissa goes to the HomeSense console and taps on the menu for the "Garage" floor. A floor plan of the garage appears, and she taps on the area corresponding to the garage door, bringing her to a screen that tells her that the door is indeed closed. The couple can sleep soundly without having to face the rain again.

Checking the Log

Catherine is a single mother of two teenage boys, and her eldest son Jerry is going to a party at a friend's house this Friday evening. Jerry has always been well behaved, so she decides to allow him to stay out as late as 2AM. However, her younger son has an early morning soccer game Saturday morning. When she wakes up early the next morning, she goes to the HomeSense console and taps on the front door of the floor plan, then presses the "Log" icon, which brings her to a list of the recent state changes of the door. She notes that the front door was opened at 1:23 AM and closed at 1:24 AM, and heads off to the game without having to wake Jerry up.