

CS6750 M3

Ryan Mahan
rmahan6@gatech.edu

Abstract—When it comes to home maintenance, keeping track of what needs to be done when is difficult. There's usually multiple maintenance tasks per appliance and they all need to be completed on different cadences. It's important that maintenance is completed but it is often forgotten. This leads to higher home maintenance costs and inefficient appliances. Through improving the interface for remembering to perform maintenance, we can increase appliance lifespans and reduce energy costs for homeowners. We can improve our users lives by providing a mobile solution that organizes and notifies home owners when it is time to perform maintenance.

1 BRAINSTORMING PLAN

At my work we do an activity called “Crazy 8s” for brainstorming. This activity is similar to the lecture’s brainstorming activity. The goal of the activity is that everyone involved individually brainstorms 8 ideas, one per minute, for whatever problem we’re trying to solve. Usually we come up with a few good ideas and a lot of bad ideas. I’ll spend 8 minutes, generating and thinking about a single idea each minute. I find that assigning one minute per idea places a lot of pressure to generate an idea, and produces a varying set of ideas. By the end, I’ll have 8 ideas that should vary widely. Then I can take those ideas and work through them to combine and create a few alternatives I can focus on.

2 BRAINSTORMING EXECUTION

2.1 Results

2.1.1 *Crazy 8s*

Each top level bullet is a one-minute chunk, subsequent bullets are additions or clarifications added within that minute. I brainstormed in this document, so these are the raw notes from that session.

- Mobile app that uses system notifications to tell the user when maintenance needs to be done
- Can track different tasks and appliances in the app

- Can see upcoming tasks in app
- Could use bluetooth headsets to have audio guides for tasks
- Can hook into the phones calendar and contacts to organize when and who to call for maintenance the user can't perform
- Augmented reality: lets the user put on glasses and walk through their home, with an overlay of what needs to be done when
 - Strong physical connection between where a task needs to take place
 - Could use AR to guide users through tasks
 - Tech isn't really there yet
 - Users may not walk around their whole house and forget tasks
 - AR notification systems dont exist, but would be difficult to ignore reminders so people wouldn't forget their tasks.
- VR: Similar to the AR idea, but more virtual
 - Could have users practice and learn certain tasks in VR that they've never done before and are nervous to attempt
 - Could better list and have users "fly" around their house seeing all the different tasks need to be done where
 - Users may not put on their headset just to check in on tasks
- Integrate into smart home tech
 - Users are adopting smart home tech like smart fridges and smarter house furnaces
 - We could integrate better sensors into the appliances so we can avoid maintenance costs when they're not necessary and could predict maintenance before it is needed.
 - Users could receive push notifications on their phone via email or text still
 - New appliances could have this + being easily serviceable as a selling point
- Watch extension of mobile app
 - add a step by step guide like a recipe that people can follow on their watch
 - extend notifications to the watch
 - text only interface because of size
- Email, text, in app reminders
 - include some links to where to purchase different tools
 - what tools might be needed
 - other tasks they can do alongside it
 - Convey the importance of the maintenance in notification
- AR guided set up of appliances

- could scan barcodes, take pictures of appliances
- what if we could scan like a fridge, find the coils, then use that to tell the user “here are the coils, these need to be vacuumed” as a learning tool.
- could use this with other appliances as well. “This is your furnace. Here’s where the filter likely goes in”
- useful method of education
- voice assistant
 - tells you at the beginning of each week what should get done
 - you can ask what needs to be done, what tools you need, how to do it
 - could send links to your phone about purchasing tools, guides, could say them verbally
 - could integrate with smart home appliances to track usage and do use-based maintenance rather than time based
 - could connect with the seasons and tell you when to do chimney cleaning, spring cleaning, etc.

3 SELECTION CRITERIA

Looking back at my needfinding notes it seemed like users needed (in order of priority):

1. Reminders
2. Check what should be done in the next few weeks
3. Track maintenance they have done, be told of maintenance they didn’t know about before
4. Track who, what, when certain contractors, plumbers, other workers come to the house so they can be contacted again
5. Be taught how to perform the maintenance

I used the following quotes and requirements from my needfinding to inform those criteria

Their ultimate goal, paraphrased from my interview:

To make appliances last longer, operate safely at peak performance and efficiency.

And another need my interviewees mentioned:

Spot you can put your contacts down (electrician, plumber, heating system, painter, pesticides, carpentry, who made the patio?) So in 5 years if you're upgrading something and if you can call them again

What they need, informed from my interface evaluation:

... provide users with a method for planning around upcoming tasks, watch appliance lifespans, and help users accomplish their tasks.

And their tasks, informed by my participant observation and interface evaluation:

1. Remembering to perform maintenance
2. Monitoring appliance health and previous maintenance

Using this selection criteria, I'd like to explore the mobile app, the augmented reality interface, and the integration with home smart devices. These interfaces have the best ability to meet the user where they are and provide a low barrier to entry for becoming organized. Ideally augmented reality and smart devices would be more ubiquitous in order to a wider user base, but I want to explore them because of the direct physical connection they can make between a to-do list and the appliances that need maintenance. The mobile app idea lacks this physical connection, but allows a wider user base to organize on a pre-existing device with a familiar interface. Exploring these prototypes together will help me further iterate the designs and the pros and cons of each.

4 PROTOTYPE 1: CARDS

For my mobile app idea, I wanted to do some cards prototyping. For my "paper" I used my iPad and Procreate. I started with a simple paper prototype for my mobile app idea, but wanted to also model the user's ability to see more information about their tasks. From left to right, I drew the flow of getting a notification and tapping on it, looking at the list of tasks to complete, and lastly a detailed task page.

This prototype fills the user's need for remembering to perform maintenance, and has a small indicator of the organization for different contacts. It's missing a bit of functionality my users wanted, the biggest item being appliance based tracking. I think that could be added on in another card deck that models that user flow better. It shows how users could be taught what to do, given the steps on the final

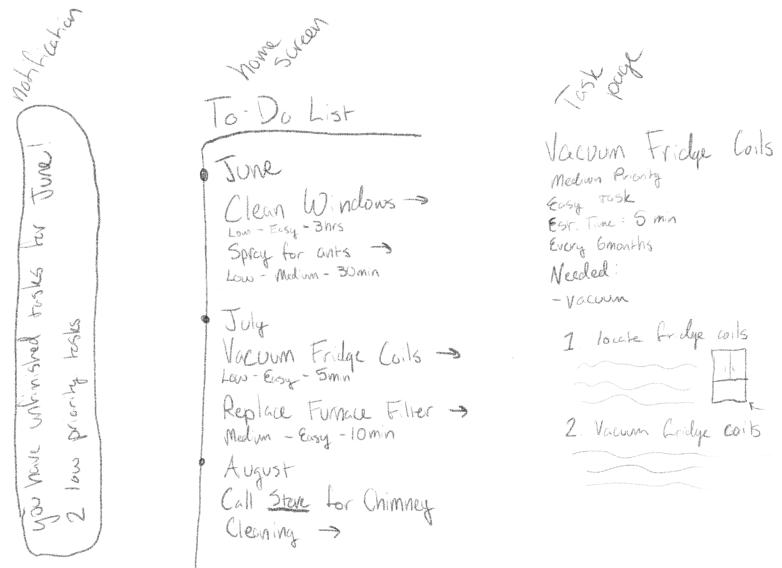


Figure 1—Cards prototype

task details page. This prototype would be good for verifying the user's main need of reminders, and then building on top of that with the other functionality.

This prototype should work well with my audience, it meets the user where they are. It focuses on their main need of a method for reminders, and will help them achieve their goal of making their appliances last longer.

5 PROTOTYPE 2: WIREFRAME

For the augmented reality interface, I made a wireframe out of a picture of my kitchen with what I think the overlay could look like.

This prototype has the same issues as the one above. To put all the information I identified in a needfinding would be too much for one interface. I again focused on the reminders and showing the user what needs to be done this month. The overlay includes elements for highlighting tasks the user is looking at with different levels of emphasis and a block in the bottom right to show what needs to be done that month. Having made the prototype, I still feel that this isn't the best solution for my users, the technology isn't ubiquitous enough (yet?) and prioritizing the information of *where* a task is accomplished doesn't address a users primary need. The information density is quite low, restricting the interface to only show a few tasks rather than all the information the user wants. This could be a better interface



Figure 2—Prototype for the augmented reality interface

for doing the actual task, but it isn't the right interface for showing what needs to be done.

6 PROTOTYPE 3: TEXT

For my integration with smart home devices, I chose a text prototype. There would be too many different interfaces, from ovens to fridges to furnaces to accurately prototype how this could fit in all contexts.

Every 6 months, the screen on the smart fridge will show a banner with a warning message to clean the coils and gasket. This message includes some more information, including information on why cleaning the coils and gasket is important. When you tap on the message you are taken to a screen that includes more information on how to vacuum the coils and gasket. Once done you can tap a confirmation that you've finished and you won't see the notification for another 6 months. Other visible appliances will follow the fridge example, having screens that can guide you through the task, or if not possible will guide you through your phone. Less visible appliances such as your house stove or furnace will send a notification to your phone (via email, sms, or an app). The furnace, for instance, will send you a notification after it has

sensed heating season over to contact your chimney sweep. Tapping the notification will lead you to their contact information.

Overall I prefer having the visual to go along with a description, but I'm happy with the amount of detail and functionality you can quickly describe in a text prototype. I chose the same scope here as the other prototypes again for clarity. This prototype is missing a method for seeing all the tasks that need to be done in the future and tracking of non-smart appliances. Integrating with smart appliances does not meet my user's needs well, as they want something that can increase the lifespan of their current appliances, not their next ones (if they chose to spend more for smart appliances). There is an underlying want for saving money by performing their scheduled maintenance, and I do not see my users spending more for smart appliances over saving on a less functional appliance. Out of the three prototypes, I would say this fits my users the worst.