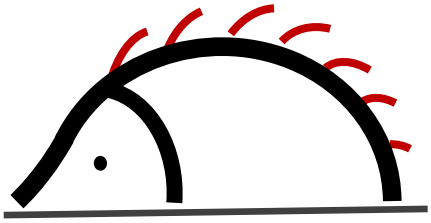
CleanLift

Touchless Elevator Panel



Porcupine Solutions

Progress Report

Issue Date: March 28th 2016
Revision Number 1.0
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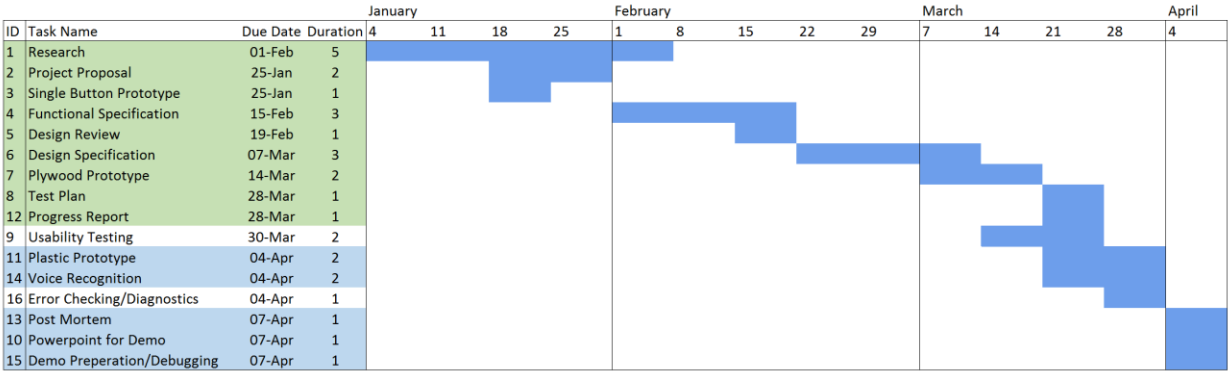
Introduction/Background

CleanLift aims to introduce touchless technology to modern elevator systems. Over the past two decades, touchless technology has been effectively implemented in nearly all modern buildings. Toilets, faucets, and door handles have been replaced with touchless mechanisms in hopes of reducing the presence of bacteria and improving sanitation on common surfaces. Unfortunately, this trend has yet to transfer over into the realm of elevators, despite several studies showing that elevator buttons are subject to more bacteria colonization than any other surface in hospitals and other public spaces [1] [2]. The system design of CleanLift consists of a user-facing physical panel, sensing grid, and control system - complete with voice recognition module.

Schedule

The updated schedule for the design and prototyping of CleanLift is as shown below in Figure 1.



ID	Task Name	Due Date	Duration
1	Research	01-Feb	5
2	Project Proposal	25-Jan	2
3	Single Button Prototype	25-Jan	1
4	Functional Specification	15-Feb	3
5	Design Review	19-Feb	1
6	Design Specification	07-Mar	3
7	Plywood Prototype	14-Mar	2
8	Test Plan	28-Mar	1
12	Progress Report	28-Mar	1
9	Usability Testing	30-Mar	2
11	Plastic Prototype	04-Apr	2
14	Voice Recognition	04-Apr	2
16	Error Checking/Diagnostics	04-Apr	1
13	Post Mortem	07-Apr	1
10	Powerpoint for Demo	07-Apr	1
15	Demo Preperation/Debugging	07-Apr	1

Figure 1: Gantt Chart outlining schedule for CleanLift development

Items highlighted in green in Figure 1 are those that have been completed successfully and on time, as of March 28th, 2016. Those highlighted in light blue are those that have a deadline different than specified in earlier reviews. Our original plan had these items scheduled to be done on or before April 1st, as we did not know our Demo date. On March 5th, received our Demo date of April 7th, effectively adding a week to our available time. Due to this, we decided to push back our final prototype and documentation tasks, allowing us to put more effort into the design and implementation of the project. We do not consider this slippage, as we were on track to complete on time before we added the extra time to our schedule.

Financial

Our funding is coming from two main sources:

1. The ESSEF, Engineering Science Student Endowment Fund, at $399
2. The Wighton Fund, at $62.29 – to pay for the 3D printing used on our final prototype

Overall, that gives us a funding budget of $461.29

As of March 28th, all components for the initial demo have been purchased and all major components for the final demo have also been bought, as seen in Table 1 below. There will be other minor purchases in the coming weeks, used to ensure the final demo is as presentable as possible, but they should not amount to more than $100, leaving us comfortably under our $461.29 funding budget.

Table 1: Expected Budget vs Actual Spending

Section	Estimated Cost	Total Spent	Items
Physical panel	$150.28	$143.63	Front panel (P2), 3D printed recessed (P2) screws, and assorted building supplies
Sensing Grid	$196.63	$134.76	Lasers and photoresistors x10 (initial budget was for 6)
Control System	$102.95	$87.99	Arduino, LEDs, Voice recognition module, assorted electronics
Subtotal	$449.86	$366.38	
Shipping	$30.00	$12.11	
Contingency	$89.97	–	
Total	$569.83	$378.49	

Progress

The initial prototype of CleanLift, comprised of a simplified sensing grid and control system, has been completed and had one round of user testing completed. This iteration will soon be dismantled for parts, as we will be re-using lasers and sensors in the final prototype.

The physical panel is on schedule, with the 3D printing for recesses and laser cutting of front plastic panel completed. Strip LEDs have been soldered and placed on the panel, with circuitry completed to ensure they get consistently adequate power input. The enclosure box has been created out of painted plywood, completed on March 28th.

The sensing grid is ready to be constructed and attached to the final prototype. All of the parts have been purchased and the design has been finalized. We had some challenges with alignment and changed holder design from full-panel to individual, allowing us to align each laser as we go. The powering circuit has been implemented and tested to provide a consistent current from a 9V battery

The control system programming has been split into three sections – ideal use, non-ideal use, and diagnostics. Ideal use is when the user treats the system correctly. The ideal use case has been fully coded, debugged, and tested on users. The non-ideal use case includes analysis, which has been coded but not yet debugged. The diagnostics section has been completed.

The voice recognition module has been programmed with the ability to recognize certain commanding keywords and give instructional feedback to the user. It has issues recognizing between male and female voices, tone and accent, but as it is not a main feature of CleanLift, this proof of concept is deemed sufficient.

Summary/Conclusion

The development and prototyping of CleanLift is on time and on budget. In the next two weeks we will be able to complete our goals by finishing the assembly of our final prototype, integrating it with our software, and completing the necessary documentation. We will be able to confidently demonstrate our progress, design, and our prototype to those concerned on April 7th, 2016.

References

[1] M. Europe, "Infection Control Today," 4 November 2010. [Online]. Available: http://www.infectioncontroltoday.com/news/2010/11/level-of-bacteria-on-elevator-buttons-40-times-higher-than-on-public-toilet-seats.aspx. [Accessed 8 February 2016].. [Accessed 8 February 2016].

[2] C. E. Kandel, A. E. Simor and D. A. Redelmeier, "Elevator buttons as unrecognized sources of bacterial colonization in hospitals," *Open Med,* vol. 8, no. 3, pp. e81-e86, 2014.