Progress Report for AlarmSense System

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Introduction

The AlarmSense System is a system of noise canceling headphones, noise canceling microphones, and audio processing, as well as a mobile app for control. The complete project will allow industrial workers to hear auditory alarms through their hearing protection, as well as communicate with each other in a natural way.

The proof of concept system, which will be demonstrated in April, will consist of one unit worn by the test user. This unit will allow alarms at one of three frequencies to pass through the hearing protection, which will be accomplished through a combination of analog hardware filters and a software detection algorithm. The mobile app will update which frequency to pass through by measuring ambient frequencies and selecting a frequency that is closest to one of the preset frequencies. The prototype unit will also be able receive speech from a secondary unit. The secondary unit will transmit sound either short range for low volume input or long range for high volume input. The above features are designed to demonstrate all features of the AlarmSense System.

Schedule

Figure 1 shows the planned schedule. The lines for app development were added a week after the schedule was submitted for the design proposal.

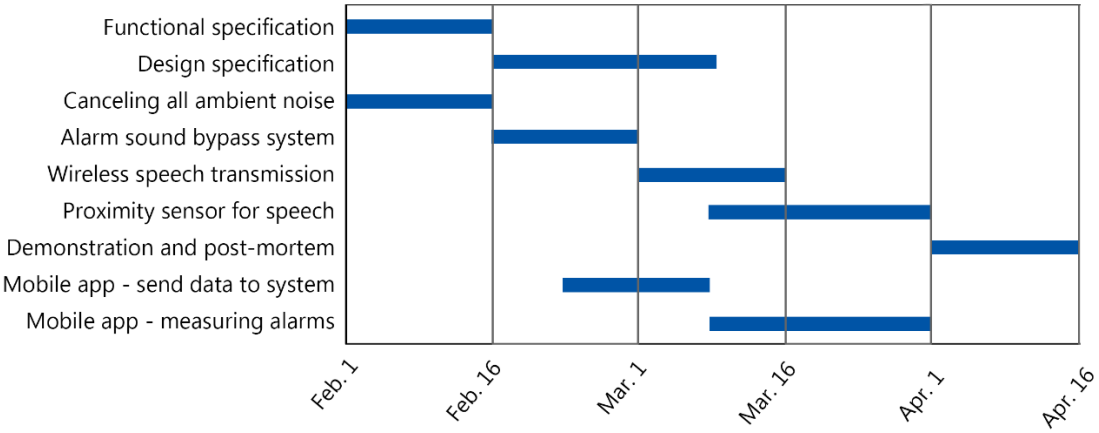

Figure 1: The planned schedule

Our project is on schedule. We are currently working on the two-level proximity filter, measuring an alarm with the mobile app, and integrating components of the project together.

Budget

The original budget and current expenditures are shown in Table 1.

Table 1: Planned versus actual expenditures

	Planned		Actual	
Component	Part	Unit Cost	Part	Unit Cost
Primary microcontroller	1x Intel Galileo Gen 2 Microprocessor	$100	1x Genuino Uno Rev3 Microprocessor	$32.47
			1x Genuino Zero Microprocessor	$68.95
Noise cancelling headphones	1x Sony 10RNC Noise Cancelling Headphones	$220	1x Bose QuietComfort 25 Noise Cancelling Headphones	$300.39
Noise cancelling microphone	1x Motorola NNTN8382 Noise Cancelling Microphone	$200	1x Tactical Throat Mic	$56.80
Proximity sensor	2x Murata Electronics MA40S4S Ultrasonic Transducer	$10	Not purchased	N/A

Table 1: Planned versus actual expenditures (continued)

	Planned		Actual	
Component	**Part**	**Unit Cost**	**Part**	**Unit Cost**
Secondary microprocessor	1x Genuino Uno Rev3 Microprocessor	$25	1x Genuino Uno Rev3 Microprocessor	$32.47
Receiver/transmitter pair	1x Wenshing RWS-374/TWS-BS Wireless Receiver/Transmitter	$10	1x Short Range nRFL01+ Receiver/Transmitter	$7.00
			1x Long Range nRFL01+ Receiver/Transmitter	$10.00
Other costs	Undetermined	$200	Various interfaces and circuit components	$637.38
Total Cost		**$765**		$1162.46

Rather than a separate proximity sensor, we elected to purchase two ranges of sensors for a two level proximity filter. The primary microcontroller was changed because testing revealed that the Intel Galileo did not have the required processing speed, but a combination of the Geniuno Uno and Genuino Zero in parallel did. We received $517 from the ESSEF, which puts our personal expenses at $645.46. Overall the project is $397.46 over budget, primarily due to purchasing a more expensive set of noise canceling headphones and higher than expected miscellaneous costs.

Progress

Progress on each component is detailed in Table 2.

Table 2: Progress on each component

Component	Milestones reached	Milestones not yet reached
Cancelling ambient noise	• Headphones cancel ambient noise • Throat microphone cancels ambient noise	
Alarm sound bypass system	• Software frequency detection implemented • Hardware frequency filters tested individually	• Test all components together
Mobile app	• Interface developed • Able to send alarm frequencies wirelessly	• Not yet able to measure alarm frequencies
Wireless voice transmission	• Can wirelessly transmit voices • Can detect loud volumes and when out of range	• Not yet able to switch transmitters during operation
Integration	• All software processing has been moved to interrupts for easy interfacing	• Alarm bypass and voice transmission have not been tested together

Comparing Table 1 with Figure 1, we see that we are on schedule for all components of the design. The alarm sound bypass system has been tested in parts, and will be integrated in the coming week. The noise detection algorithm for the app and the two-level proximity filter are currently being developed, and while their development may slip beyond the planned April 1 finish date, our demonstration is on the April 15, which allows us an additional two weeks to finish development while planning the demonstration.

Conclusion

The prototype is on schedule for presentation on April 15. The project is $397.46 over budget, which is primarily due to overestimation of miscellaneous expenses. Work remains to be done finishing and integrating systems for the proof of concept, but the overall system will be finished in time for the demonstration.