Progress Report: Lab 06

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Week 5

Backward-Looking Summary

The items investigated during last lab included: the positives and negatives of the various AEV designs and the code testing scenarios. These items were important because they provided a basis for the rest of the design process of the AEV. The team evaluated each of the AEV designs and weighed the advantages and drawbacks of them. The most important attributes of the AEV the team looked at when evaluating the designs included: balance, weight, and center of gravity. Each of these characteristics were prioritized since each have a direct effect on the way the vehicle travels along the rails. Using the provided template for a concept screening matrix and score sheet, the team collectively evaluated each part of the designs. These tables were used to draw conclusions about the design flaws, which also allowed us to identify the parts that made the designs better. Tables 4 and 5 in the appendix are the concept screening matrix and concept score sheet respectively.

Design Analysis Discussion

The team looked at three different designs and concluded that the final design the team collectively came up with was the best. Problems that were prevalent in other designs were balance, weight, and durability. The final design consisted of concepts taken from each individual design. From Design A, the team took the small base to allow for easier maintenance, better control and decreased weight. From Design B, the team took the T-Shape base and the position of materials for a better center of gravity. The team collectively came up with the idea to position the Arduino towards the side of the base to allow for better overall balance. The team will continue to adjust the design to accommodate for any flaws or errors that may show up during testing. The final design has a few minor problems, but part of the design process is getting these design issues fixed as the team does more testing.

During the lab, the team also conducted test runs to see how the design held up under various coding scenarios. Comparisons against previous designs showed that the new design had better balance, which caused it to sway less when recovering from turns.

Due to the new design of the AEV, it was imperative that the group gather some insight as to how the vehicle behaved using different commands and power settings. The team first tried a coding scenario that spiked the power setting to attempt make the vehicle coast along the track. Doing this would reduce the amount of power that would normally be used to maintain speed and brake the vehicle. This version of the implementation caused the AEV to go too far along the track instead of stopping at the gate. The second version of the implementation told the AEV to use the same amount of power at the beginning of the run and then break towards the end, instead of coasting, so it would stop at the gate instead of going all the way to the end. This implementation proved successful, but at the cost of using slightly more energy. The team will try more variations of code to see how coasting and using breaks affects the overall efficiency and success of the AEV. Design changes may also need to be made if

changes in the code implementations prove to not be working well enough. The goal of this process is to make the AEV the most efficient through the best possible coding and the best possible design to complement the code.

Takeaways

- The collective design pulled features from every team members design to create one final design for the AEV, which turned out to be the best design.
- Different implementations of code caused the AEV to use different amounts of power during certain parts of the run. Reducing some of the AEV's actions should aid in improving the power usage.
- Coasting and using breaks has a large effect on the power usage of the AEV and the team will need to adjust the code and design in accordance to the decisions to use these aspects of the runs.

Week 6

Forward-Looking Summary

The next two labs consist of reviewing the current state of the team's project and preparing for the oral presentation to take place in Lab 07. For Lab 06, the team expects to finalize any design discussion still left from Lab 05 and to begin reflecting upon and organizing all of the work thus far. Conducting this detailed review will enable the team to project how the rest of the project will need to play out so that the group may reach its goals and the overall goals of the entire project. The group also expects to run further power analysis trials so that the code may be refined to reduce the power usage, but the main concern involves reflection and preparation. Additionally, the team will discuss the Preliminary Design Review (PDR) presentation and the project portfolio with one of the teaching staff to determine areas of confusion.

Table 2: Weekly Schedule for the Week of February 20, 2017

Date:	Location:	Time:	Blake H.	Kyle P.	Kyle K.	Joe S.
February 19, 2017	Houston House: 2nd Floor Lobby	1:00 pm-3:00 pm (2 hrs.)	Design Analysis, Meeting Notes	Design Analysis, u.osu site design	Design Analysis, Arduino Code	Design Analysis, Weekly Schedule
February 22, 2017	Houston House: 2nd Floor Lobby	7:00 pm-9:00 pm (2 hrs.)	Backwards looking section Progress Report 5	Record Meeting notes, Draft Code, Finalize Progress Report 5	Draft code, Appendix Progress Report 5	Edit Progress Report 5, Finalize Concept Screening and Scoring

Table 3: Weekly Goals for the Week of February 20, 2017

1	Organize all of the data & discussions, determine the project's status in relation to the end goal
2	Prepare a presentation that summarizes the team's progress thus far
3	Construct various AEV Arduino scripts to work for further energy analyses
4	Create storyboard for extra credit opportunity
5	Model final AEV design in SolidWorks
6	Determine which part design will be laser cut

Appendix

Meeting Notes

Meeting 08: February 22, 2017, 7:00 PM - 9:00 PM, Houston House, 2nd Floor Lobby		
Team Members:	In Attendance:	Job/Responsibility:
Blake Harriman	**X**	Scenario coding
Kyle Kottyan	**X**	Meeting leader, organizer
Kyle Pellikan	**X**	Meeting Notes/Website
Joe Sudar	**X**	AEV Design, SolidWorks modeling, Scheduling

This meeting was planned to discuss any final details of the Progress Report due in Lab 06. Also, since the project is reaching its halfway point, the team wanted to discuss the long term plans to finish the project. The weekly goals in Progress Report 6 detail what the team is aiming to complete by the end of this week. Upon meeting in Lab, these goals will be further discussed and progress on completing them should begin.

Goals for next meeting:

- Complete the lab, and start on the next progress report.
- Have a draft of the oral presentation
- Have a storyboard for the extra credit opportunity

Summary:

- Finished the Progress Report
- Made the website look presentable and updated
- Discussed goals for the end of this week to better prepare for the future

Notes:

- Finished the AEV 3D part designs
- Need to print PDR worksheet for completion in lab

Design Analysis Tables

Table 4: Concept Screening Matrix for Considered Designs A-C

Success Criteria	Reference	Design A - Kyle K.	Design B - Joe S.	Design C - Team
Balance	0	0	-	0
Minimal Blockage	0	0	0	+
Center of Gravity Location	0	0	+	0
Maintenance	0	+	0	+

Durability	0	0	-	+
Cost	0	0	0	0
Environment	0	0	0	0
Sums of +'s	N/A	1	1	3
Sum of 0's	7	6	3	4
Sum of -'s	N/A	0	2	0
Net Score	0	1	-1	3
Continue	REFERENCE	Maybe, needs refinement	No	Yes, needs refinement

Table 4 above is the concept screening matrix used to evaluate each design in relation to the reference AEV given in the project's lab manual. This method of design review uses a comparison method to determine the overall quality of each design.

Table 5: Concept Screening Score Sheet for Considered Designs A-C

		Design A - Kyle K.		**Design B - Joe S.**		**Design C - Team**	
Success Criteria	**Weight (%)**	**Weighted Score**	**Rating**	**Weighted Score**	**Rating**	**Weighted Score**	**Rating**
Balance	5	0.15	1	0.05	3	0.15	3
Minimal Blockage	15	0.45	3	0.45	4	0.60	4
Center of Gravity Location	10	0.20	2	0.20	3	0.30	3
Maintenance	25	1.0	2	0.50	4	1.0	4
Durability	15	0.30	1	0.15	4	0.60	4
Cost	20	0.60	3	0.60	3	0.60	3
Environment	10	0.30	3	0.30	3	0.30	3
Total Score		3		2.25		3.55	
Continue		No		No		Yes, but needs further refinement	

Table 5 above is the concept screening score sheet for each of the evaluated designs. The weighted score and rating are to show how important each portion of the design is to the team.

Tested Arduino Coding Scenario(s)

```
//Accelerate all motors from start to 25% power in 3 seconds
celerate(4,0,25,3);

//Run all motors at a constant power of 25% for 1 second
motorSpeed(4,25);
goFor(1);

//Run all motors at 20% power for 2 seconds
motorSpeed(4,20);
goFor(2);

//Reverse all motors and go at 25% power for 2 seconds. Then brake the
//motors.
reverse(4);
motorSpeed(4,25);
goFor(2);
brake(4)
```