Group P - Ishan Taparia, Wenbo Nan, Kyle Fathauer, Jason Hahn Progress Report 4

Instructor - Dr. Parris, GTA - Sheena Marston
2/21/17

Week 5

Situation

During this week's lab session, we finalized our AEV design by going through rigid scoring structures like concept screening and decision matrices to compare each of the team members' design ideas. This was done to gain an objective perspective on whose design would perform the best. In order to gain the clearest evaluation of the designs, concept screening methods were used. We used the reference guide and scored it against multiple criteria like balanced in turns, minimal blockage, center of gravity, etc. and finalized a net score for each design. From there, the team was able to generate weighted scores for certain success criterion to see which design should finally be used.

Results & Analysis

A basic Arduino code was created to run the AEV on the straight track in the front of the classroom. After the AEV was turned on, it halted for a very short period of time, with the buzzing of the propeller coming out. According to the scenario code, the AEV was supposed to accelerate to power of 25% and continue for one second. And then run at a power of 20% for 2 seconds. In reality, the propeller started to spin and the AEV went forward. However the AEV accelerated smoothly and the change of power was not obvious. This may be because of the inertia of the AEV to kept it going forward, and the fact that the change of power was not significant. The next lines of code asked the AEV to reverse the direction and run at the power of 25% for 2 seconds and stop. Shortly after, the propeller stated to spin in the opposite position. The AEV decelerated quickly, ran towards the opposite direction. The propeller stopped spinning shortly and the speed of AEV decreased to zero quickly. The AEV was considerably balanced because the team tested it on the desktop stand before, made adjustments of the position of each parts of the AEV and made sure of its balance.

The Basis for the team's concept screening was two excel document that allow for a simple comparison of each design. Both of these two documents compared seven distinct attributes of the AEV that are important. These are balance in turns so that the AEV is stable sand safe while running, minimal blockage so that the least energy is wasted, center of gravity so that the design is easy to handle, weight so that the AEV completes the design requirements, Cost so the AEV is the lowest possible, and Environmental so that it will use the least amount of power.

Success Criteria	Reference	Kyle's Design	Jason's Design	Wenbo's Design	Ishan's Design
Balanced in Turns	0	0	0	0	0
Minimal Blockage	0	+	0	0	+
Center of Gravity	0	+	0	+	+
Maintenance	0	0	0	0	0
Weight	0	+	+	-	+
Cost	0	+	-	-	+
Environmental	0	0	-	0	0
Sum +'s	0	4	1	1	4
Sum 0's	7	3	4	4	3
Sum -'s	0	0	2	2	0
Net Score	0	4	-1	-1	4
Continue?		Yes	No	No	Yes

From the original concept screening all designs were compared against the base designs so see if there were improvements. The chart shows that Kyle's design was thought to have less blockage, a better center of gravity, less weight and less cost than the reference AEV. Jason design was thought to have less weight the the reference but had more cost and use more energy than the reference. This is similar to Wenbo design whose was thought to have a great center of gravity, but worse weight and cost then the reference AEV. From the spreadsheet, it was decided the the best two design would move forward, which were the Ishans and Kyle's design.

The next spreadsheet that was used what the concept scoring sheet. This sheet used weight scores to compare the best two design from the previous sheet. The team put the weight on cost then simply balanced the rest of the weight between the other categories.

Table 2: Concept Scoring Matrix

		Reference		Kyle's Design		Ishan's Design	
Success Criteria	Weight	Rating	Weighted Score	Rating	Weight Score	Rating	Weighted Score
Balanced	15.00%	3	0.45	4	0.6	4	0.6
Minimal blockage	15.00%	3	0.45	5	0.75	5	0.75

center-of-gravity	10.00%	3	0.3	4	0.4	4	0.4
maintenance	15.00%	3	0.45	4	0.6	4	0.6
Weight	15.00%	3	0.45	3	0.45	2	0.3
cost	20.00%	3	0.6	4	0.8	5	1
Environmental	10.00%	3	0.3	3	0.3	4	0.4
Total Score	100.00%		3		3.9		4.05
Continue			No		Combine		Combine

From the sheet it was decided to combine the Design of Ishan's and Kyle's due to the large similarities between each design.

Takeaways

1) AEV -- When designing, it is important to keep all of the constraints the AEV presents in mind
2) AEV -- Constant testing on the small track on the desk is important to make sure the AEV is still functional
3) General -- An objective view to analyze everyone's idea in a fair setting is important

Week 6

Situation

For Lab 6, there is no lab procedure to follow. Instead, the team will be working on whatever they deem fit to work on. Our team will be using lab time to develop the full code block for the AEV run. This will involve carefully looking at the lab manual to revisit the original problem, and using the Arduino IDE to write code that satisfies all constraints and conditions the problem possesses. The team also use this time to better collect performance data on the AEV. This data will be used to fully understand the when each different power setting should be used.

Weekly Goals

1. To develop the code for final AEV run.
2. To discuss and prepare for the presentation.
3. Collect more data
4. Model the AEV in solidworks

Weekly Schedule

Table 1

Task	Teammate(s)	Start Date	Due Date	Time Need
Progress Report 5	all	2/17/177	2/24/17	2hrs
Create Solidworks Parts	all	2/17/17	2/24/17	1hr
Update Website	all	2/17/17	2/24/17	1hr
Complete Presentation Draft	all	2/17/17	2/24/16	1hr

Appendix

Date: 21 - Feb - 2017
Time: 6:00 (In-Person)
Members Present: Wenbo Nan, Kyle Fathauer, Jason Hahn, Ishan Taparia

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Objective: Today's objective was to complete the progress report covering this week's lab session, update the portfolio site with new info, and to work on the PDR Presentation worksheet

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To do:

- Write progress report
- PDR Worksheet
- Update project website

Decisions:

- We decided to combine aspects of Ishan's design and Kyle's design
- Wenbo decided to take care of the results and analysis, while Ishan and Jason worked on the PDR Presentation worksheet
- Kyle decided to work on the future analysis section of the progress report

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Reflections:

- Coming up with a solid idea in a constrained amount of time can be difficult

Arduino Code for Lab 5 Straight Track Scenario:

```
//Initial reverse of the motors to make sure the AEV goes in the correct direction
reverse(4);

//Accelerate all motors at a power of 25% for 3 seconds
celerate(4,0,25,3);

//Set all motors at a power of 25%
motorSpeed(4,25);

//Previous command for 1 second
goFor(1);

//Set all motors at a power of 20%
motorSpeed(4,20);

//Previous command for 2 seconds
goFor(2);

//Reverse all of the motors
reverse(4);

//Set all motors at a power of 25%
motorSpeed(4,25);

//Previous command for 2 seconds
goFor(2);

//Brake all the motors to stop movement
brake(4);
```