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AEV Lab 3

Introduction

The purpose of this lab was to review the different AEV designs the team came up with and weigh the pros and cons to decide which design would promote the most efficiency. After the team agreed on a design, the task was then to write a code that would test the AEV on the flat track to make sure everything works smoothly.

Results

The AEV ran on the test track as the team expected but a little slower. The AEV was leaning a little bit to the left but it was a simple fix, as the team just switched the wheels to the other side of the hanger. Since the AEV ran slow, the team decided to make the wings wider and put the three-bladed propellers on because that would make it faster. The AEV did not run right when the code was activated, there was a brief pause.

Concept Screening Matrix

Success Criteria	Design X	Design Y	Design Z
Balanced Around Turns	-	0	+
Minimal Blockage	0	0	0
Center-of-gravity Location	-	-	+
Maintenance	0	0	0
Durability	0	0	0
Cost	0	0	0
Environmental	-	0	0
Sum +'s	0	0	2
Sum 0's	4	6	5
Sum -'s	3	1	0
Net Score	-3	-1	2
Continue	No	No	Develop

Table 1. displays categorical scores for designs X, Y and Z

Table 1. represents the scoring of the three different AEV designs the team came up with. The criteria choices are what best represent the efficiency and performance of the AEV. The zeros represent that that specific element of design has neither a positive or negative impact, a negative means that element of design has a negative impact on the final AEV, and a positive means that specific design element has a positive impact on the AEV.

Concept Scoring Matrix

		Design X		Design Y		Design Z	
Success Criteria	Weight	Rating	Weighted Score	Rating	Weighted Score	Rating	Weighted Score
Balanced	5%	3	0.15	4	0.2	5	0.25
Minimal Blockage	15%	4	0.6	4	0.6	4	0.6
Center-of-Gravity location	10%	2	0.2	2	0.2	5	0.5
Maintenance	25%	3	0.75	3	0.75	3	0.75
Durability	15%	3	0.45	3	0.45	3	0.45
Cost	20%	3	0.6	3	0.6	3	0.6
Environmental	10%	2	0.2	3	0.3	3	0.3
Total Score	100%	20	2.95	22	3.1	26	3.45
Continue?		No		No		Develop	

Table 2. displays weighted, categorical scores for Designs X, Y, and Z

Table 2. represents of the scoring of three AEV designs. In this matrix, scoring consisted of a weighted numerical system, ranging from 1 to 5 that is weighted from the percentage of various categories. This allows scores from some categories to stress the overall score of the design more than others. Depending on what team values the most, the students valued cost and maintenance as the highest importance for design. The categories were weighted 20% and 25%, respectively.

Each design was separately scored based on the design criteria in table 1. As shown, most parts of the design were neither positive or negative to the outcome of the AEV. Design X was not balanced around turns and it had a bad center of gravity. This was due to the fact that the hanger and wheels were not perfectly centered, which caused the AEV to hang at an angle. It was also not the most environmentally friendly AEV out of the choices. These three negatives put Design X in last place. Design Y was a very plain design, causing it to have a lot of zeros, but it had one negative because it had a bad center of gravity due to the distribution of weight. With only one negative, this put the design in second place. Design Z was the final design choice because it scored the highest with positives in balance around turns and center of gravity. This is because the weight was distributed evenly and the wheels and hanger are placed in the most efficient spot.

Future screening and scoring can deal with newer designs, in procession of the designs analyzed from this current lab. While Design Z gathered the most points, other components could be added on this design such as tilted wings or the curved hanger. Slight additions, or even cancellations, in Design Z can maximize the efficiency of the AEV.

External Sensors Arduino Program with comments

```
// 1)
reverse(4);
celerate(4,0,25,3);
// 2)
motorSpeed(4,50);
goFor(1);
// 3)
motorSpeed(4,40);
goFor(2);
// 4)
reverse(4);
// 5)
motorSpeed(4,50);
goFor(2);
// 6)
brake(4);
// 7)
```

Conclusions

The team tested a variety of designs and evaluated them based on balance, blockage, center of gravity, maintenance, durability, cost, and environment effects. The team concluded that design z was the best overall design for the team's AEV because it had the power to move efficiently on the track due to its three inch propellers. It also was more balanced and had an easier time staying on the track because the weight of the various components, such as the battery and arduino, were spread out over more area. The design was also the most efficient at making turns.

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