Shell Team 1 Prototype Car

Overview
The Shell Eco-Marathon is a competition in which teams design, build, and test lightweight vehicles for maximum fuel efficiency. The current prototype car is operated by a battery powered electric hub motor on its rear wheel. The prototype car was not operational at the beginning of the semester due to a faulty motor controller and loose steering system. The car was also not in an inspection-ready state due to poor wiring within the car, weak brakes, and a bulky steering wheel among other issues. The prototype team needed innovative solutions to get the car ready for the Shell Eco-Marathon Competition in April.

Objectives
The prototype team’s main objective was to make the vehicle operational which meant designing and creating a working motor controller and tightening up the steering system. The team also decided to redesign the steering wheel, rewire the car’s electronics, and fabricate fenders for the front wheels as side goals.

Approach
- The sponsor clearly stated that efficient and lightweight designs were priorities
- Gathered rules and specifications from 2018 Shell Eco-Marathon Rule Book
- The car’s current motor controller and steering system were assessed
- Pre-existing motor controllers and steering systems were researched
- Concept generation, selection, and AHP matrices were used in the redesign of the steering system
- CAD models of the steering brackets, steering wheel, and fenders were created using SolidWorks
- FEA was done on the steering brackets and wheel to check for design flaws
- The motor controller was redesigned using EagleCAD
- Aluminum steering brackets were machined and grinded
- Multiple steering wheel prototypes were fabricated through machining and welding
- Motor controller PCB fabricated by DorkBotPDX and assembled using solder paste and hot air
- Fenders were formed from carbon fiber cut-outs
- The steering brackets were tested by moving the vehicle in a 90 degree arc. The test succeeded with a turning radius under 8 meters

Outcomes
Finally, list the outcomes for this project making sure to clearly convey their implications for the sponsoring company:
- A new motor controller was created
- The steering system was tightened and passes competition requirements
- Carbon fiber fenders were fabricated
- A new steering wheel with a U-joint was installed for quicker driver egress and better driver comfortability