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SOLAR CAR DESIGN AND ASSEMBLY

Kyle Buikema, Christian Willis, Cristina Cabascango, James Weisman
Advisor: Hansung Kim,

Background and Description

- Solar Car Project is a continuation of previous teams' work.
- Started in the Fall of 2015 by Professor Hansung Kim.
- Overall Goal: Build a vehicle to qualify for and compete in Shell Eco-Marathon® that takes place April, 2020 in California.
- **Our Team's Goal: Contribute to ongoing progress, and assemble car systems that allow the vehicle to roll and drive.**

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Shell Eco-Marathon®

- Competition including two races.
  - Traditional Race
  - Energy Conservation

- Build vehicle that uses renewable or clean energy sources.
  - Must abide by all Shell Eco-Marathon Rules!

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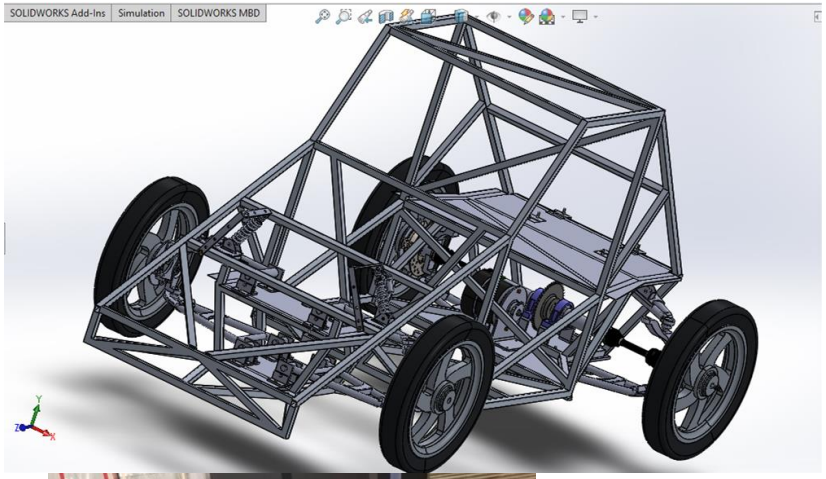
Prior Solar Car Progress

- 3D Model of frame, front and rear suspension, and powertrain.
- FEA analysis to design frame and mechanical systems.
- Built frame out of aluminum, and welded members together.



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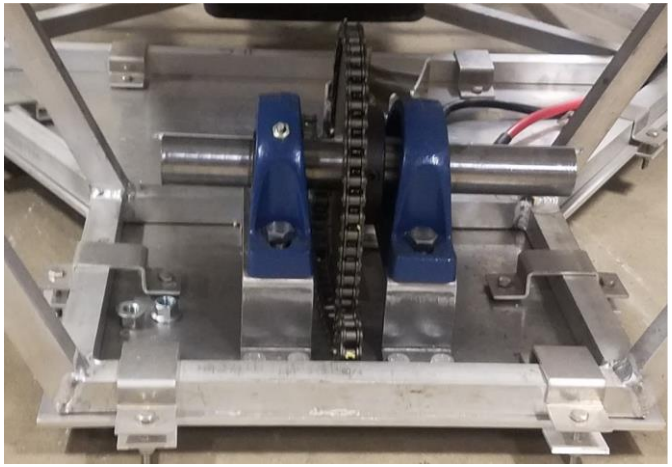
Prior Solar Car Progress

- Completed the front suspension system.
- Completed part of powertrain system.
  - Bolted down the drive shaft and sprocket.
- Most parts for powertrain, suspension, and steering systems purchased.



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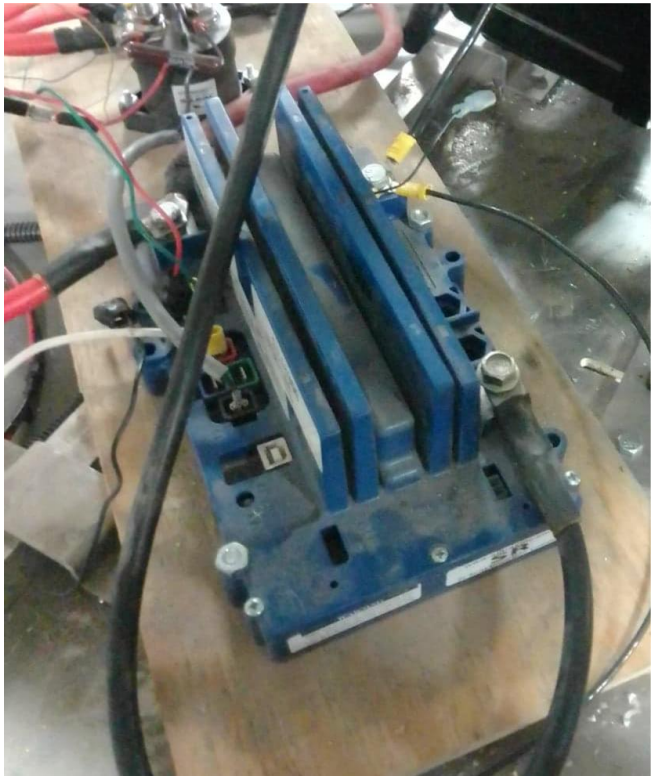
Prior Solar Car Progress

- Bought and assembled Motor Controller



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Our Plan and Goals

- Goal Restated: assemble car systems that allow the vehicle to roll and drive.
- Assemble remaining major mechanical and electrical car systems:

SYSTEMS	
MECHANICAL *Kyle & Christian*	**ELECTRICAL** *Cristina & James*
Front Suspension ✔	Motor Controller ✔
Rear Suspension	Lighting
Steering	Dashboard
Powertrain	Emergency
	Battery, Solar Panel

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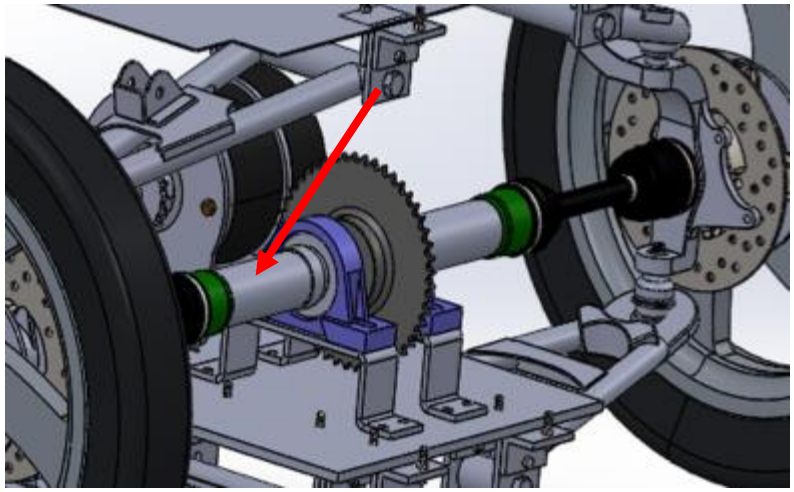
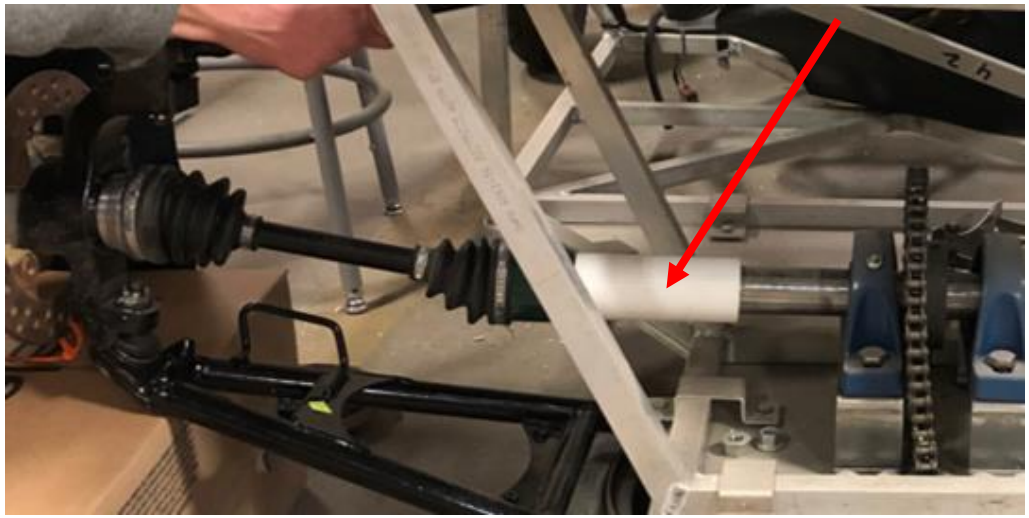
Mechanical

- Powertrain - Join drive shaft and CV axles with some sort of connection.





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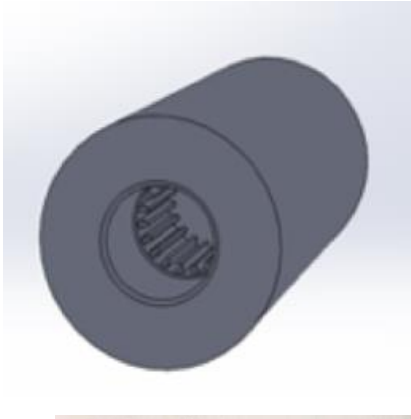
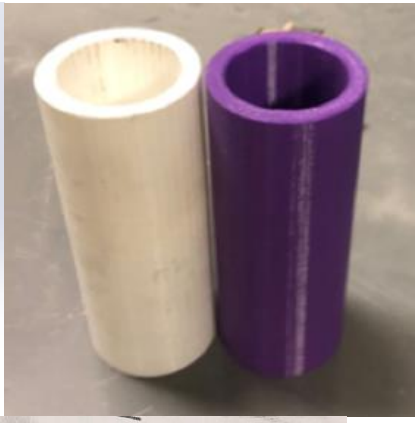
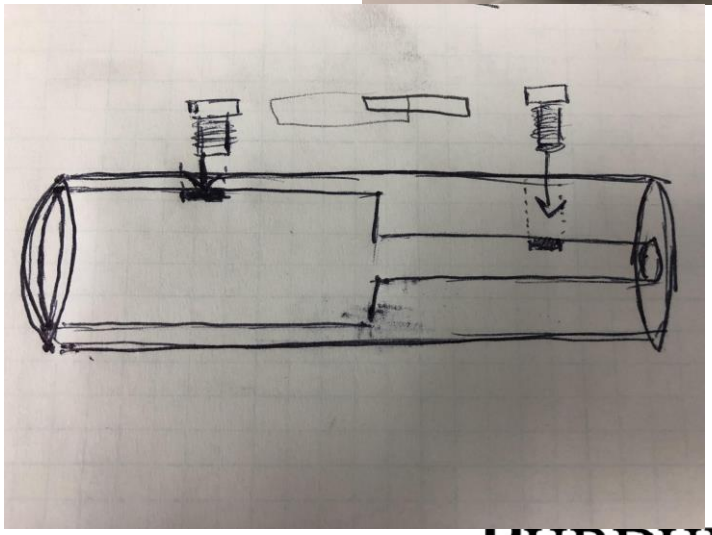
Drive Shaft Connection

- Previous team designed, and 3D printed model to manufacture.
- Realized due to interior spline, CNC couldn't manufacture.
- Decided to remove spline, manufacture, use set screws to secure CV axle.







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Drive Shaft Connection

- Made out of steel, manufactured by classmate David Bateman.
- Connected to drive shaft and CV axle.

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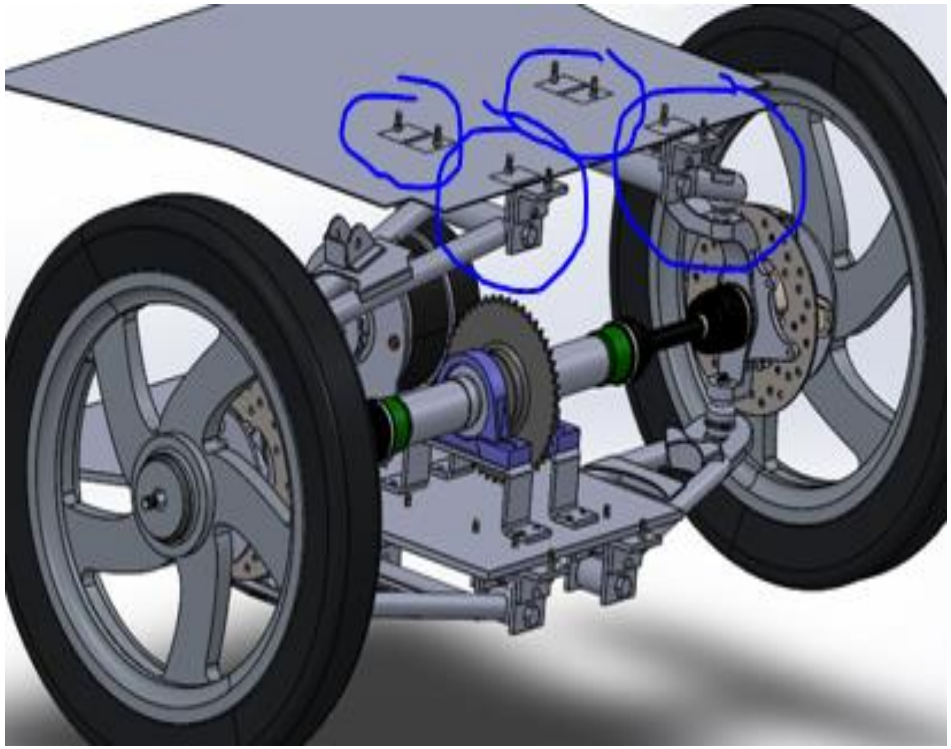
Rear Suspension System

- Designed angle brackets to bolt to the frame
- Fabricated brackets in house with help of ASME students



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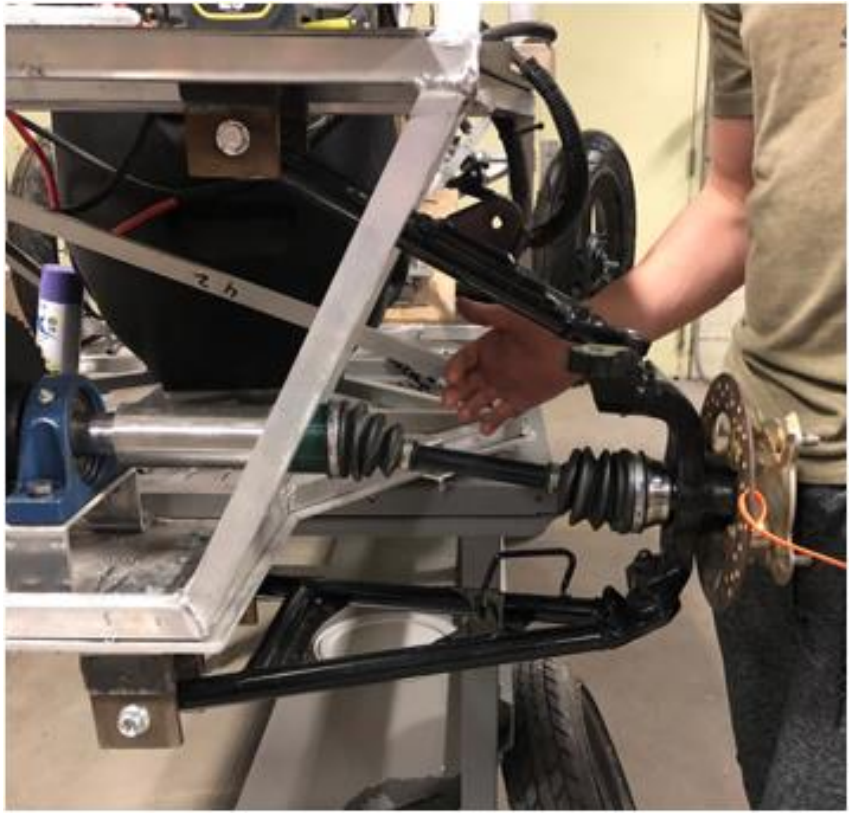
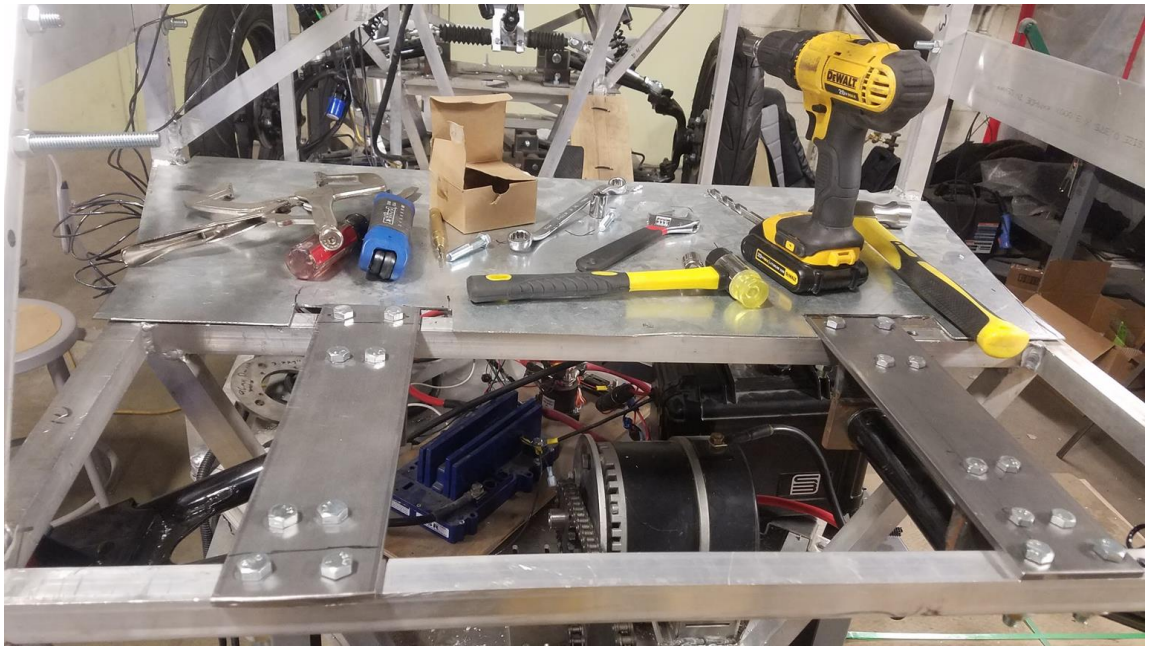
Rear Suspension System

- Installed and completed rear suspension



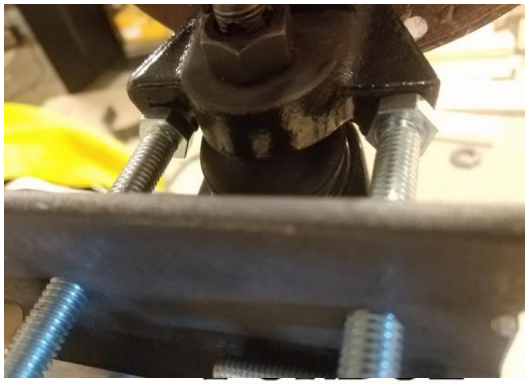
Improved Rear Suspension

- Installed metal bars to frame to increase strength



Improved Rear Suspension

- Previous team purchased front control arms for the rear
- Created fixture to stabilize turning of wheel hub
- Accommodate for control arms movement up and down



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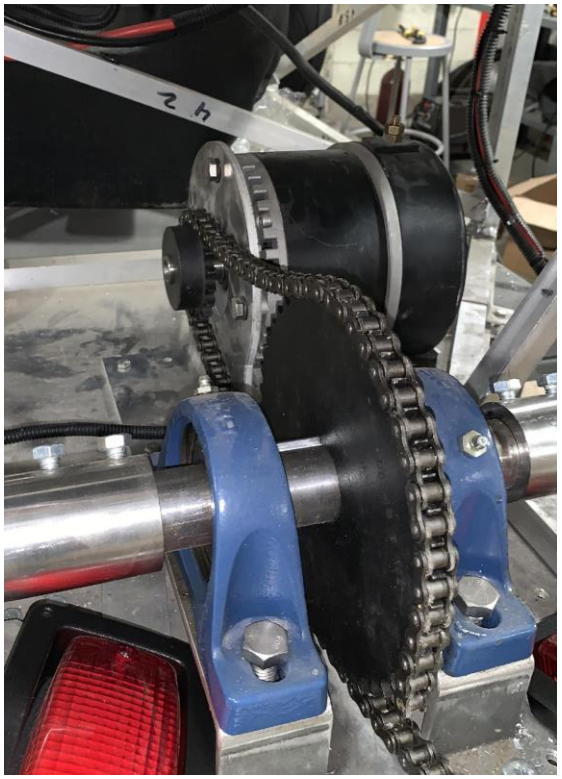
Powertrain

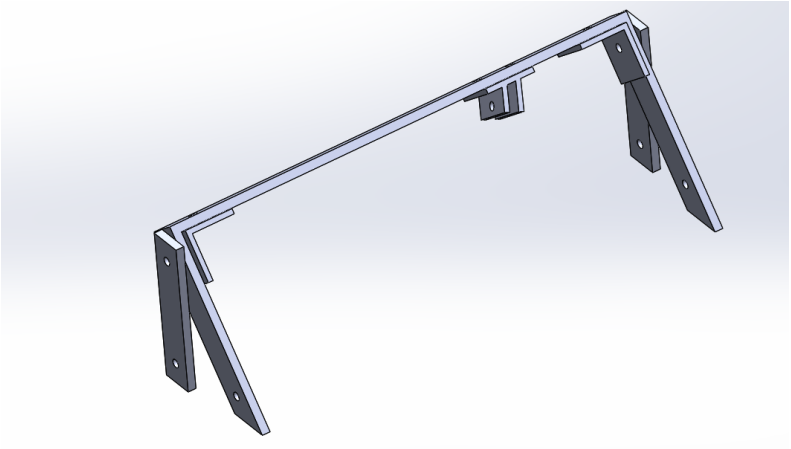
- Bolted motor onto frame
- Adjusted and installed chain
- Connected motor to battery and throttle



Front Suspension Problems

- Only one point of contact to the frame
- Made out of thin aluminum

- Designed new connection with two bolting to top and bottom



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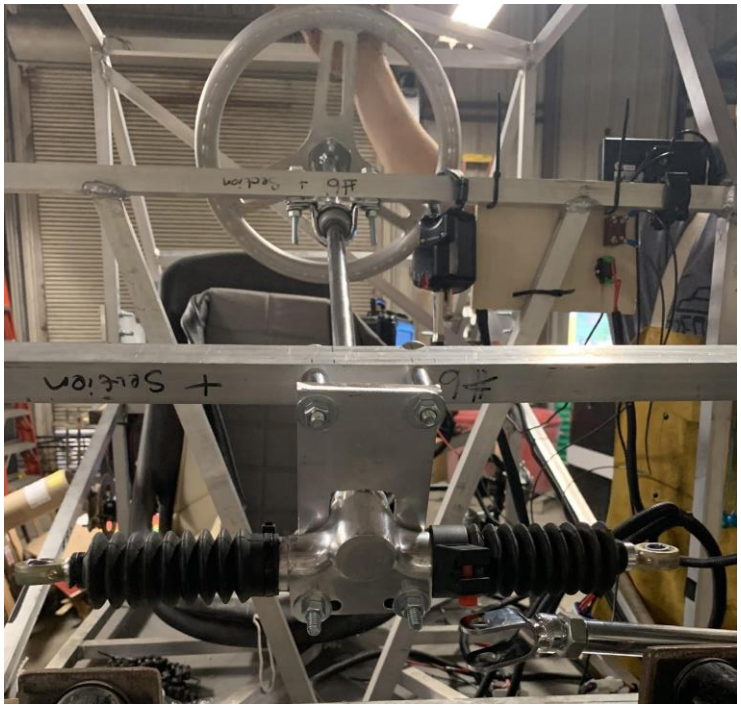
Improving Front Suspension

- Mig welded new connection pieces out of steel
- Connected from both sides

Steering System

- Bolted rack and pinion to frame
- Cut steering shaft
- Installed steering wheel to shaft
- Connected shaft to rack through swivel head

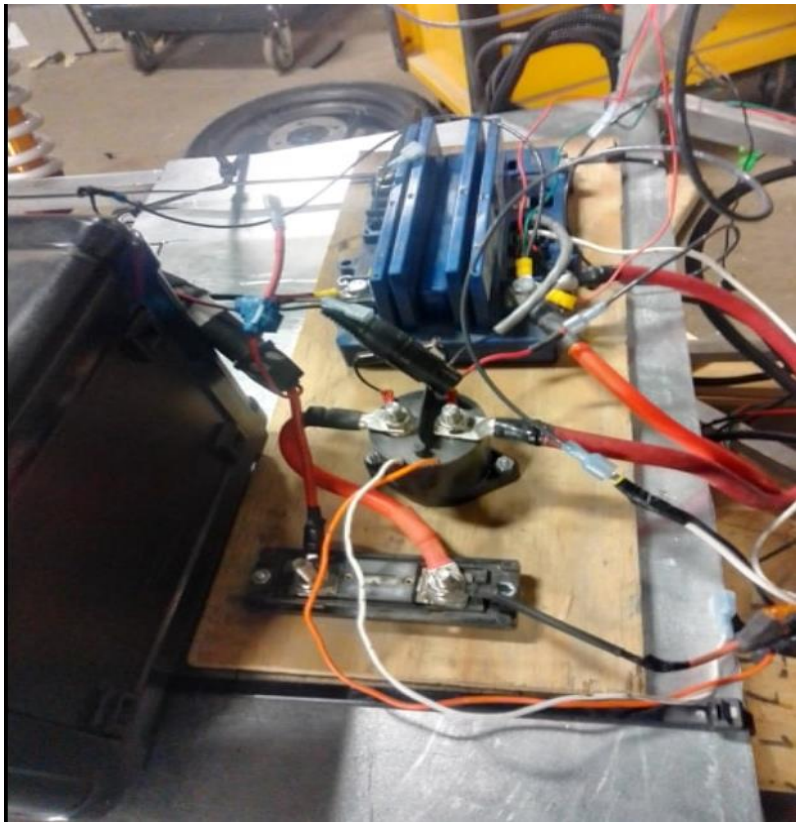


Steering System

- Connected shaft from wheel hub to rack and pinion
- Tightened down bolts to reduce wiggle

Electrical System Components – Main electrical System

- Permanent magnet DC motor
- Lithium Ion Battery
- SR48300 Motor controller
- GigaVac GV200QAC-1
  48 Volts main contactor
- 50 Amps fuse
- 470 Ohms Resistor



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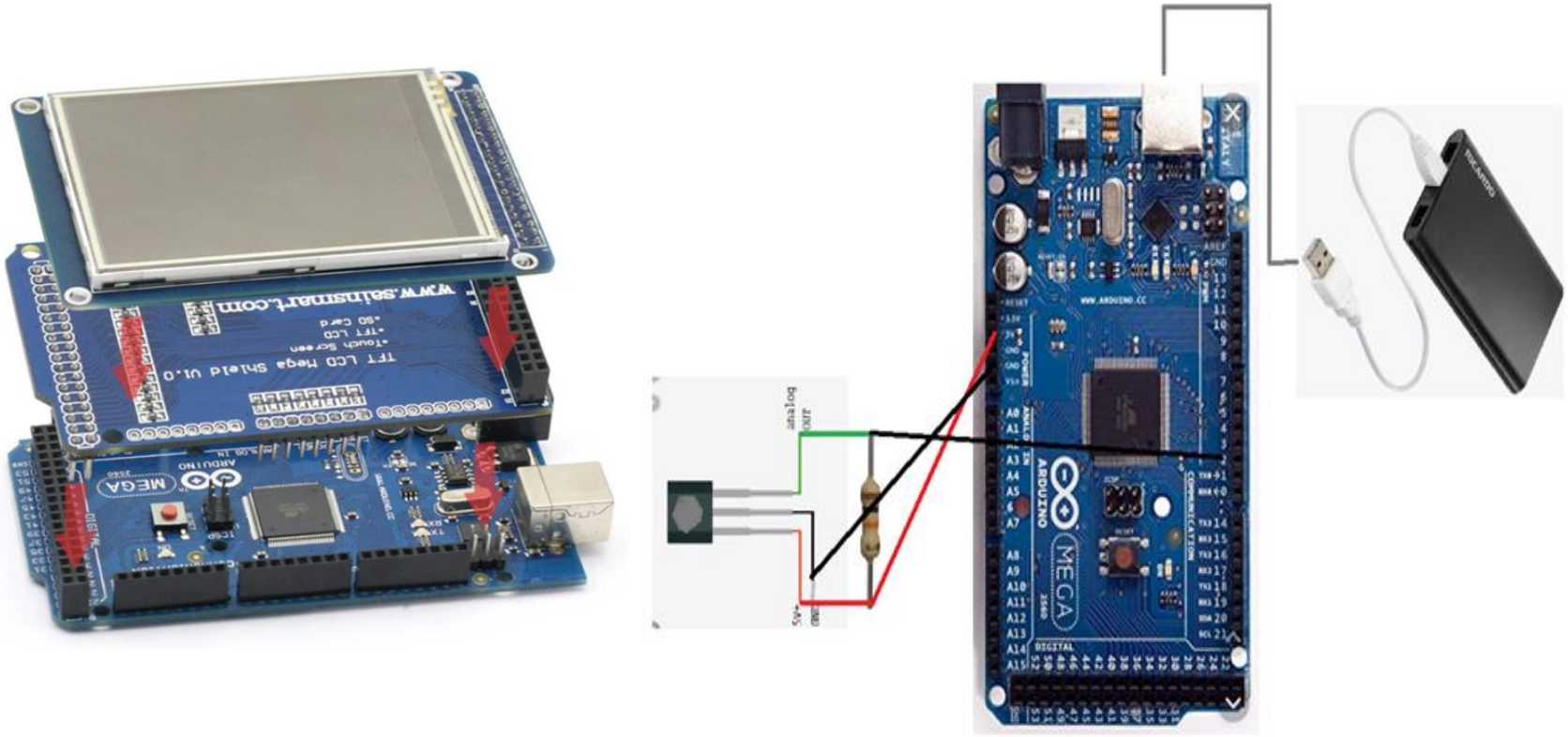
Electrical System Components - Dashboard System

- Arduino UNO Mega2560
- 3.2 TFT screen display
- Shield for Arduino UNO Mega2560
- Half effect sensor
- Power bank

Circuit diagram – Dashboard System



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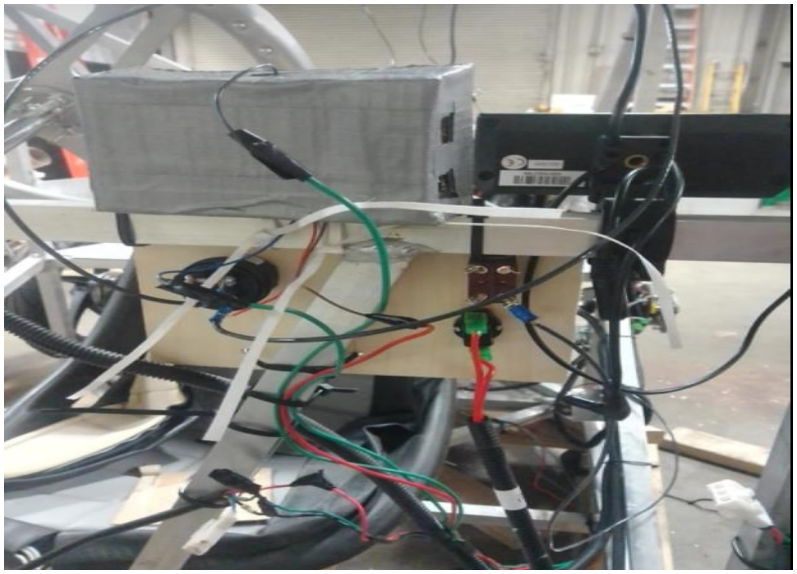
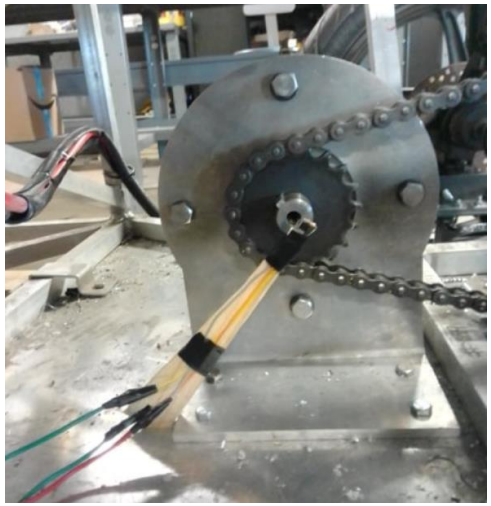
Dashboard System Assembled





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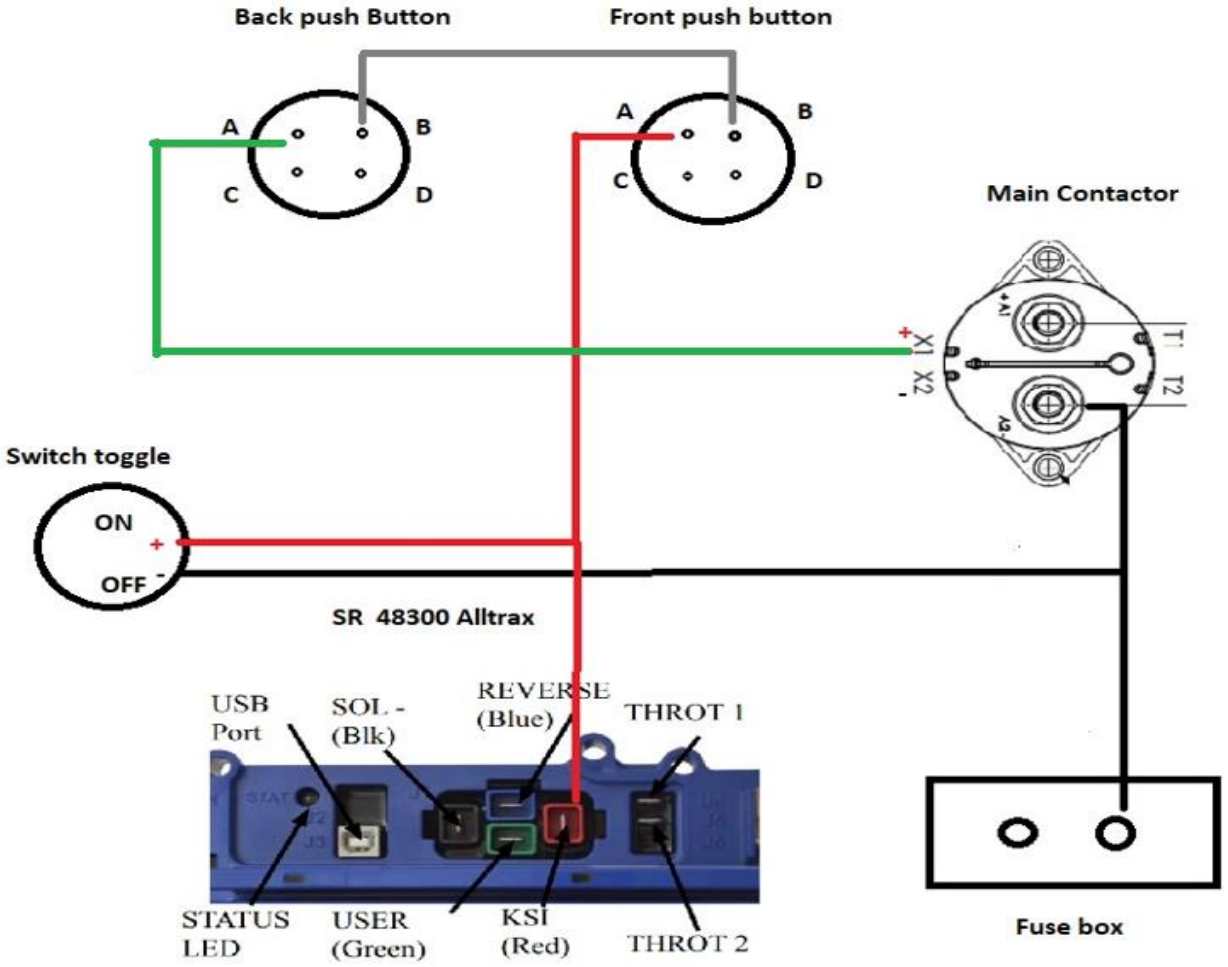
Electrical System Components - Emergency System

- Emergency stop switch

Back emergency button

Front emergency button

Circuit Diagram – Emergency System



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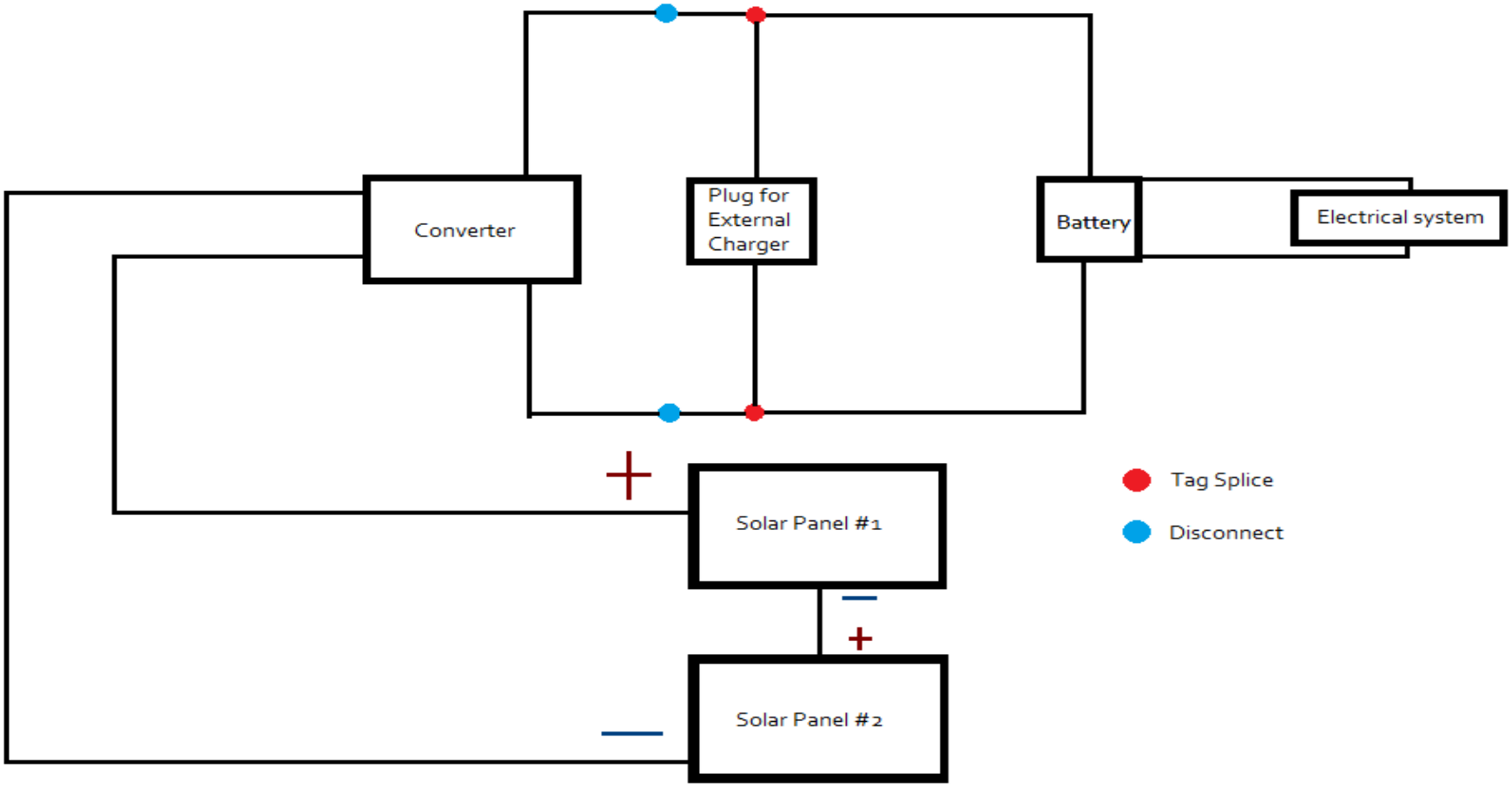
Electrical System Components - Solar System

- SPR E Flex 100 Solar Panels
- 36 to 48 Voltage Converter

Circuit Diagram - Solar System



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Electrical System Components - Lighting System

- 48V Full LED Light Kit
- Flip switch

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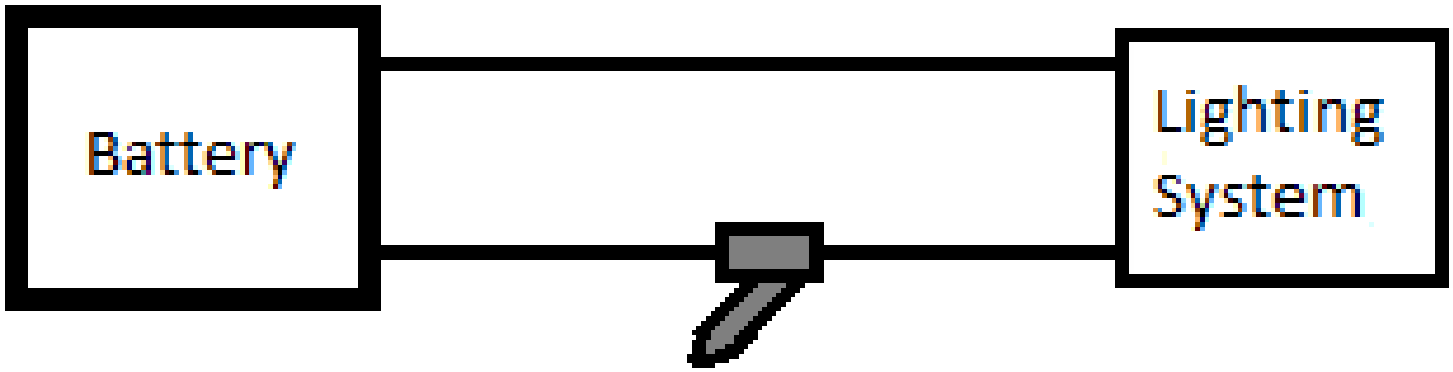
Circuit Diagram - Lighting System



Ethical Issues

- Detail Design
- Engineering Design
- Formal Engineering Methods
- The Rise of Electrical Vehicles

Environmental Effects

- Project Components
- Clean Energy
- Solar Car Prototype

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Future Work

- Correct the motor controller
- Design and implement Body
- Optimize

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Questions?