PURDUE UNIVERSITY | Agricultural and Biological Engineering

CAPSTONE/SENIOR DESIGN EXPERIENCE 2020

Mitchell Moore (ASM), Aaron Shwarts (AE)

Title: AgBot-1

Problem Statement and Background

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- Installation of electronics on trailer
- Trailer ballasting

Impact

- Revolutionize new technology in the agriculture industry
- Increase field potential to help farmers get more money into their pockets

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Constraints and Criteria

- $5000 max project spending
- The current trailer frame shall be used for 2020 competition
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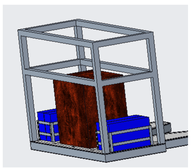
- Three-point Hitch would be kept as this allows for changing implements
- Electronics and power equipment to be moved to trailer from UTV

Alternative Solutions



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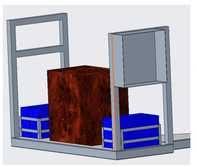

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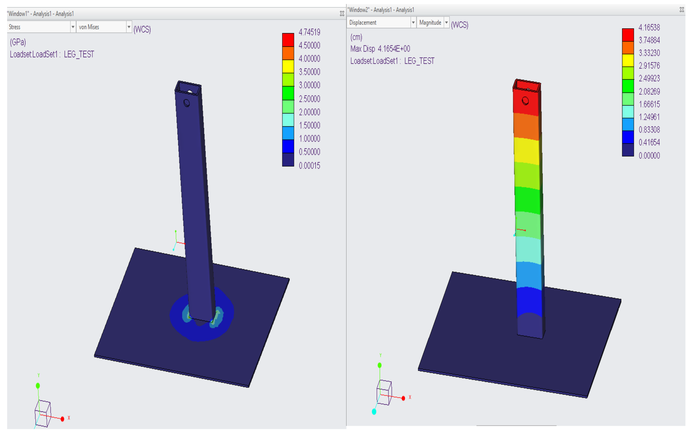

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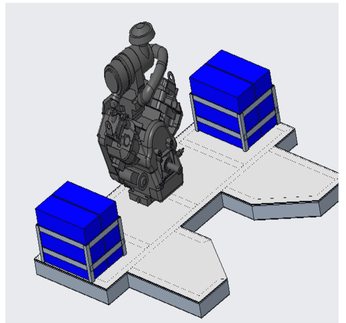
New design



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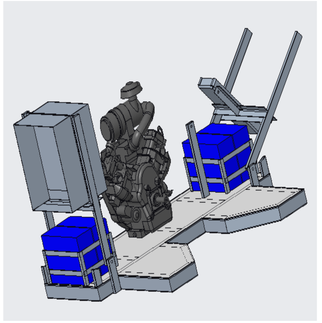

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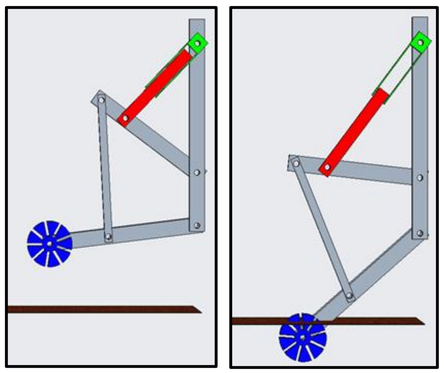

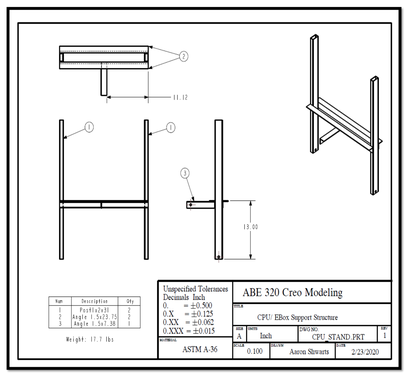

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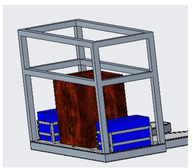

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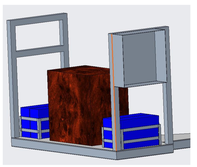

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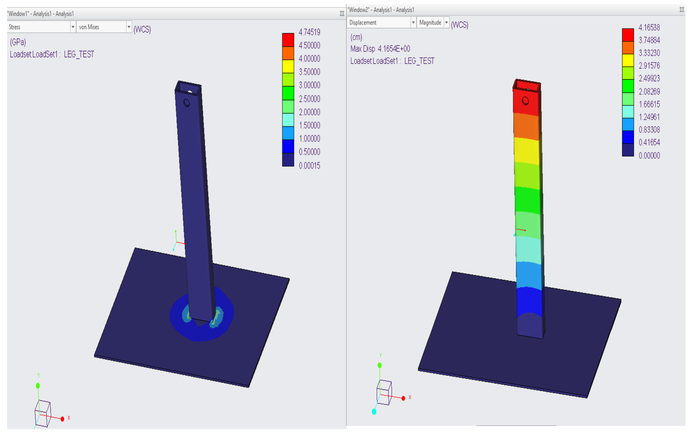

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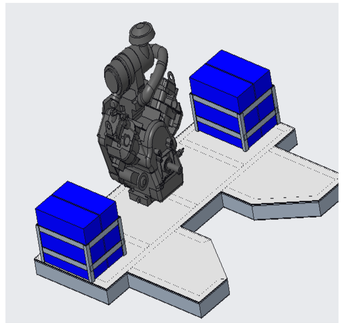

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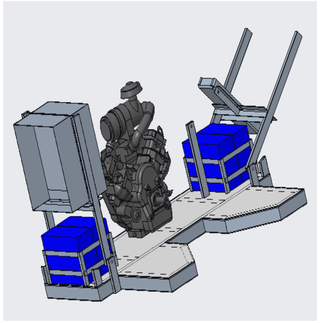

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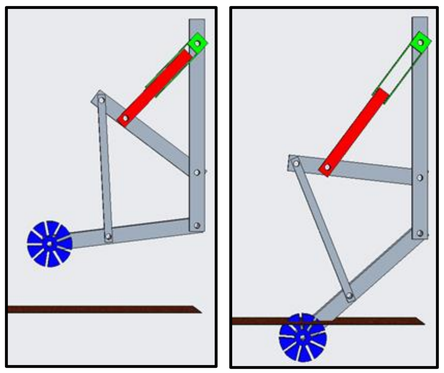

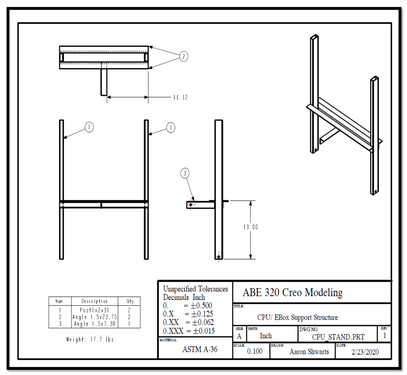

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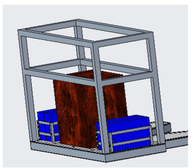

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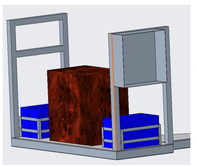

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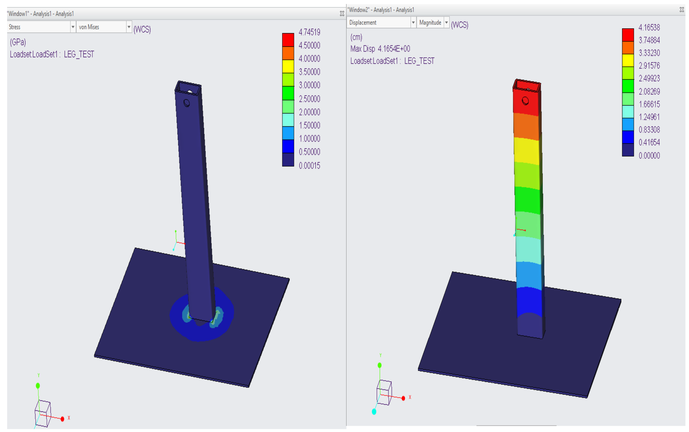

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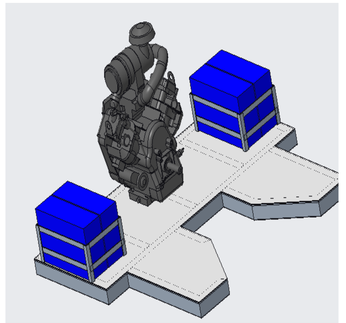

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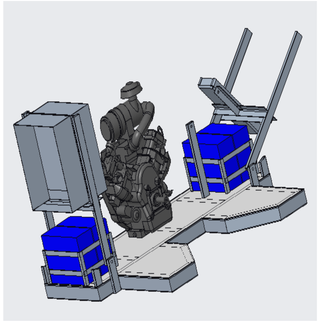

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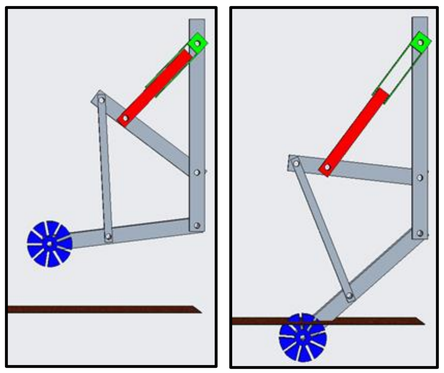

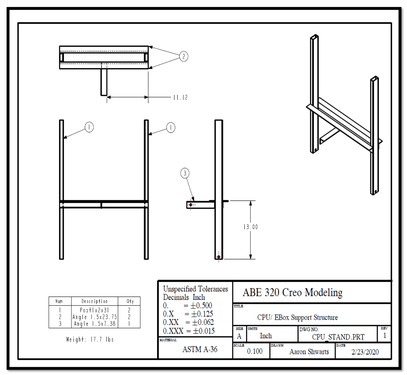

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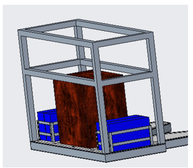

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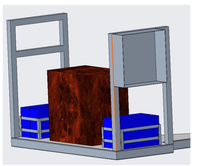

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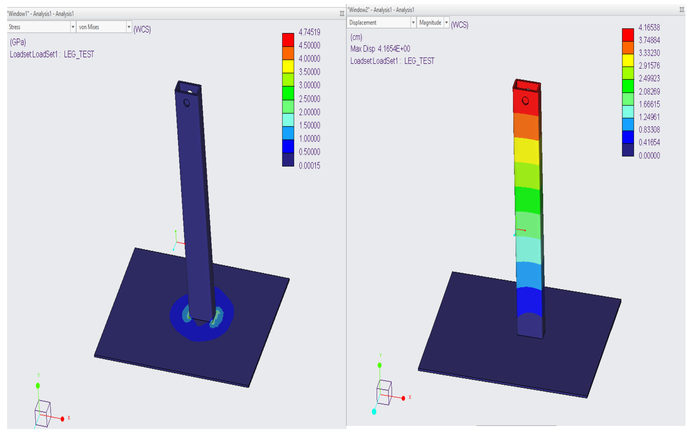

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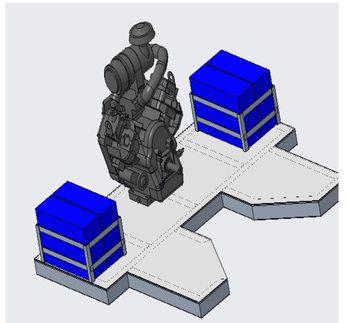

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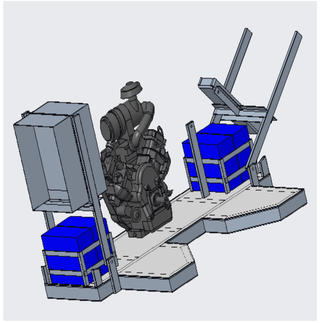

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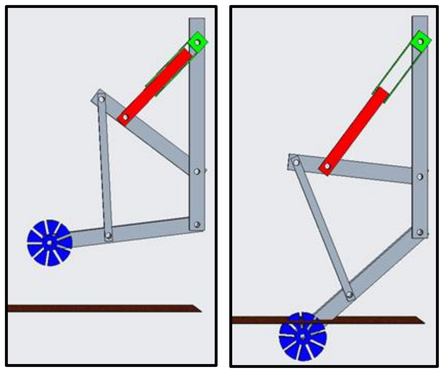

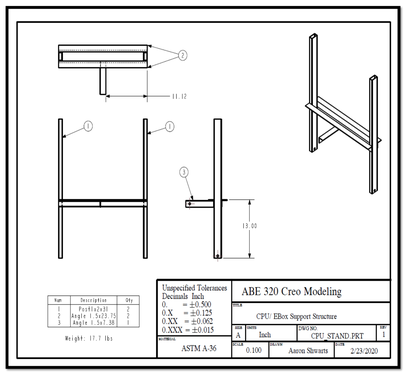

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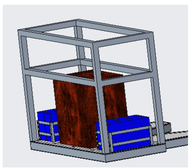

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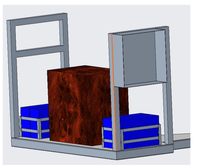

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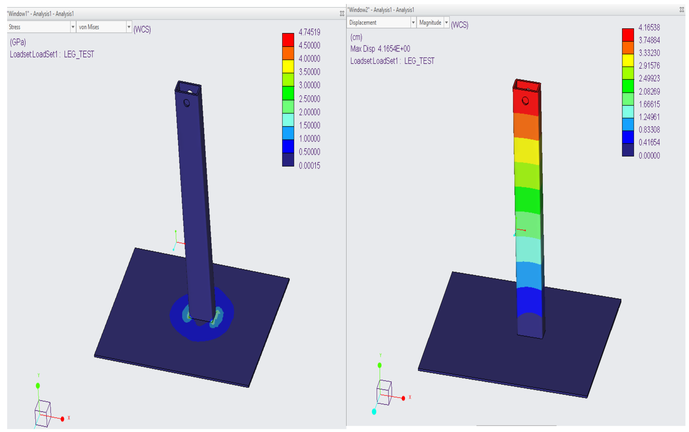

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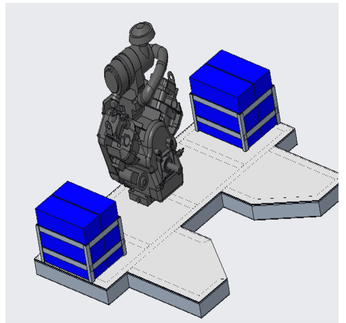

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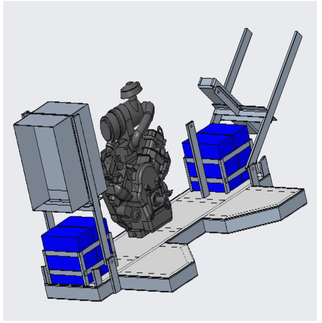

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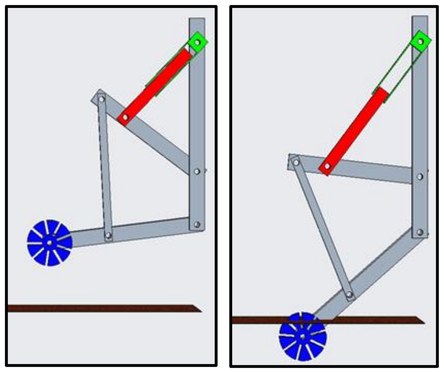

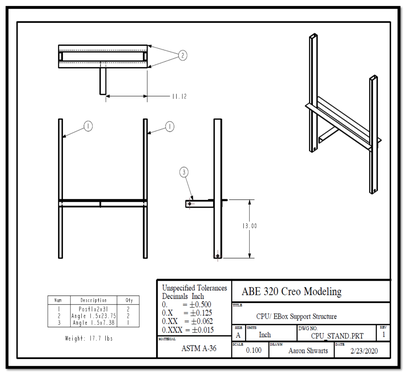

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- Revolutionize new technology in the agriculture industry
- Increase field potential to help farmers get more money into their pockets

Environmental Factors

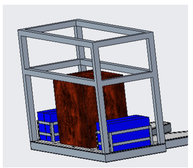
In consideration of today's growing issues with climate change, environmental pollution, and increased societal pressures to these issues The Purdue AgBOT seeks to:

- Limit application of pesticides onto crops by implementing precision application and mechanical destruction
- Monitor trouble areas of fields with geolocation tagging

Constraints and Criteria

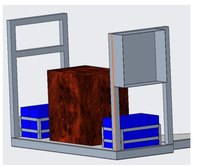
- $5000 max project spending
- The current trailer frame shall be used for 2020 competition
- Current multivators actuators would be used for 2020 competition
- Three-point Hitch would be kept as this allows for changing implements
- Electronics and power equipment to be moved to trailer from UTV

Alternative Solutions



#1 Storage For Electronics On Trailer:

1. Solid Frame- Lots of storage, simple, roomy, blocks engine and containers
2. Independent Frame- Engine access, electronics access, not as stable



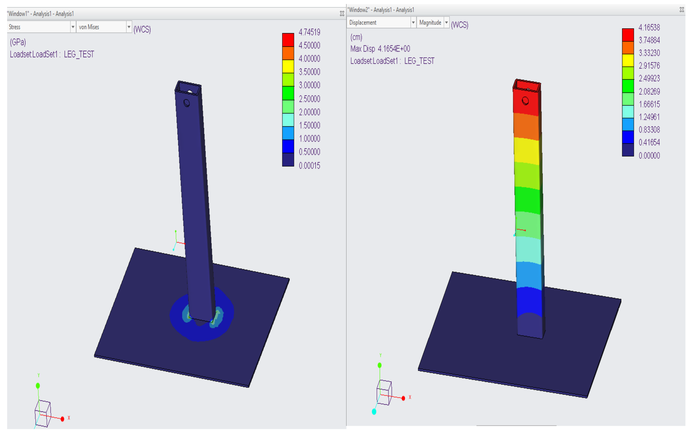
#2

Decision Making

- Design of sprayer tank mounts to utilizer slimmer tanks
- Design of automatic depth control of dynamic ground changes though a field
- Design of electronic box brackets to allow trailer to be stand alone
- Pivoting electronic mounts too provides access to various equipment

Economic Analysis

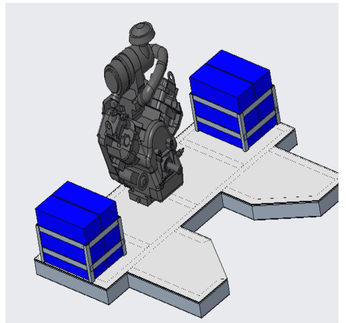
- Estimated Cost of Metal: $150
- Cost of Lidar Sensors: $600
- Use of standard metal tubing reduced cost of materials
- Simple design for equipment rack reduced cost of fabrication in manhours



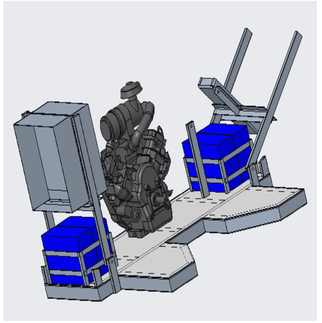
- Analysis of design to find stress concentrations performed in Creo using 500 lb loading on equipment racks.

Old AgBOT Design

New design



- All Computing on trailer
- Pivoting racks for access
- Racks locked with clevis pins
- Slim chemical containers
- Anti-sway 3-pt hitch
- Auto height control
- GPS on trailer

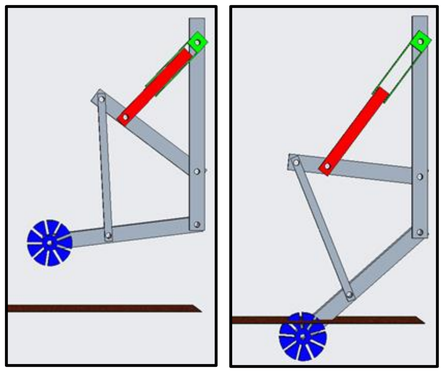


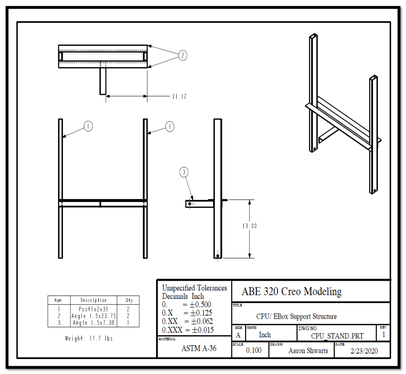
New configuration allows the system to be moved to any vehicle with a hitch.

Process Implementation Plans

Multivator Simulation and Arduino Code for Auto Height Control

Full 3D Model and Drawings For Added Structural Component





- Testing Plan for determining Effectiveness of Height Control System

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Instructors: John Lumkes, John Evans, Margaret Gitau

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