



Shihao Cheng, Xiyao Wang, Yuxin Zhou, Junlan Lu, Haozheng Qu, Yibo Cheng (From Left to Right)

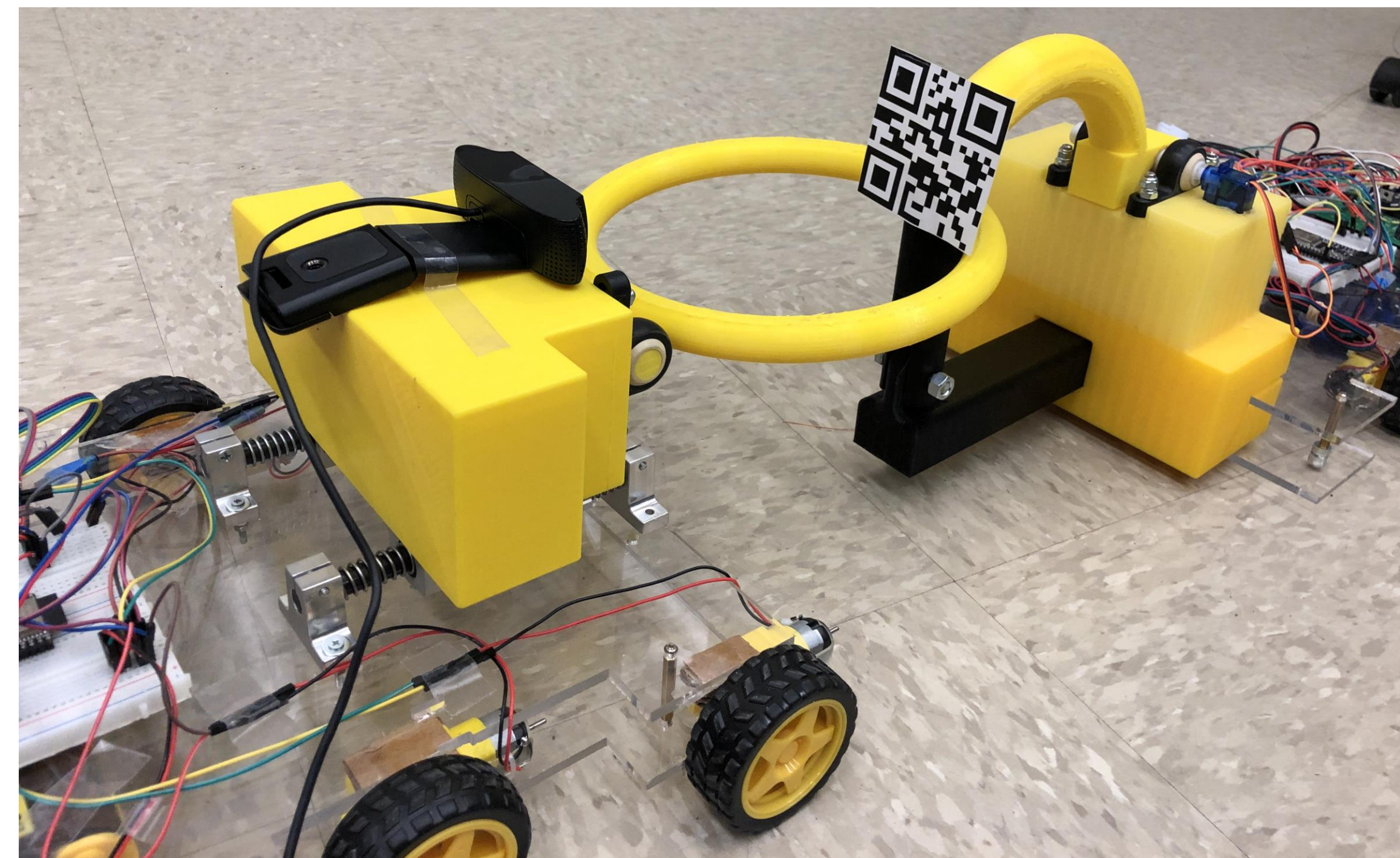
## Mission Statement

The tension between the increasing need for ground transportation and the current truck driver shortage (estimated 60,000 now and 180,000 by 2026 in North America) is getting higher. The transportation industry is now demanding new vehicle connection technologies to provide safer, cleaner and more efficient transportation solutions.

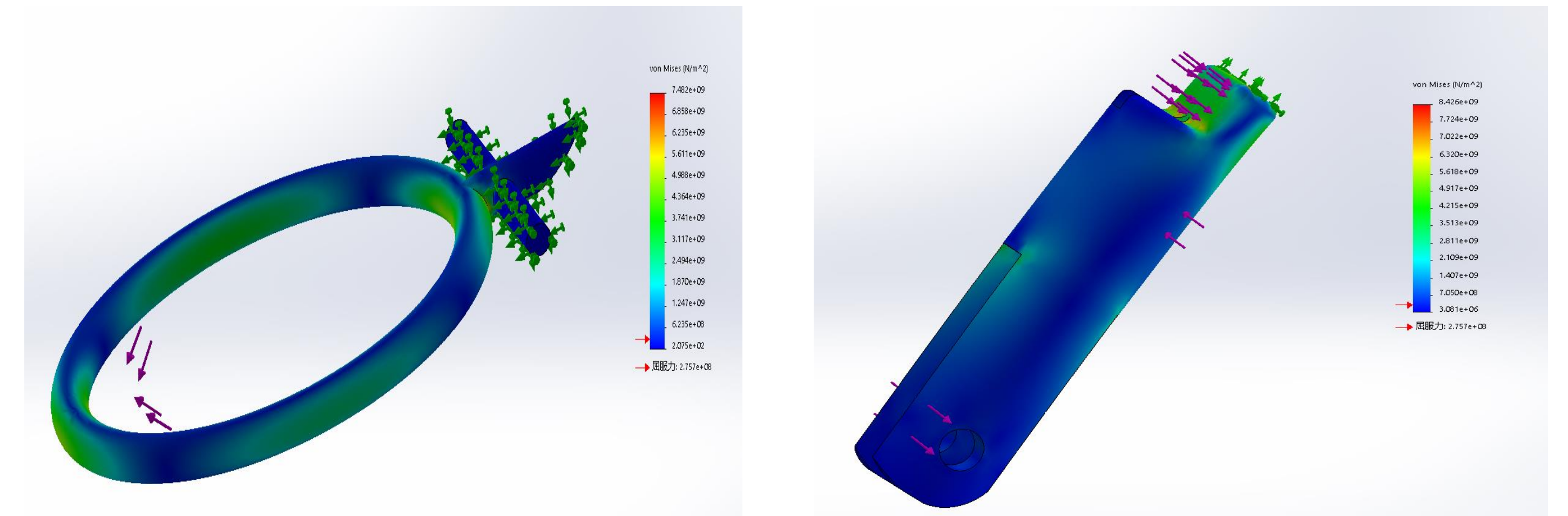


## Designed Solution

An automated, damping-free and self-reset active hitch that features 180° free of rotation



## Testing and Validation



- To analyze the potential risk of failure for the back ring on the back truck and the middle ring on the front truck, finite element analysis were performed.
- The pulling force of the front truck was estimated as 4000 lbf during the analysis.
- Stress distributions above indicate that the worst-case deflection of 1.39 mm for the back ring and 1.1 mm for the middle ring.

## Benchmarks

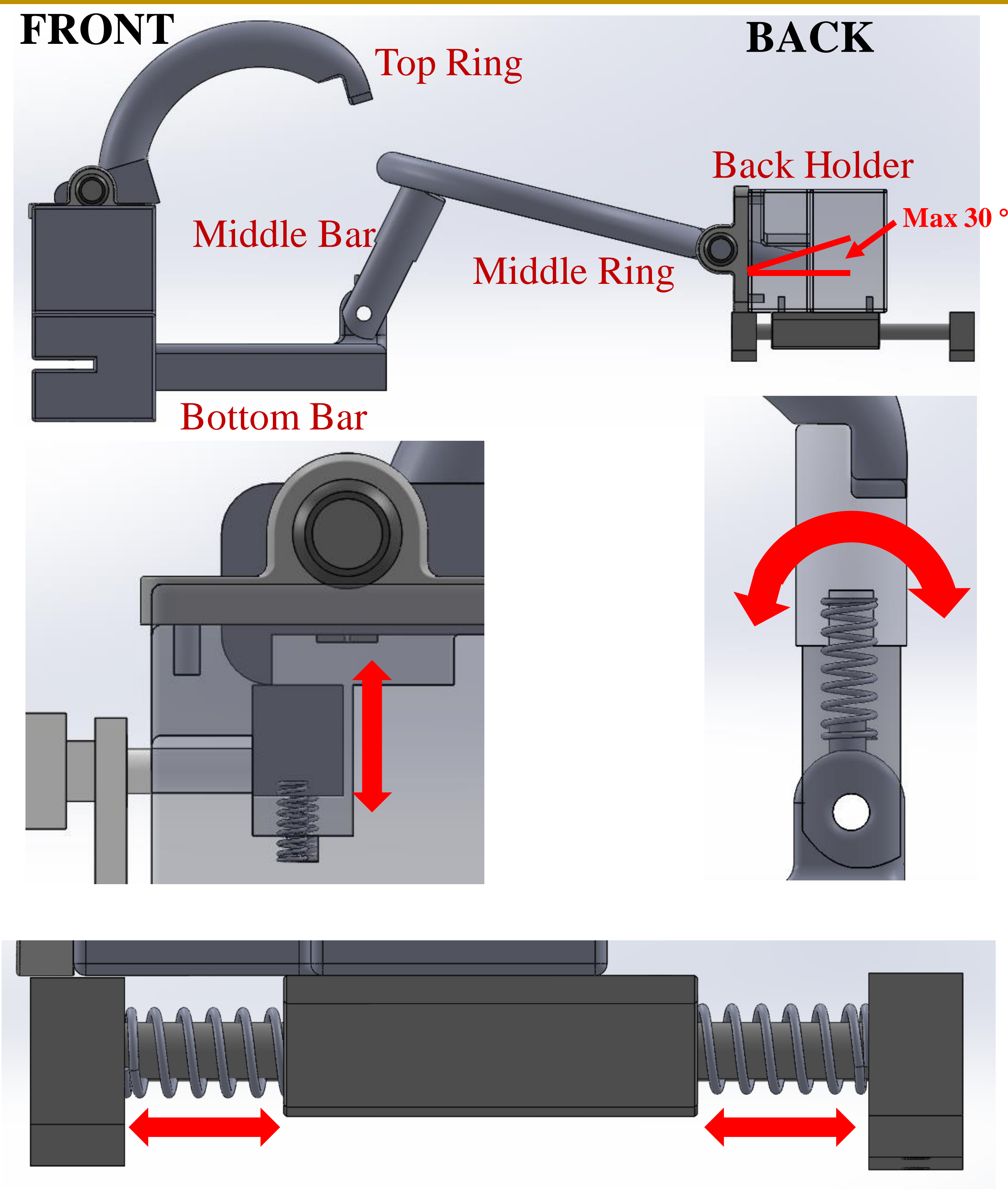


	Volvo Platooning	DAF Trucks Platooning	Hitch Ezy	Active Hitch
ALIGNMENT	✓	✗	✗	✓
SPEED	✓	✗	✗	✓
FUEL EFFICIENCY	✗	✗	✓	✓
COST	✓	✓	✗	✓
AUTOMATIZATION	✓	✓	✗	✓
SAFETY	✗	✗	✓	✓
ADAPTIVITY	✓	✓	✓	✓

## Marketability

- Safer and faster engagement and disengagement process
  - Damping and vibration-free design
  - High degree of freedom on connection joint
- Efficient Fuel consumption by utilizing aerodynamic concept
- Designed to avoid bending or being forced out of shape
- Low maintenance cost
- Easy assembly
- Designed to be adaptive to various truck models

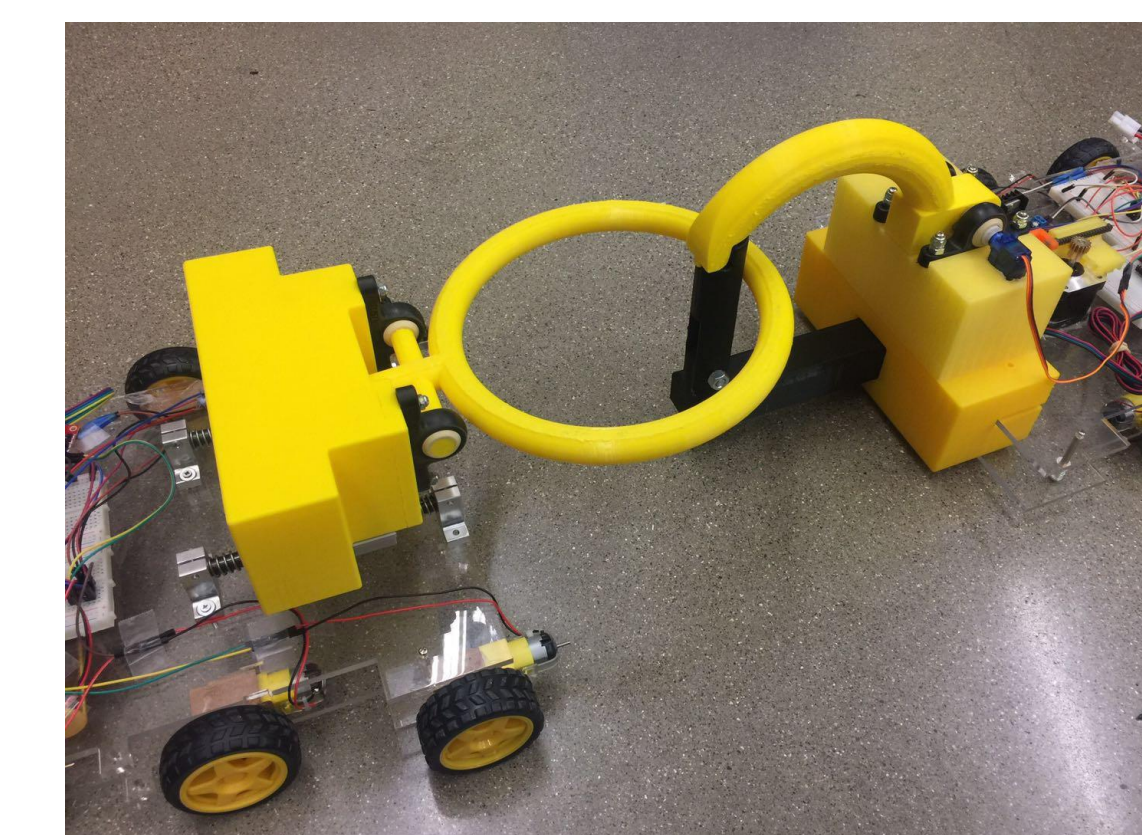
## Modeling & Features



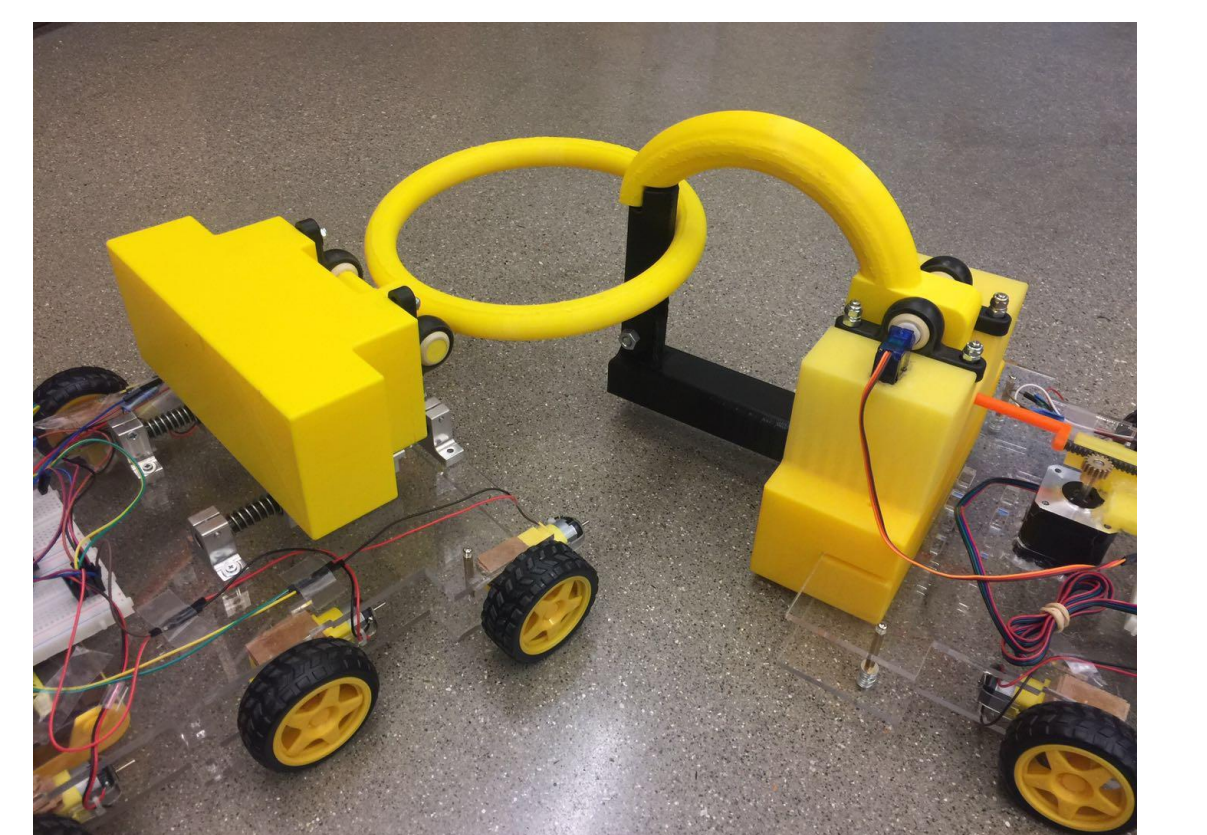
Test 1: Forward Connection



Test 2: Backward Disconnection



Test 3: Pull



Test 4: 90-degree Turn

- Passed all the tests and the functionality of the designed solution was validated

## Future Work

- Improve top ring leveling mechanism for better performance
- Research on improving rigidity of middle bar
- Research to implement the design onto truck bumpers