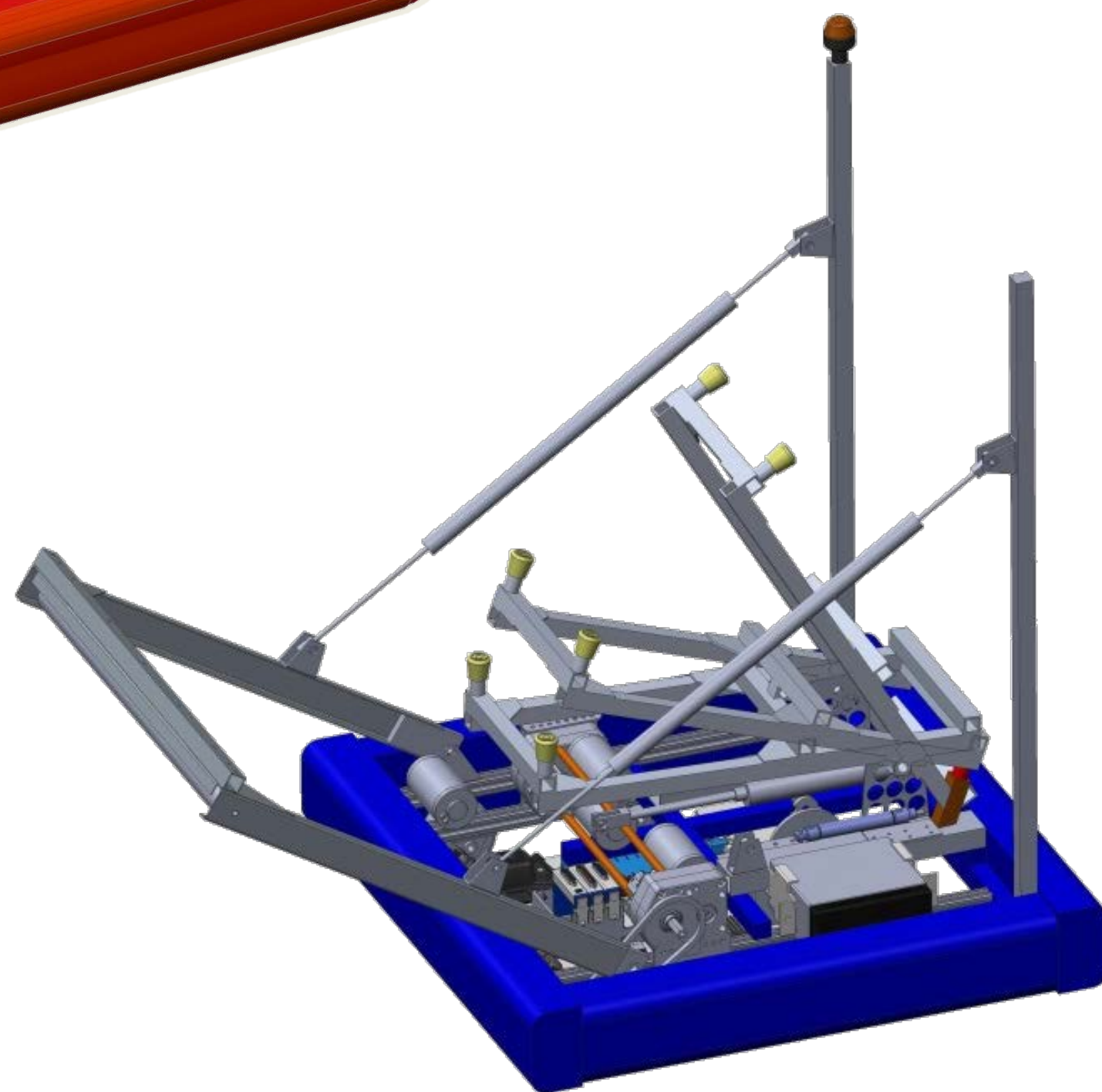
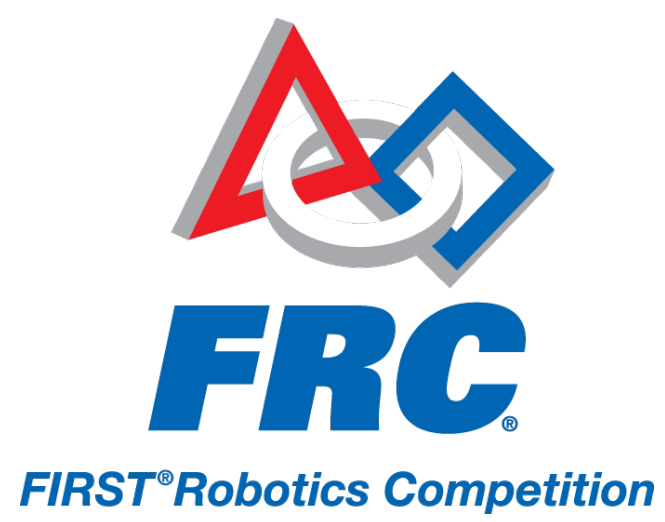
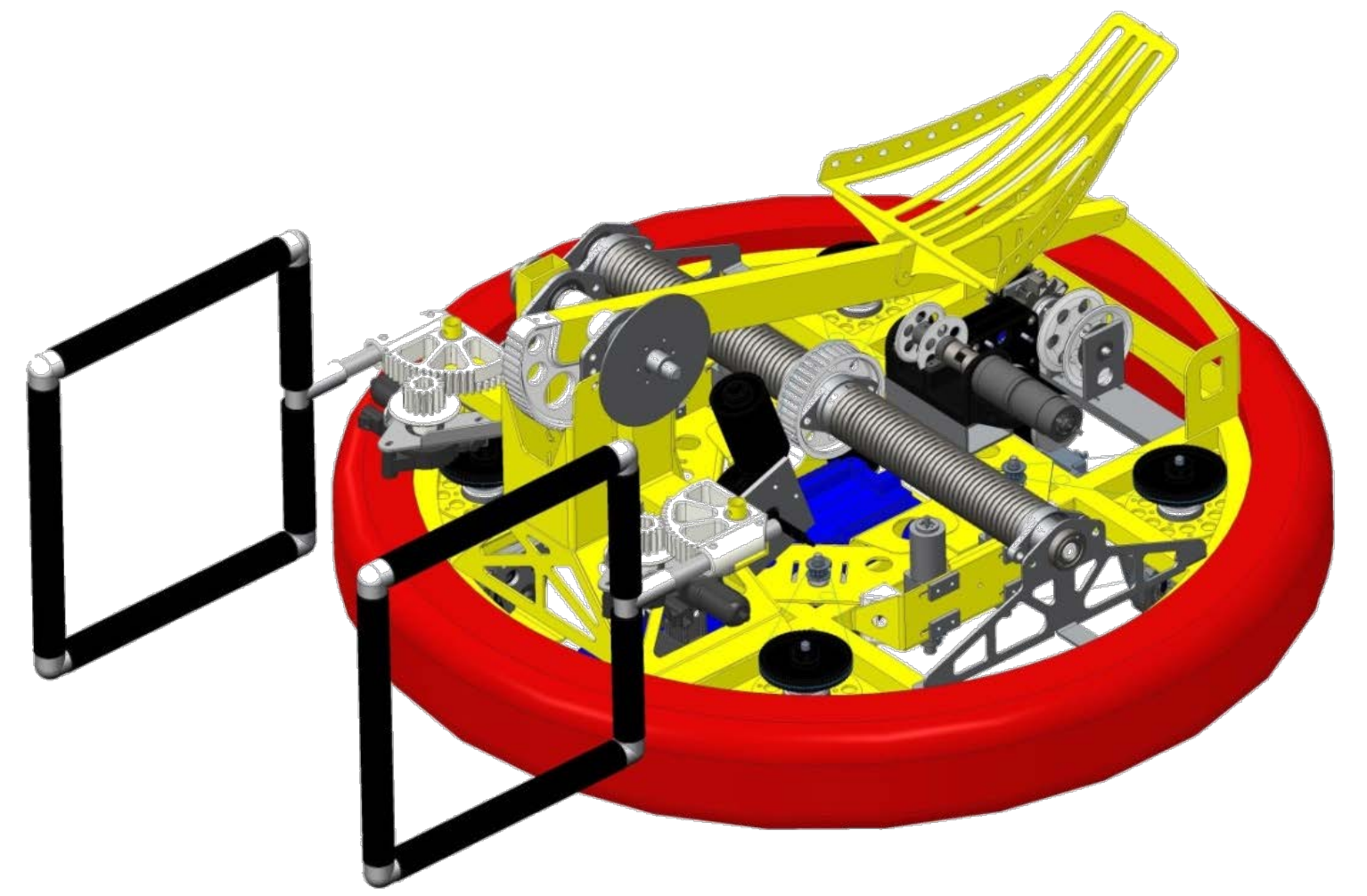
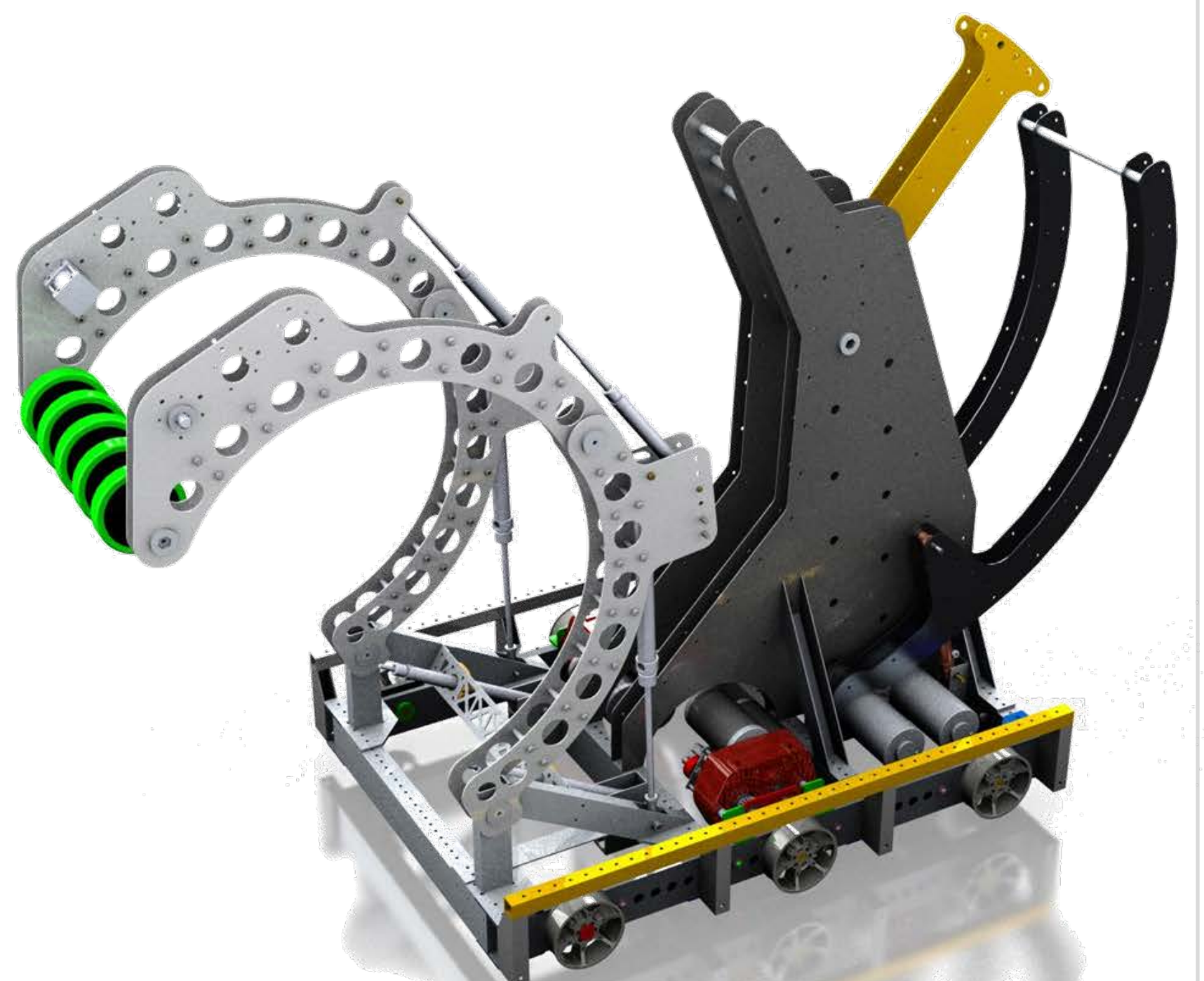
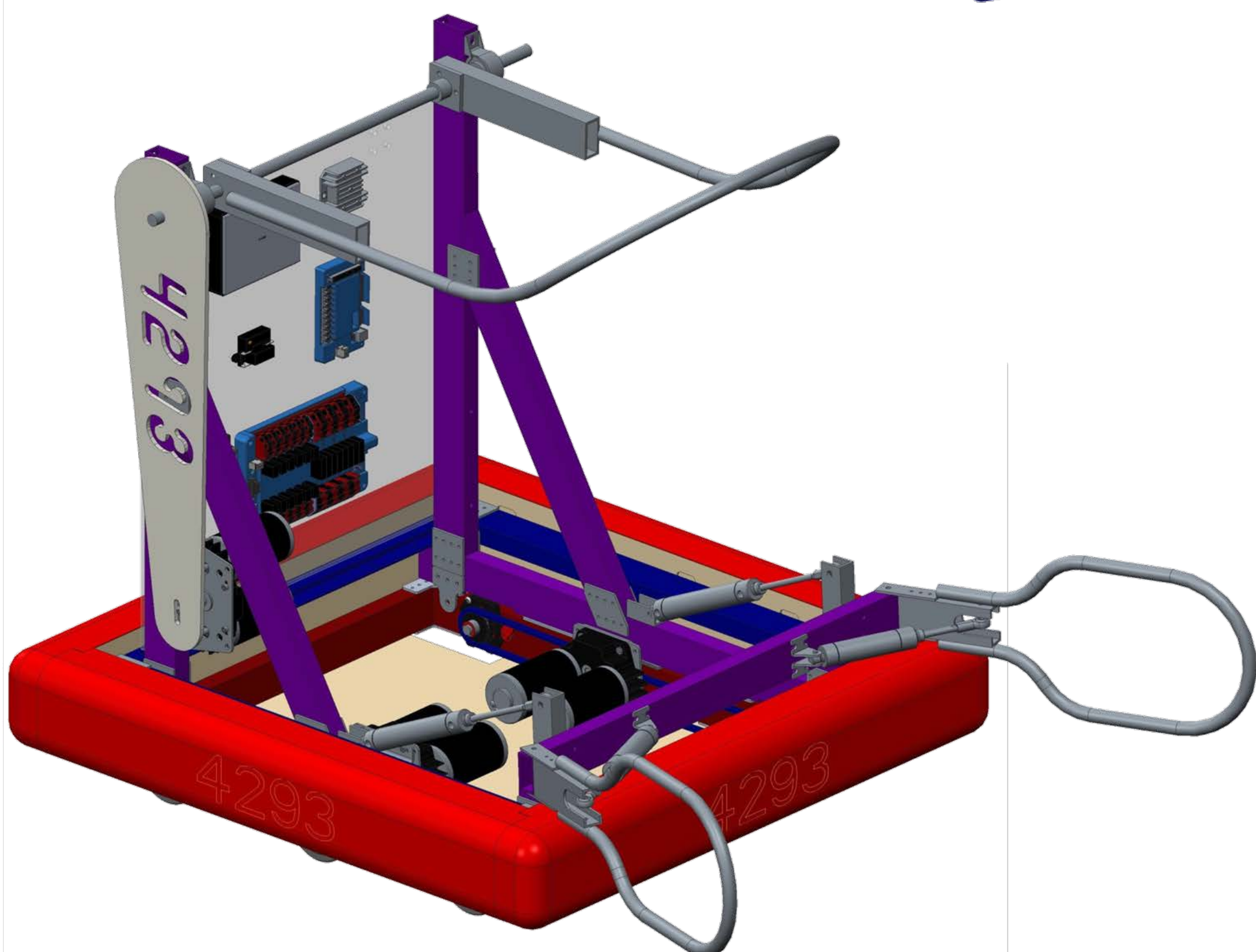


Dynamic Designs

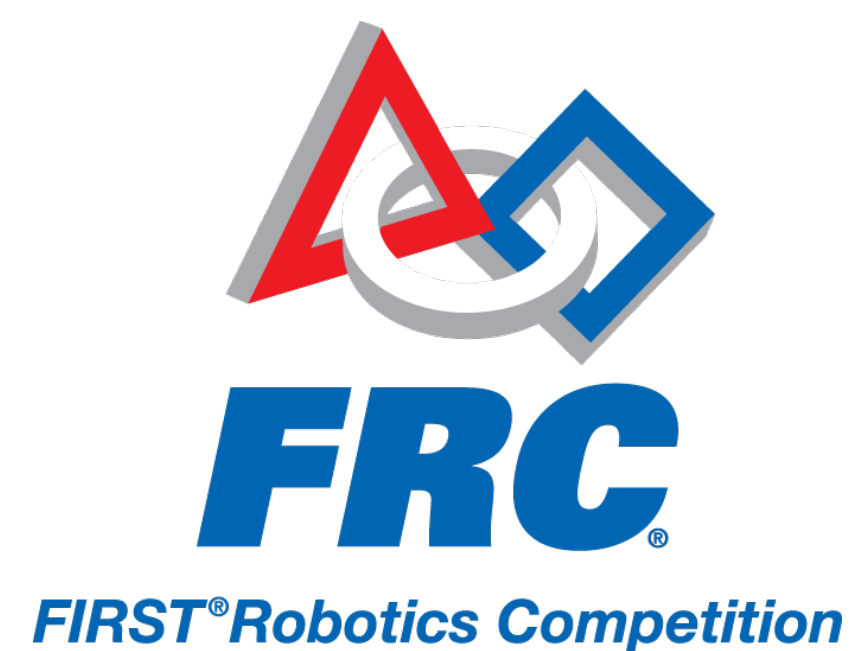
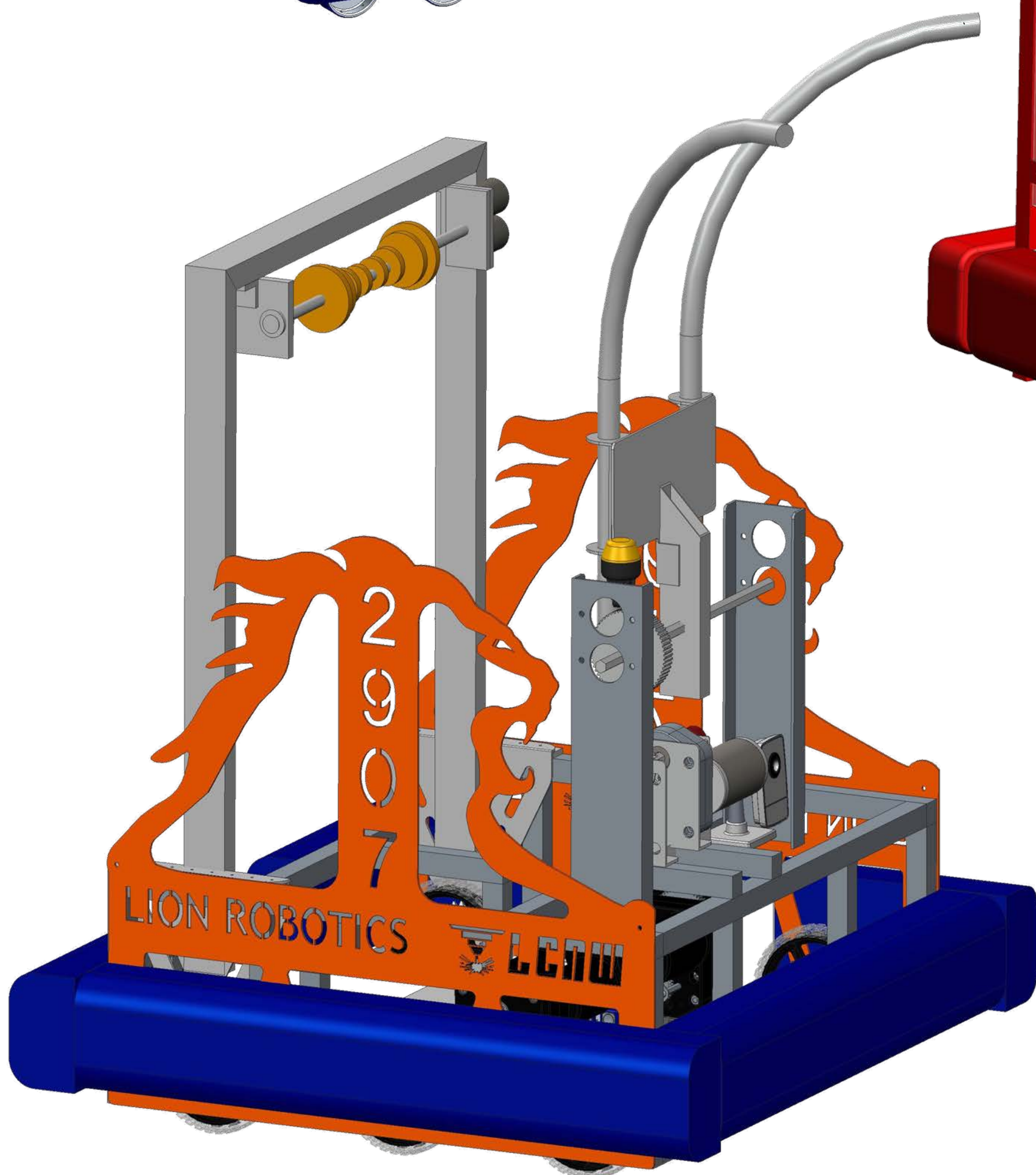


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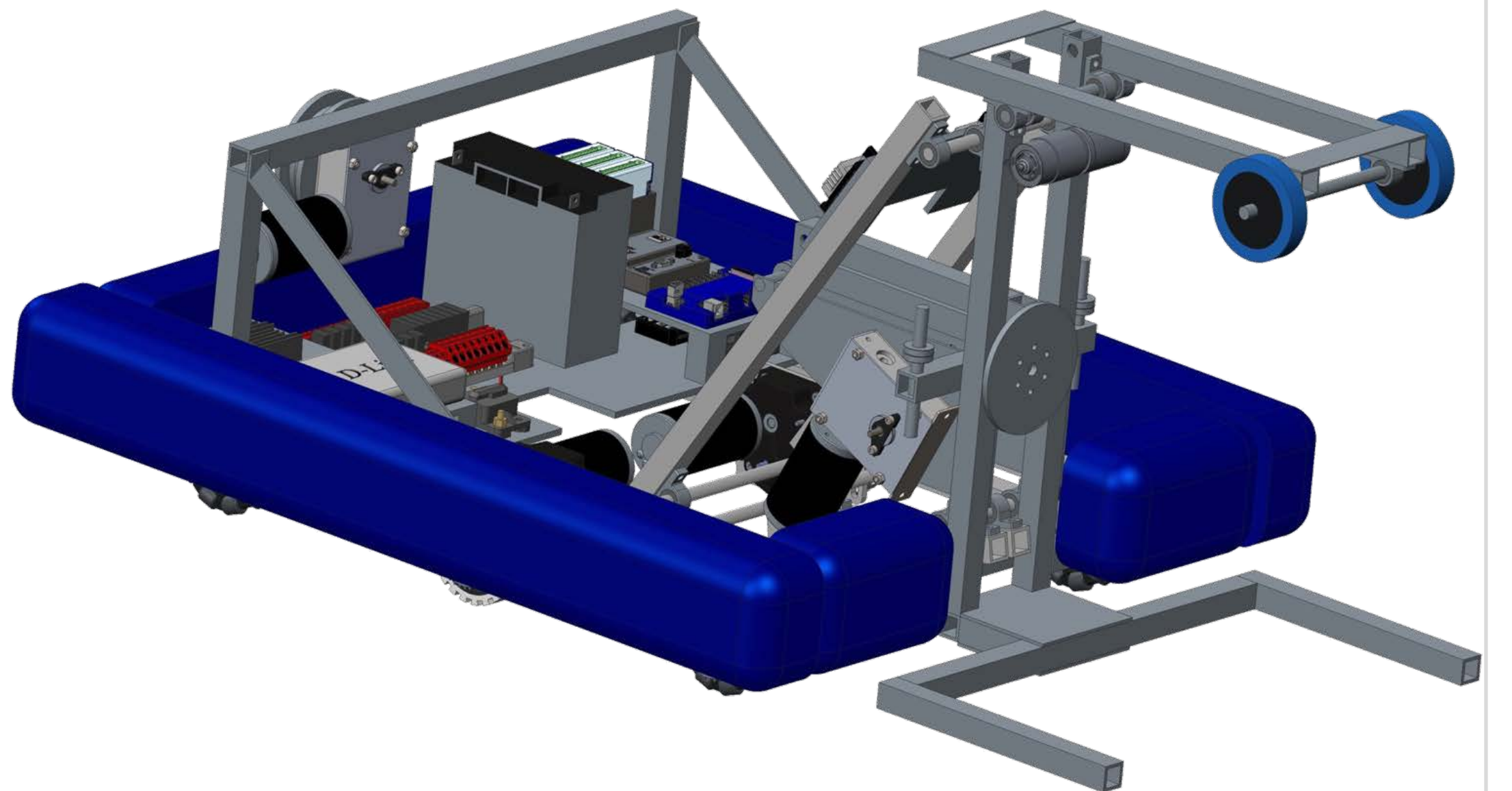
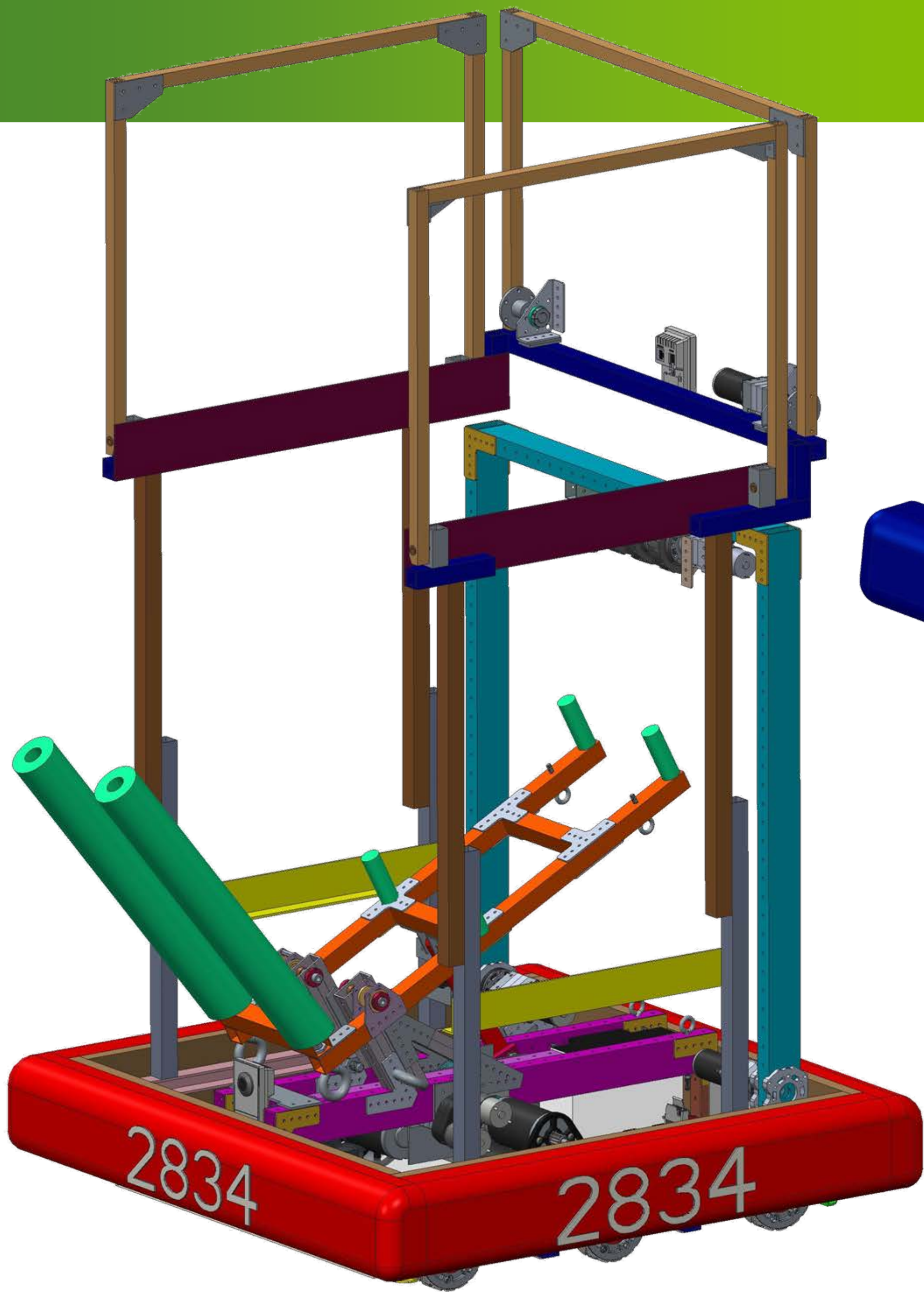


Emerging Engineers

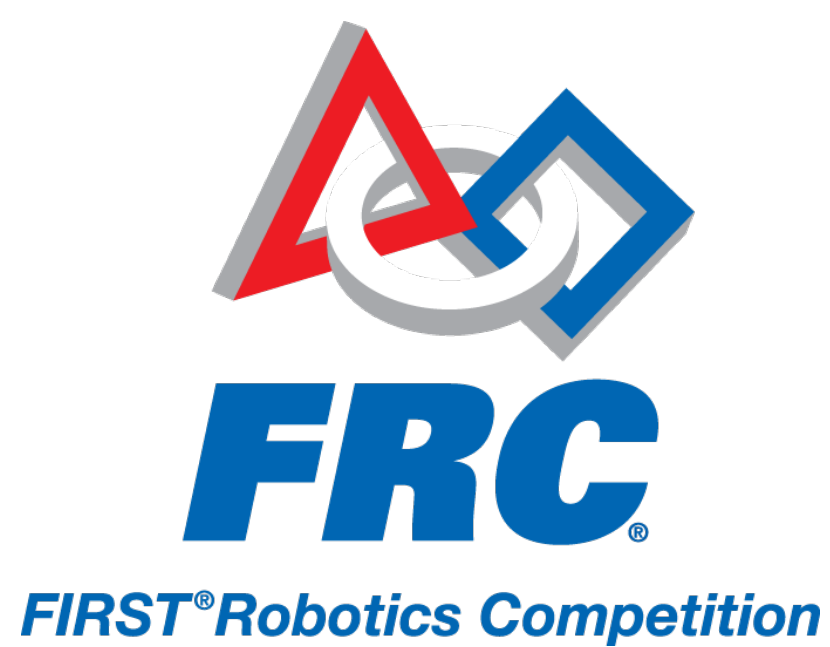
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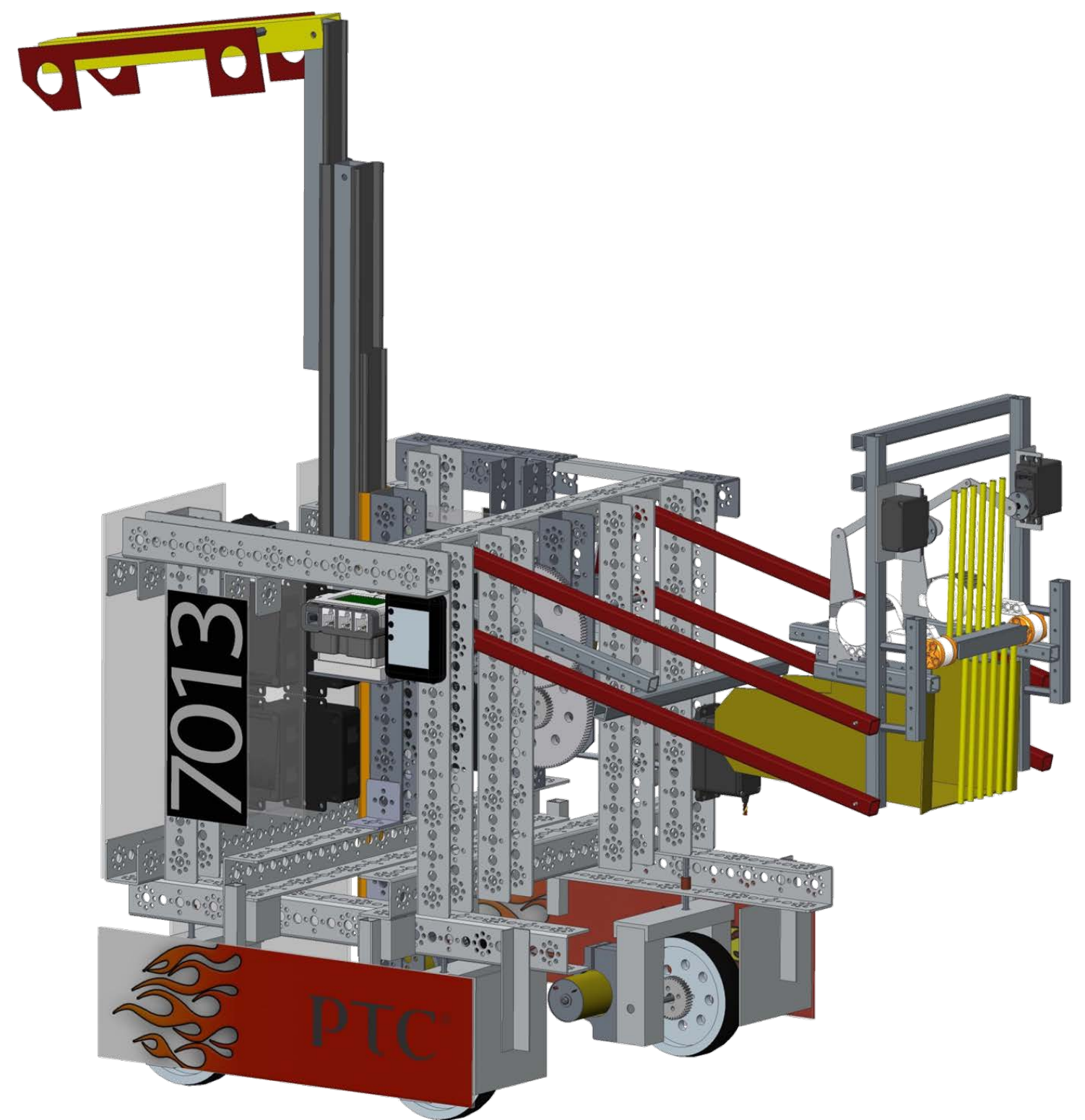
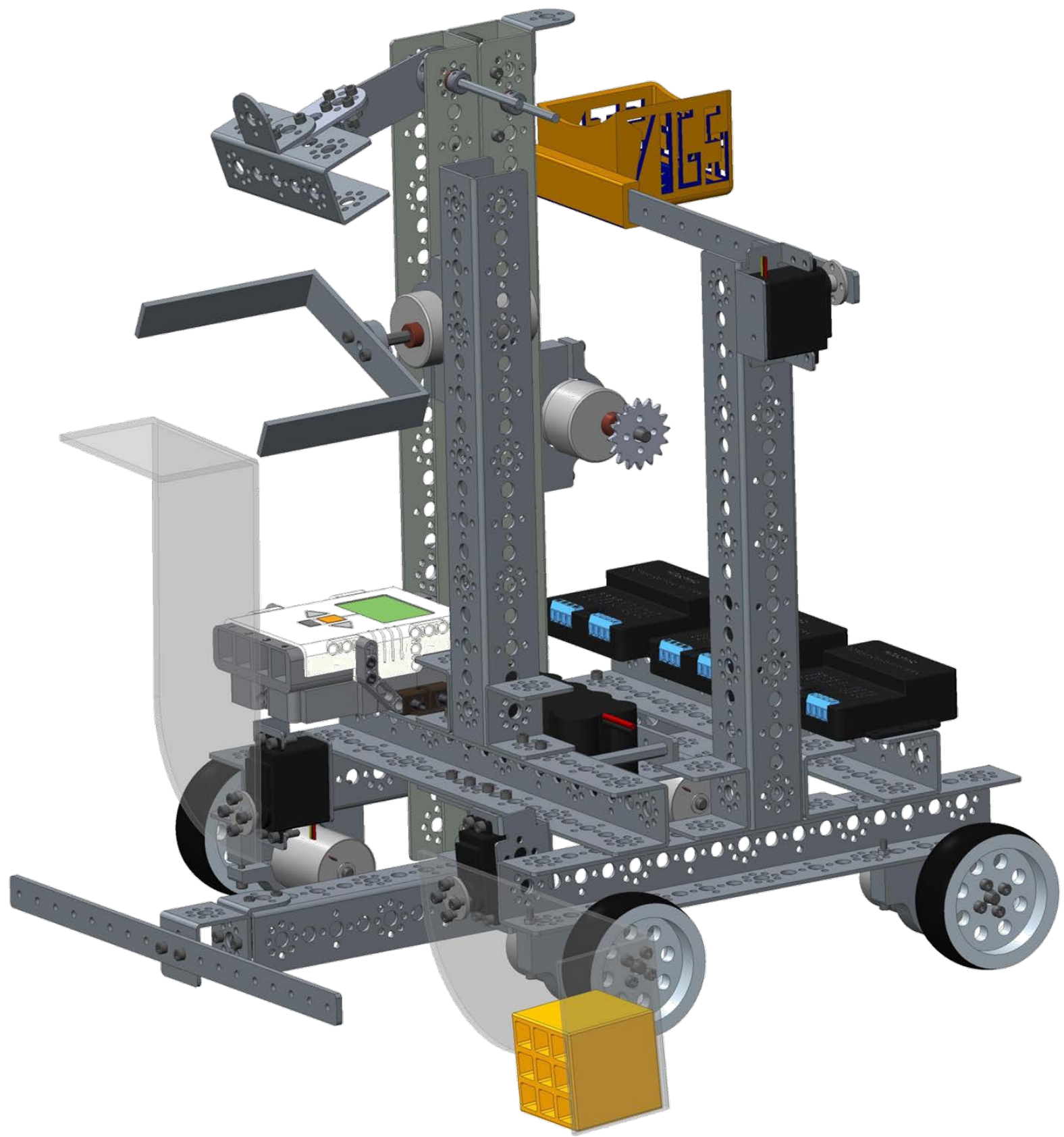
Capturing Creativity



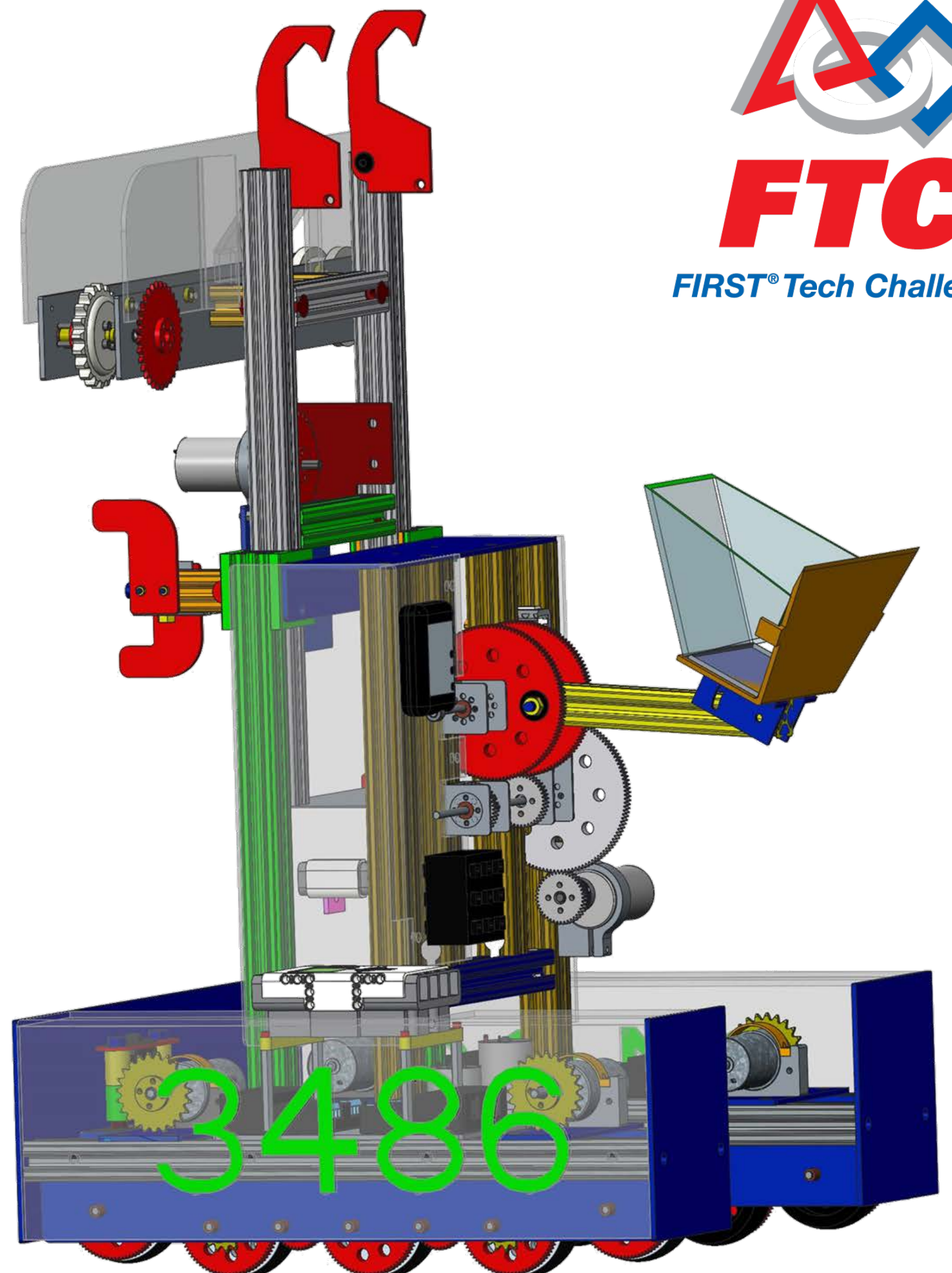
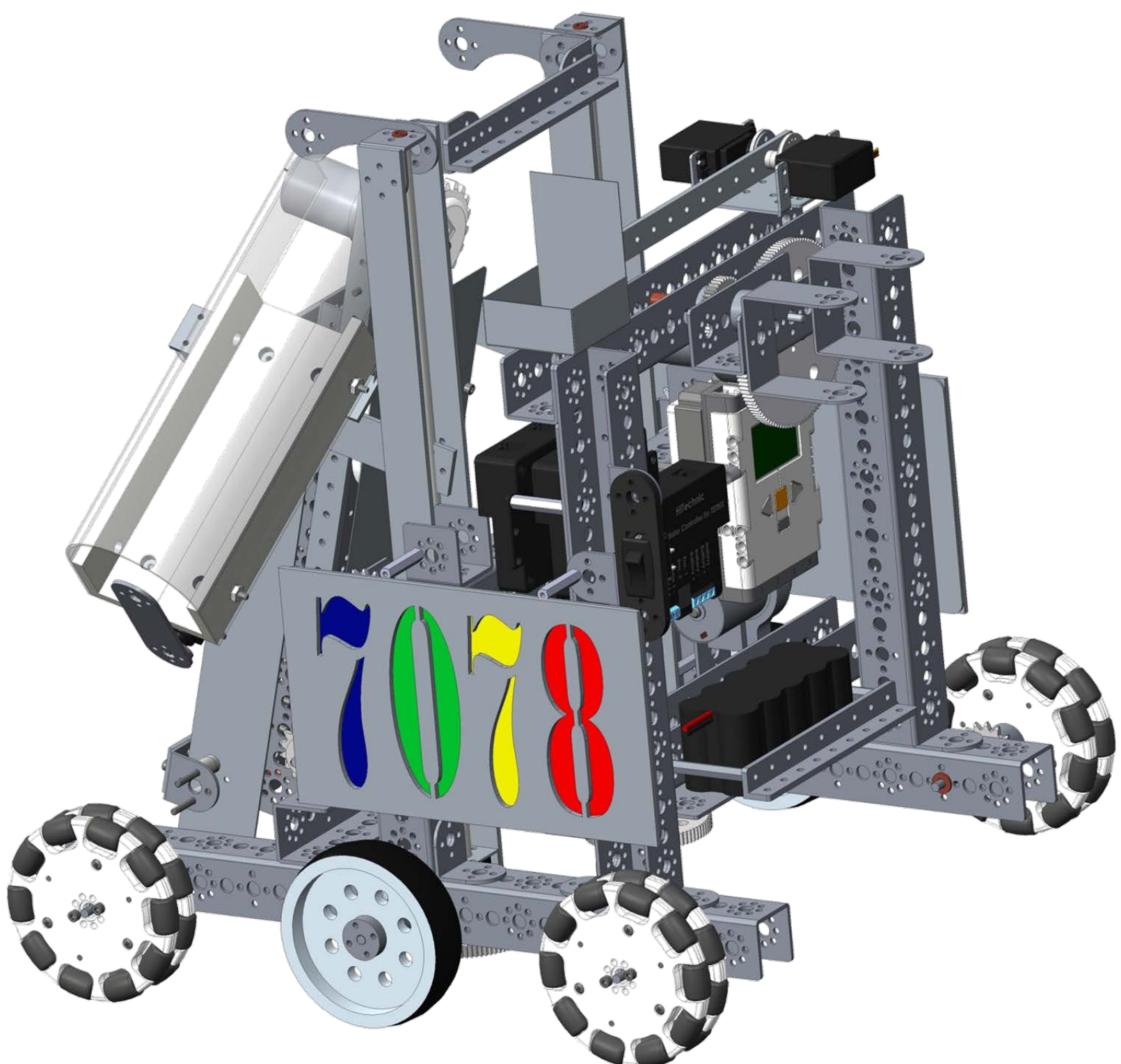
PTC[®] Mathcad[®]



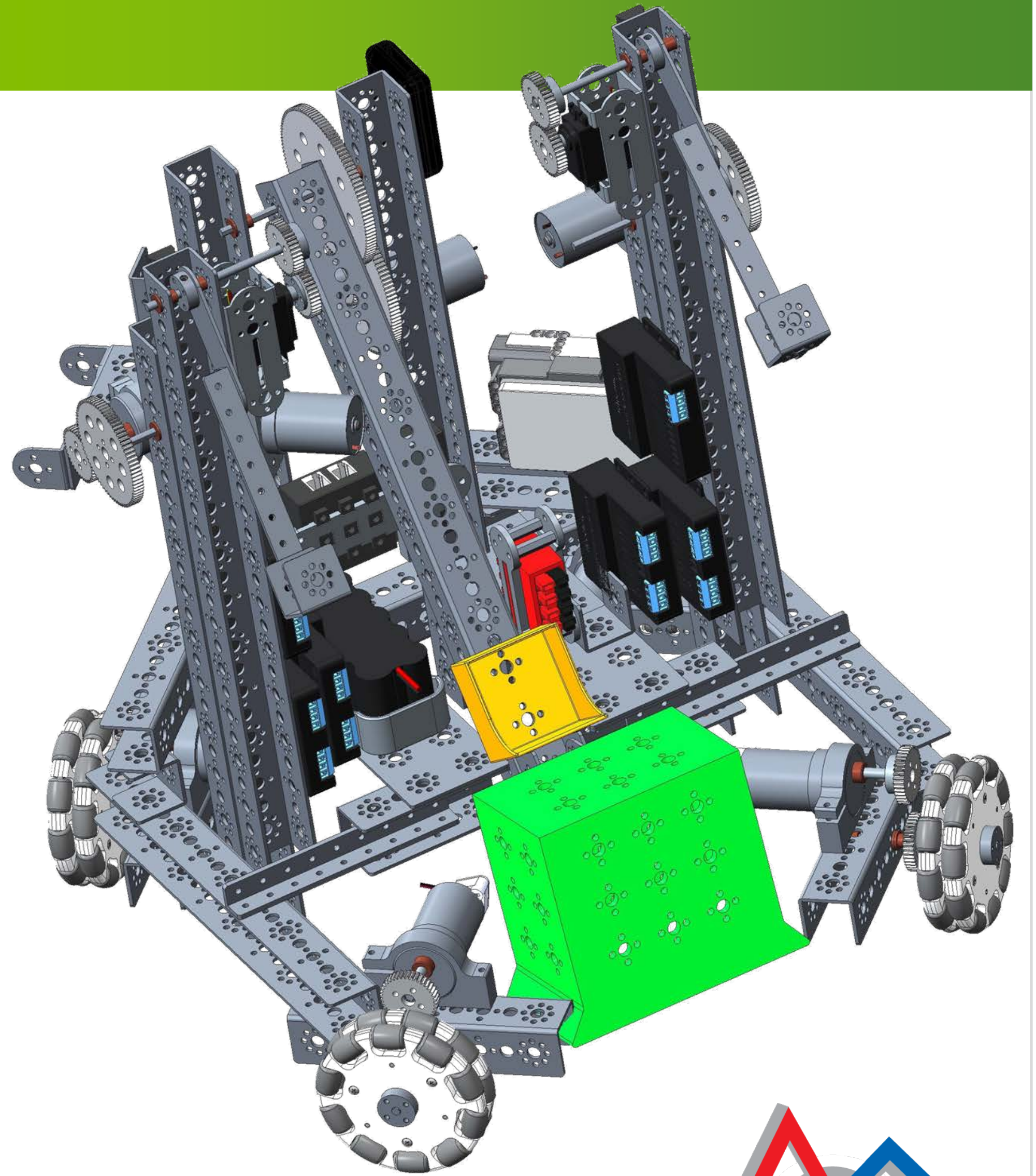
Robotic Rhythm



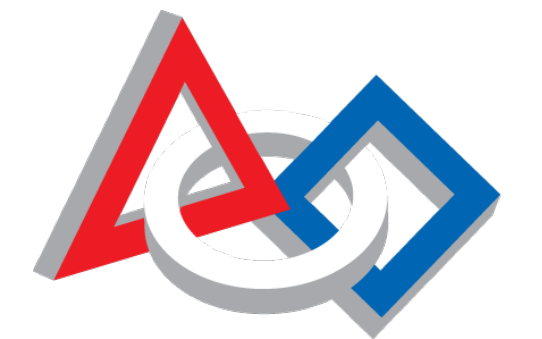
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Student Scientists

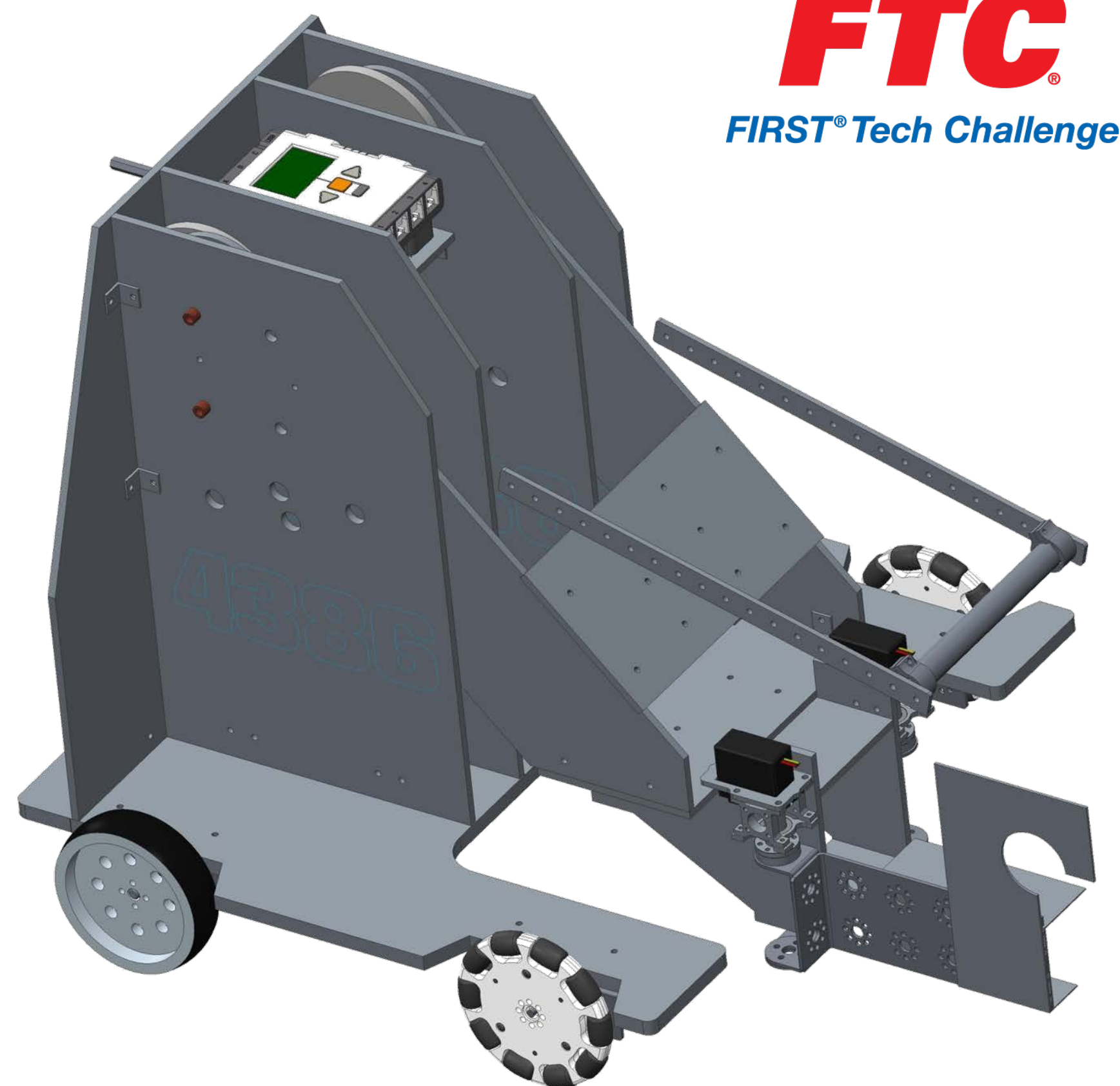
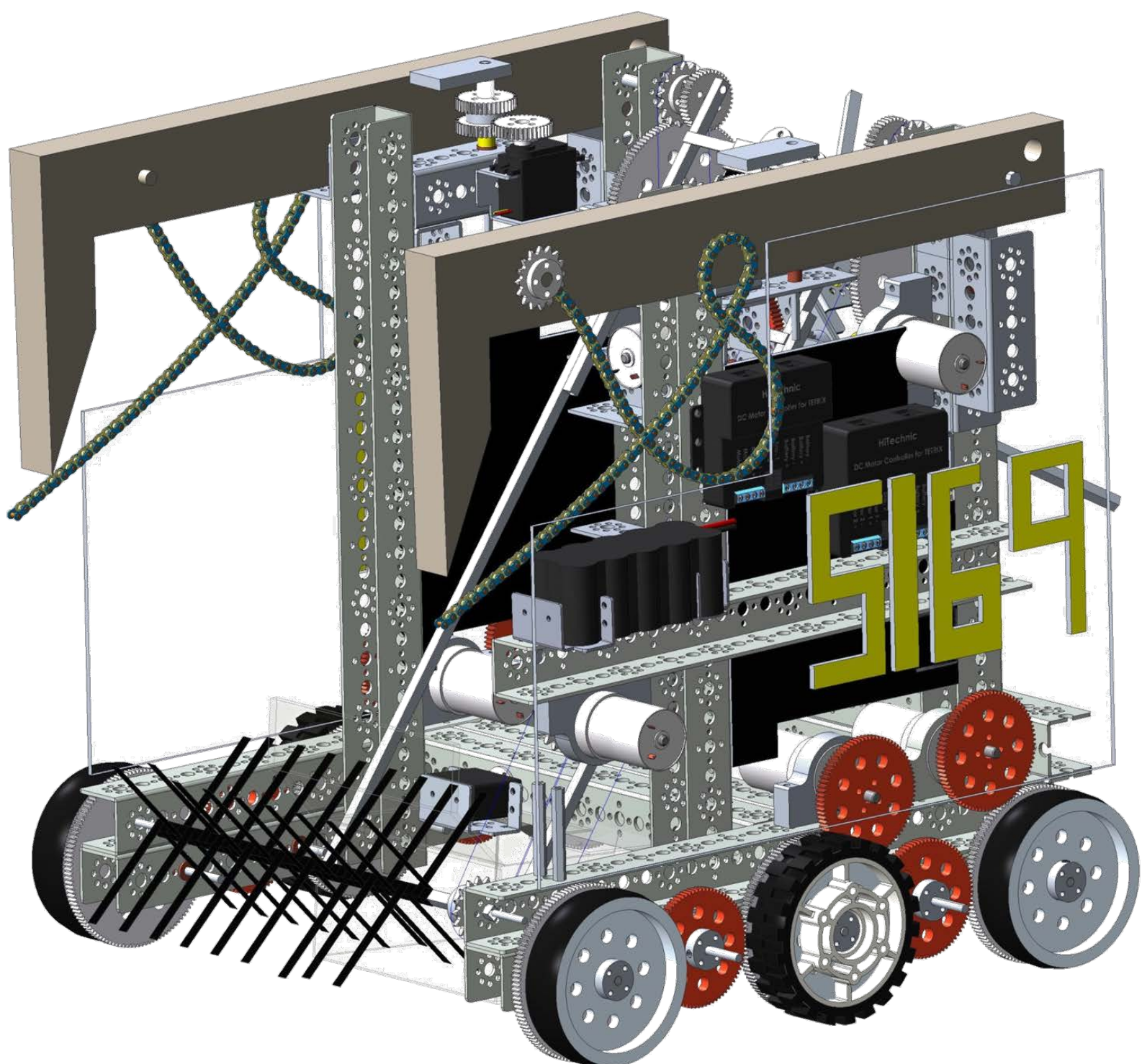


PTC[®] Creo[®] View[™]

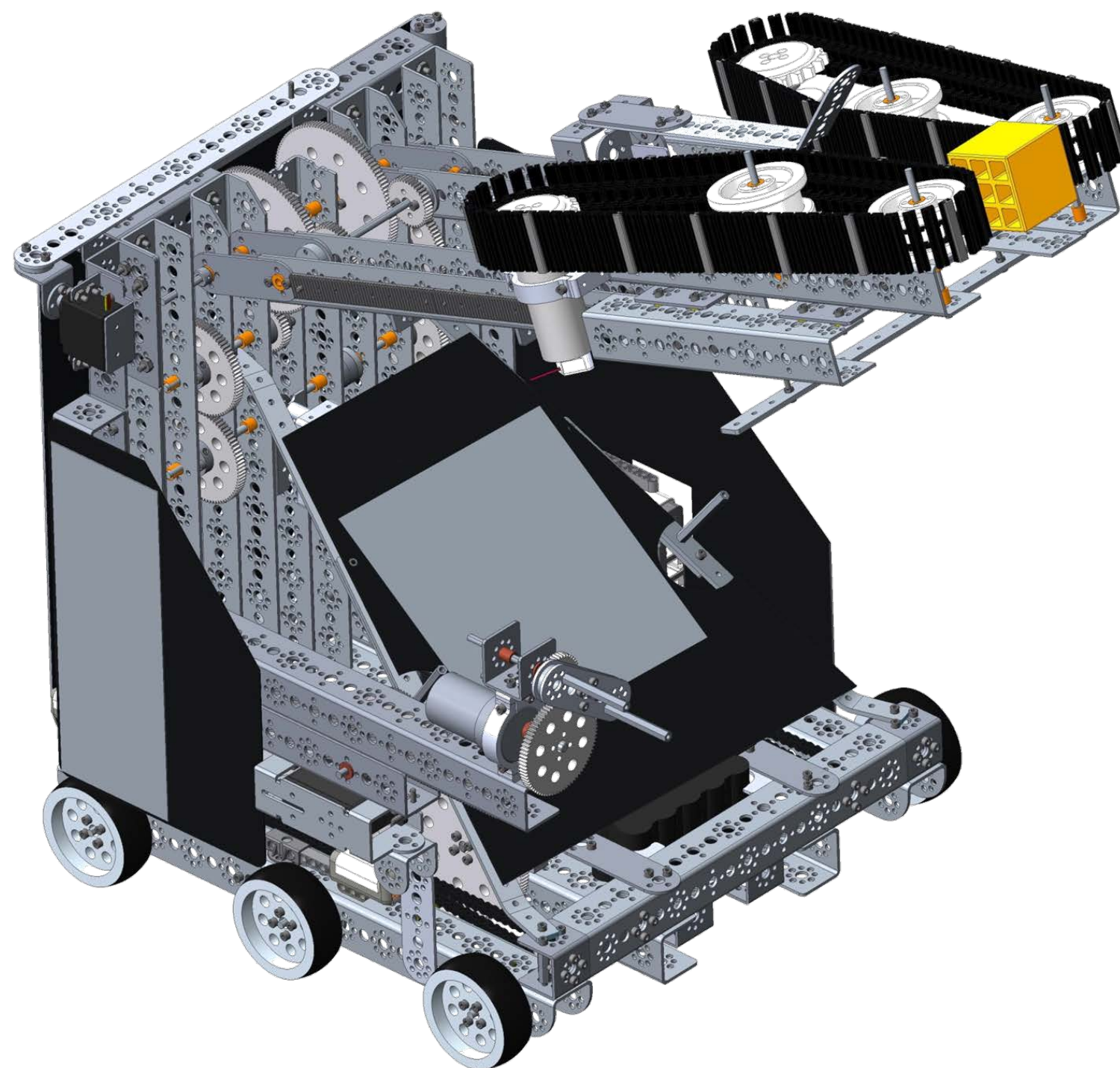
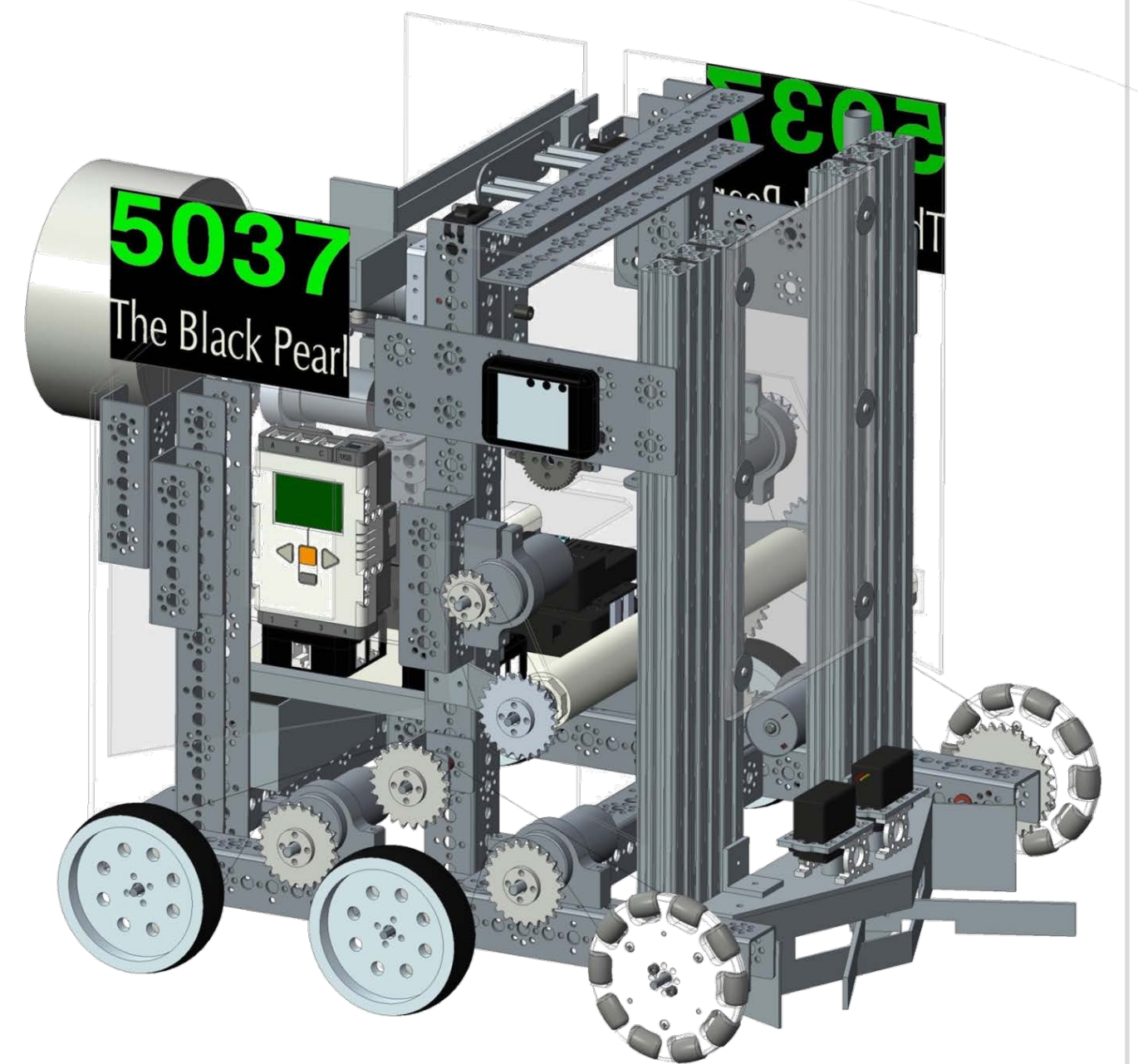
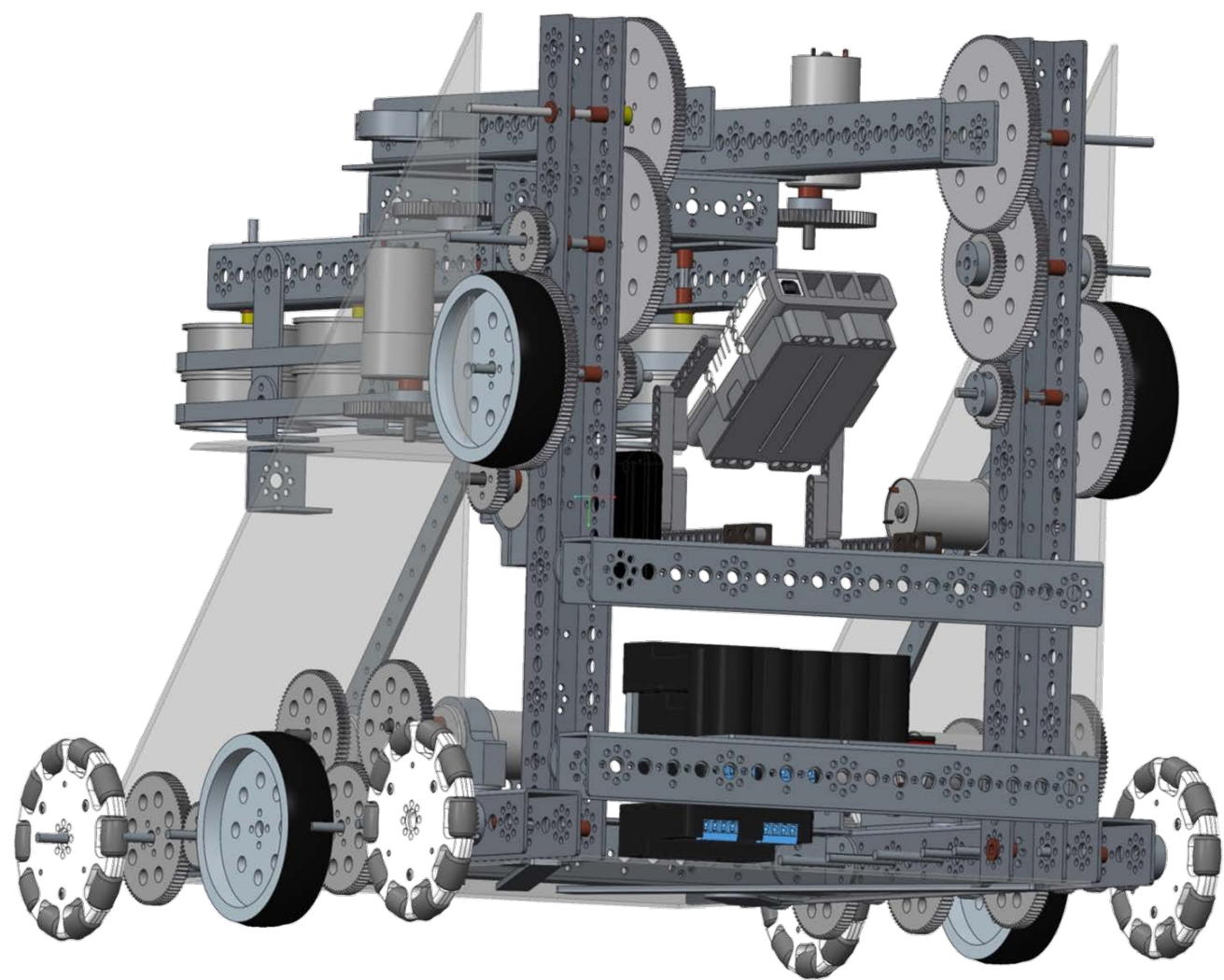


FTC

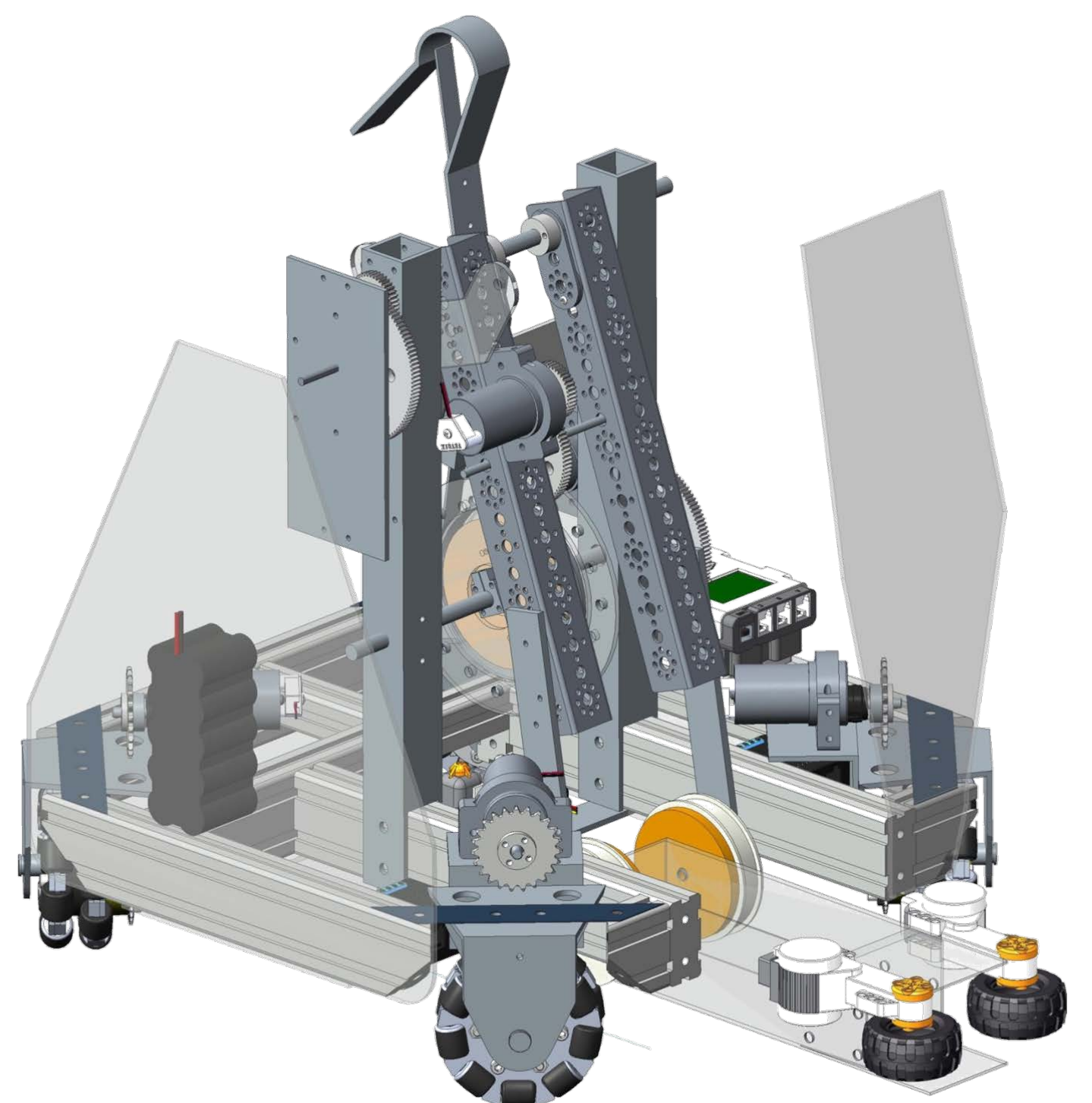
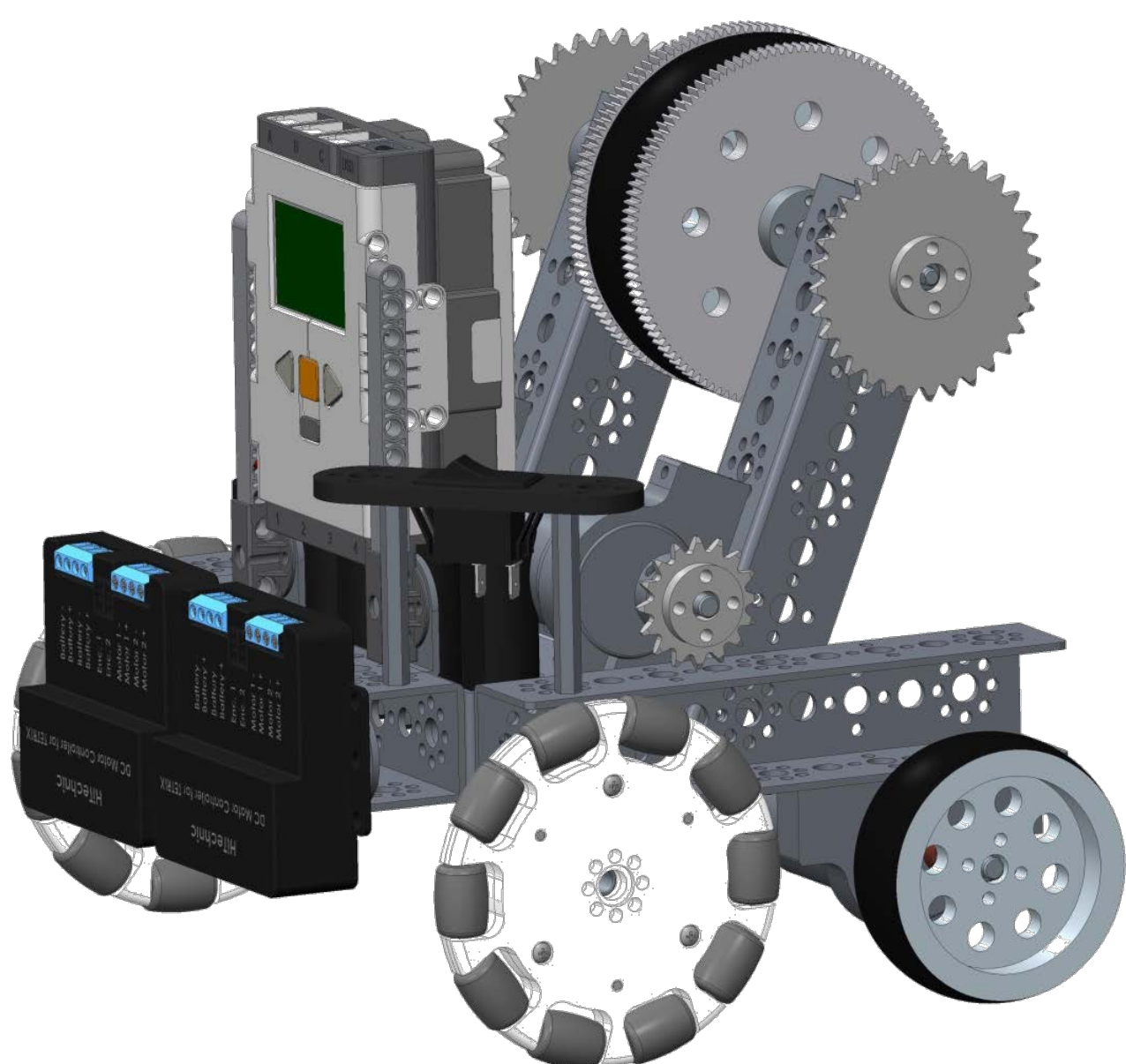
FIRST[®] Tech Challenge



Terrific Technology



PTC[®] Creo[®]



Getting Started

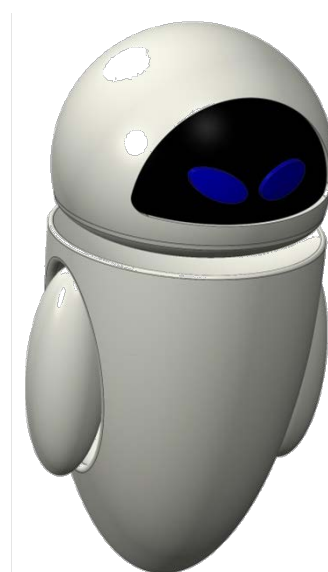
with PTC® Creo®



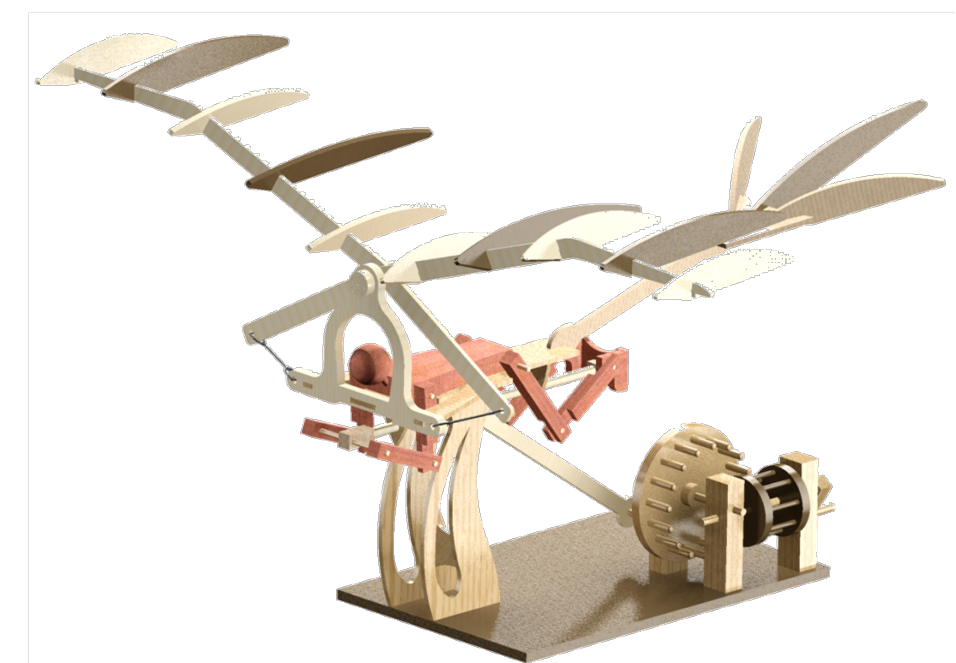
1.0 Navigating solid models



2.0 What are features?



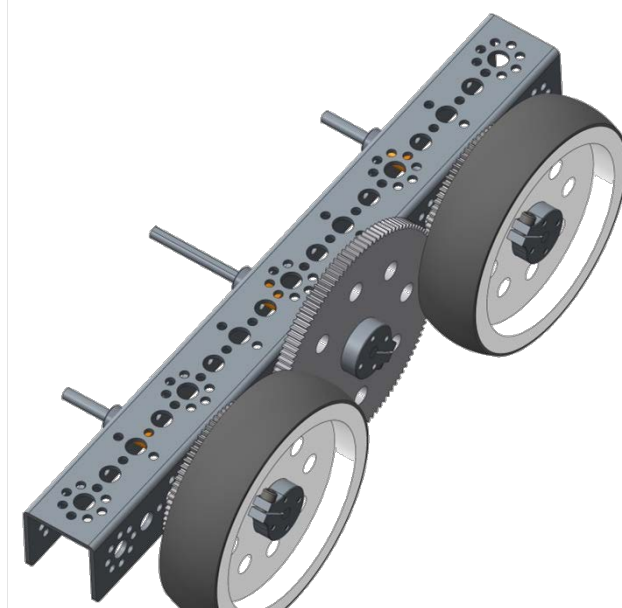
3.0 Analysis & testing



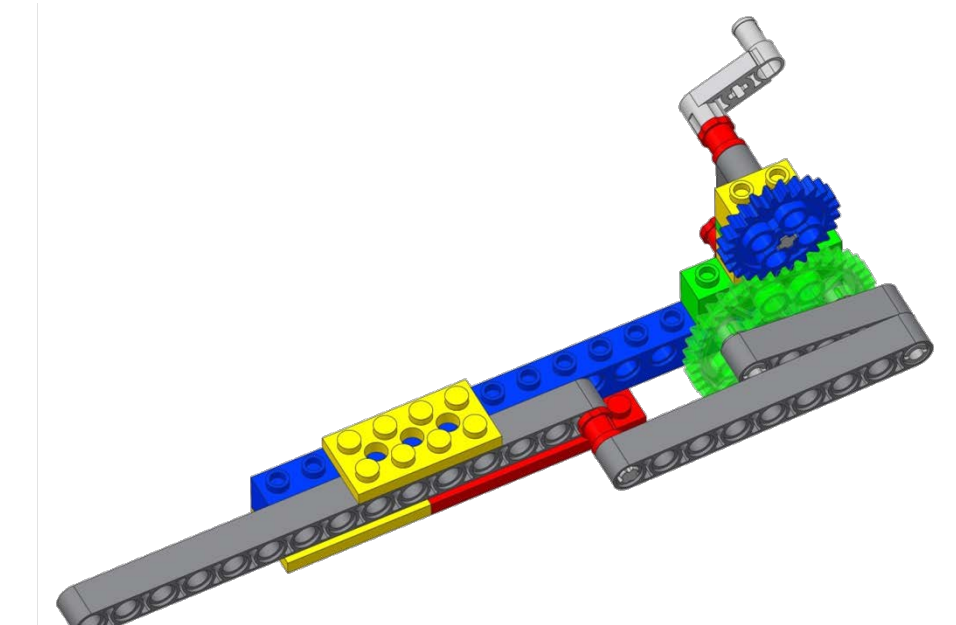
4.0 Assembly constraints



5.0 Kinematics & gear pairs



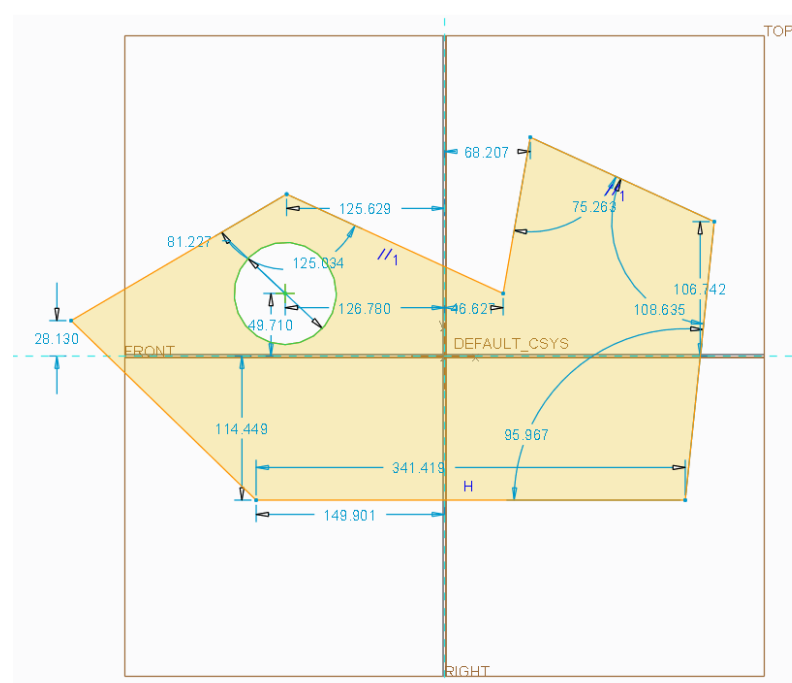
6.0 Building with kits of parts



7.0 Model planning

WING SPAR MODEL PLAN			
Characteristics	Sketches	Operation	Notes
Orientation			Based on the orientation, we will be using the RIGHT Plane to create the initial sketch of the profile.
Sketch 1 and Extrude			Based on the orientation, we will create the first sketch on the RIGHT Plane. Defining the profile, we will use an extrude feature to create the solid form. To get the proper orientation, we need to sketch the profile along the TOP Plane. This will define the proper views.

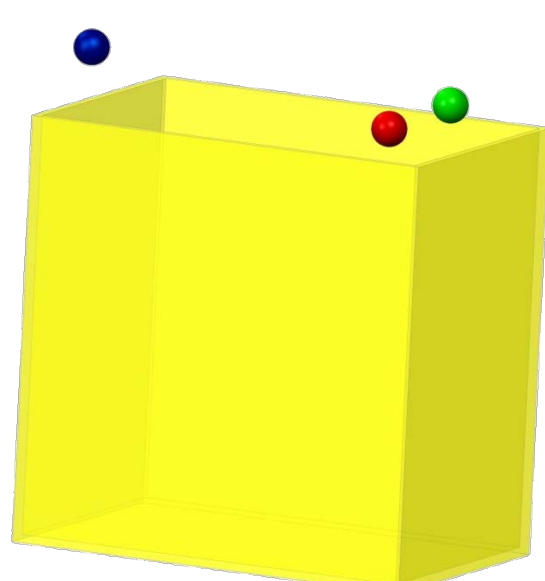
8.0 Sketching



9.0 Creating custom part models



10.0 Simulation



11.0 Data collection



12.0 Integrating Mathcad

Homework set #1:
Designing your own automobile suspension

Objectives:

- To learn how to use ordinary differential equations to model an automobile suspension and to design the suspension for a specified performance.
- To bridge the gap between mathematics and real applications.

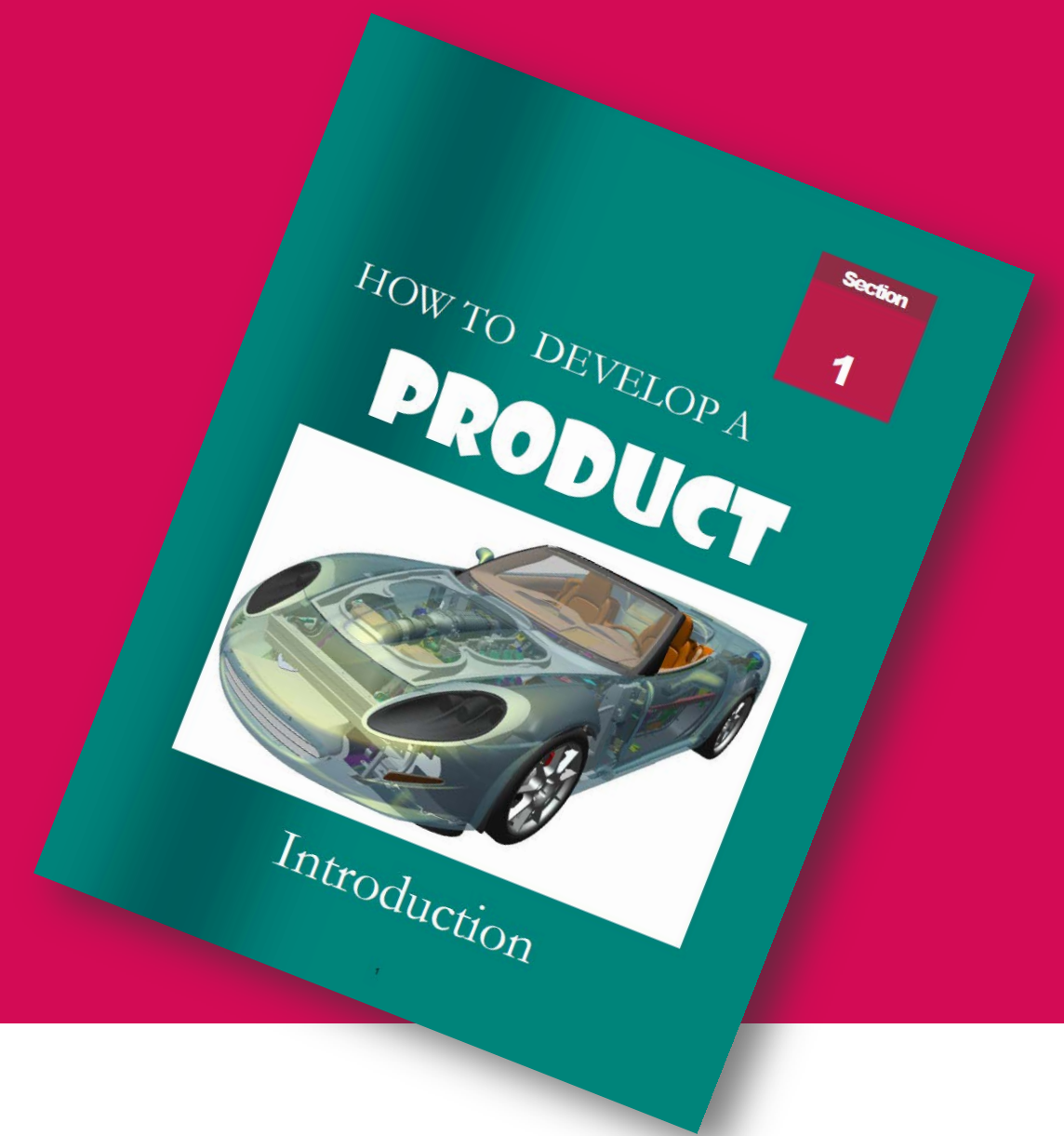
Description:
The suspension of a car can be modeled as a simple mass-spring-dashpot system. Assuming that the mass of the car can be lumped into a single mass and the springs and shock absorbers can be lumped as well into single units, the vehicle system can be simplified into a system with one mass, one dashpot (shock absorber), and one spring as shown.

Where: M = Mass of the car, C = viscous damping in the suspension, and K = the springs in the suspension system. Doing a sum of forces produces the following equation:

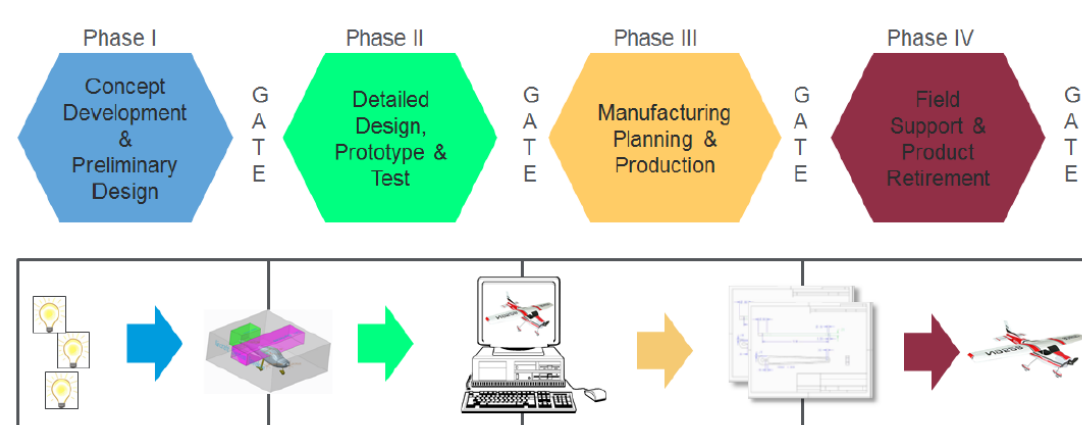
$$\sum F = Ma = M \frac{d^2}{dt^2} x(t) + C \frac{dx}{dt}(t) + Kx(t)$$

Designing a Robot

Using Real World Product Development Techniques



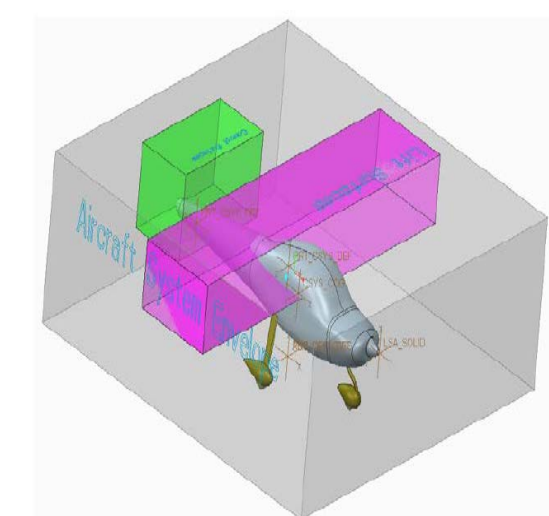
1.0 The product development process



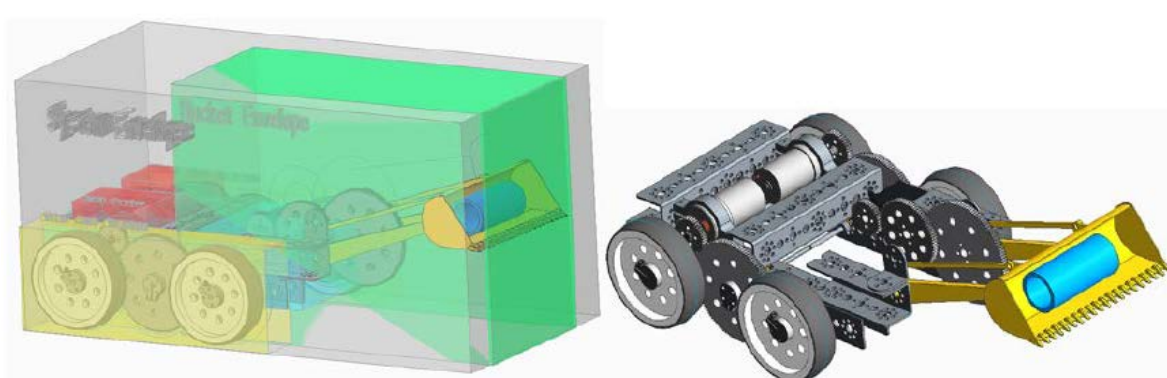
2.0 Project planning

Phase I: Concept Development and Preliminary Design	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6
Creating the project plan	Kari					
Defining system requirements	Jeff					
Modeling the system envelope	Jeff					
Modeling the subsystem envelopes	John, Sandy, Aaron, Dale					
Selecting technologies	John, Sandy, Aaron, Dale					
Documentation	Ralph					
Gate Check: design review	Larry & David					

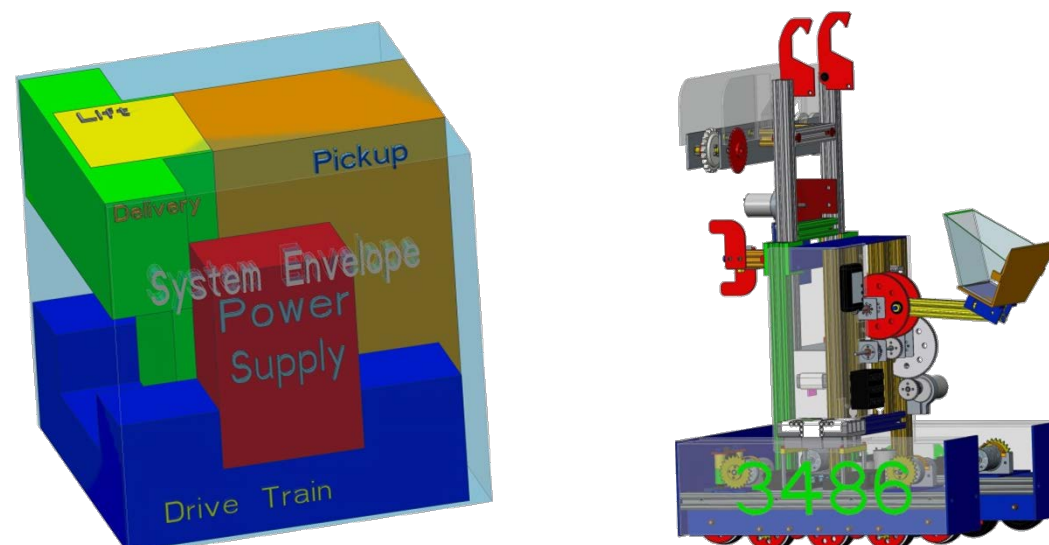
3.0 System requirements



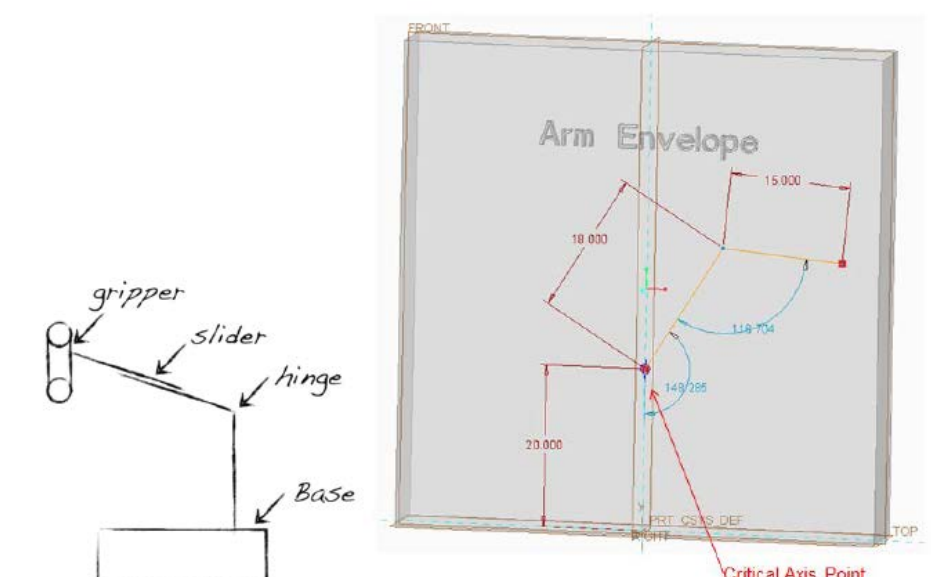
4.0 System envelope



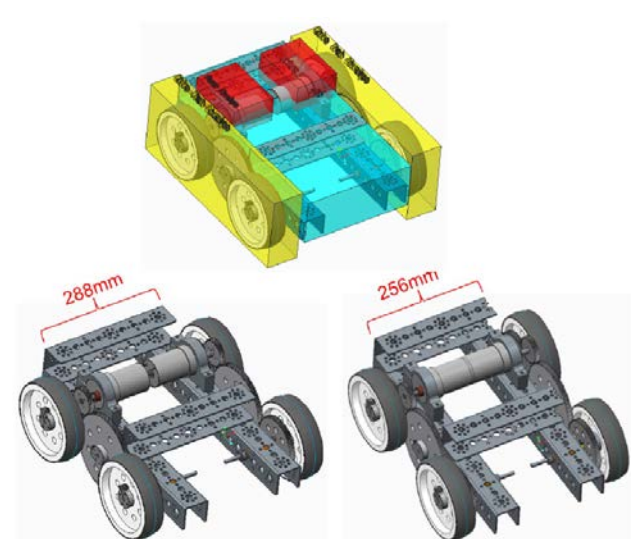
5.0 Subsystem envelopes



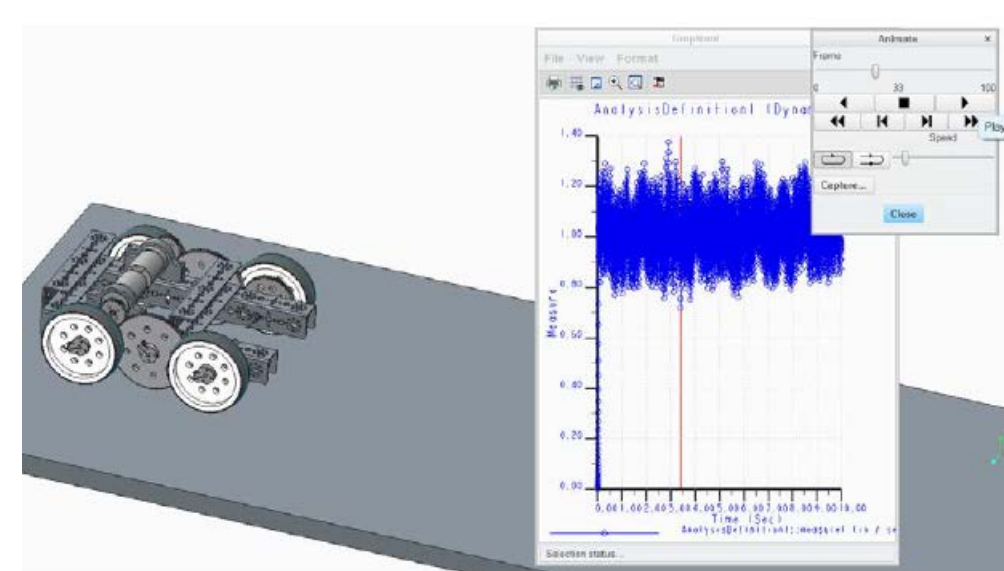
6.0 Proof of concept models



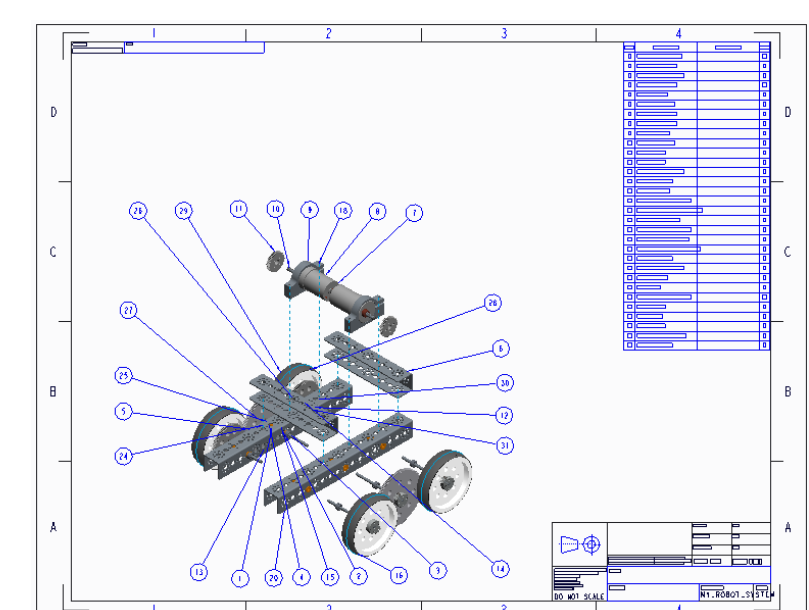
7.0 Detailed design & associativity



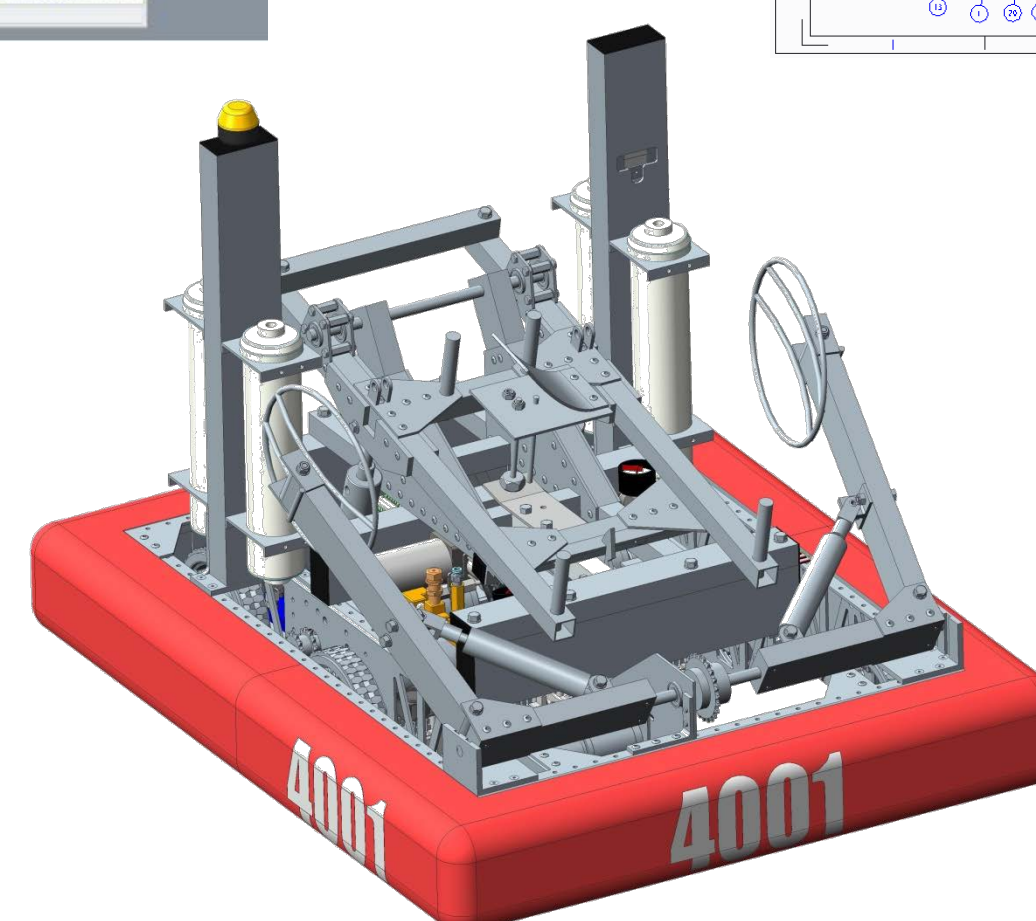
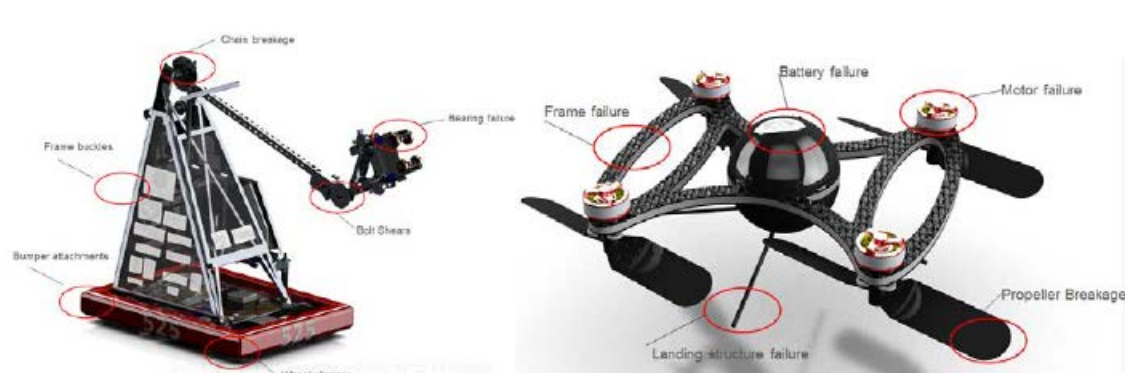
8.0 Simulation and model validation



9.0 Exploded drawings & assembly plans



10.0 Failure modes and effects analysis

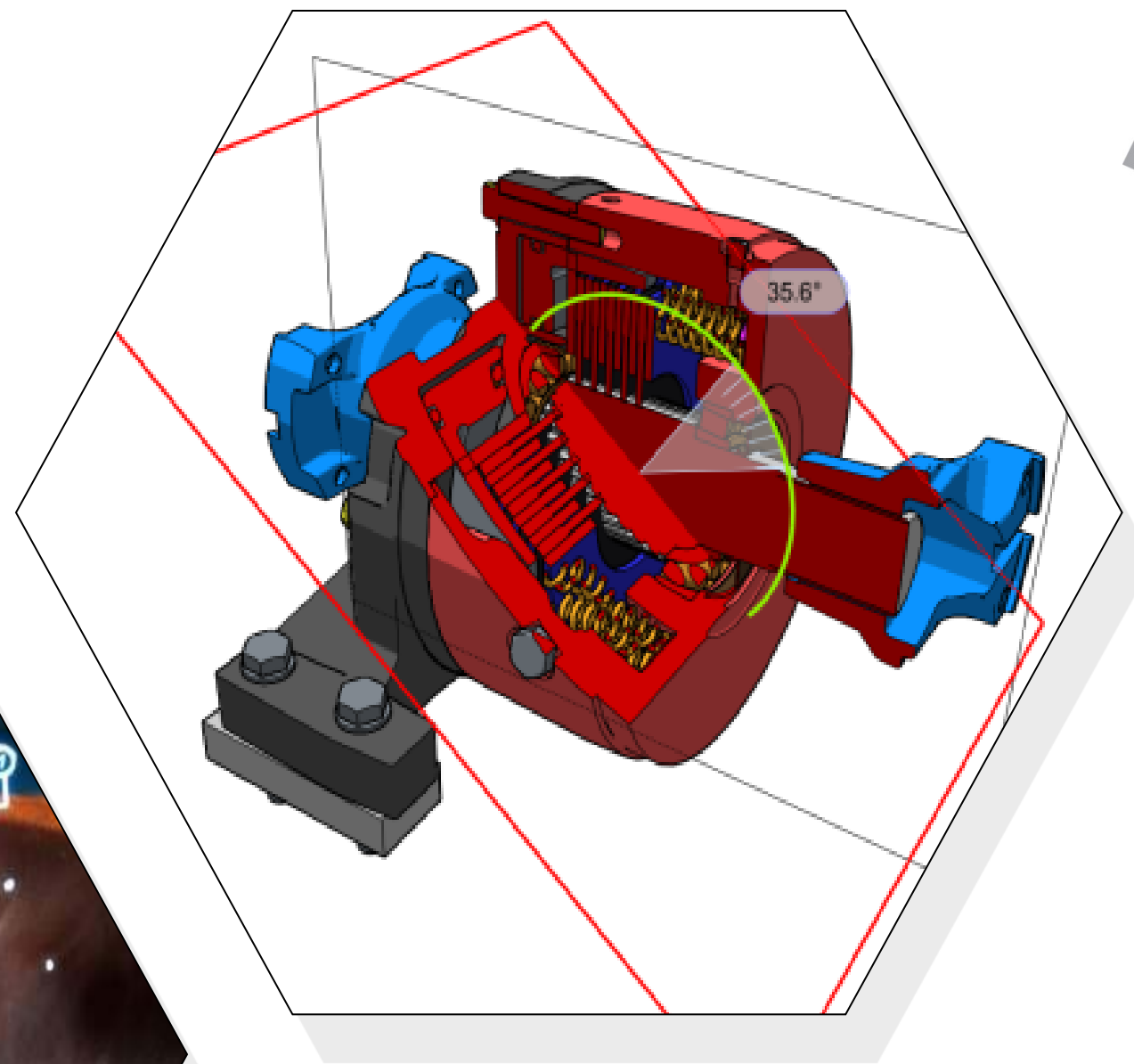


Creating Engineers

Software Grants



Online Training



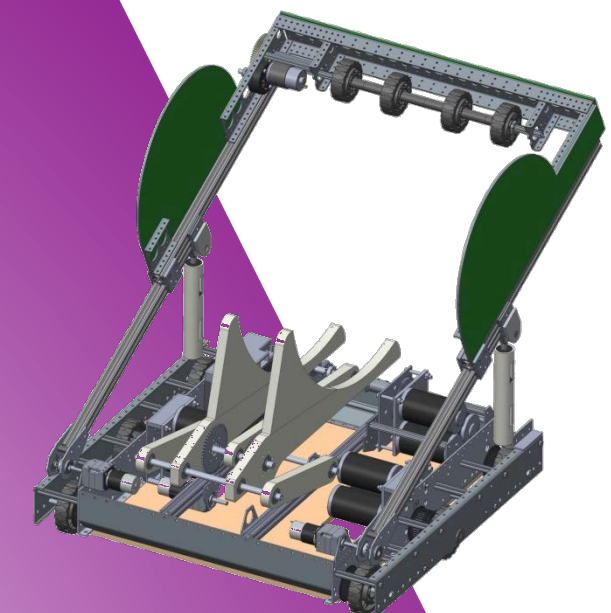
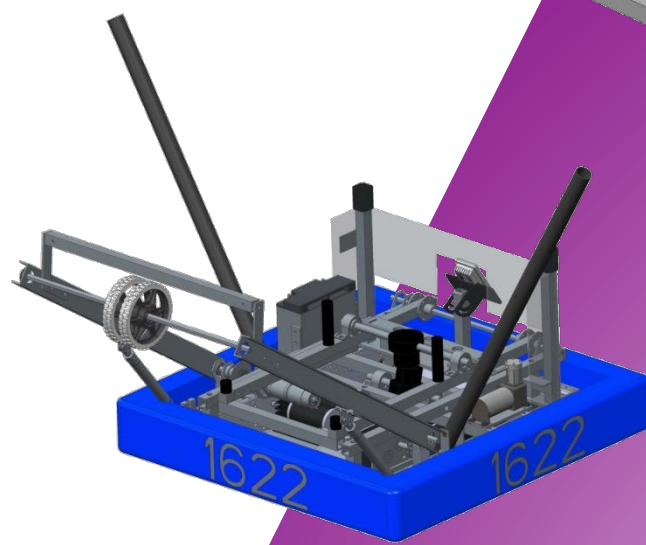
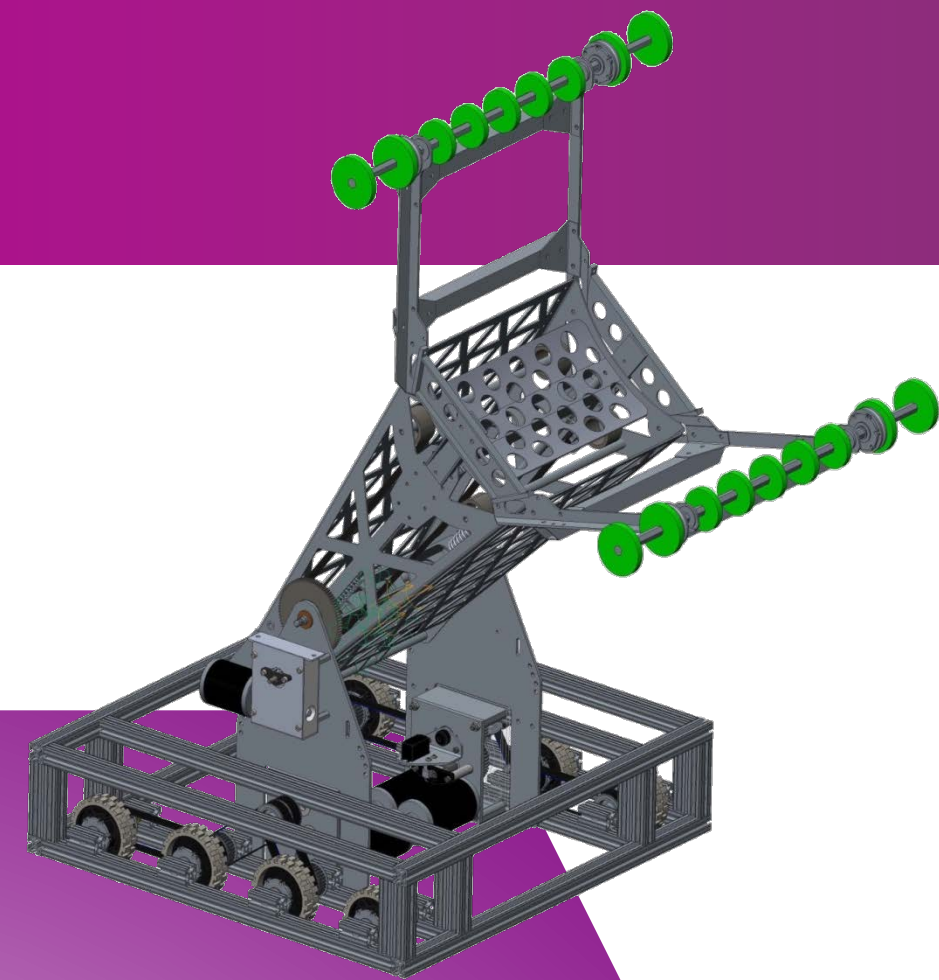
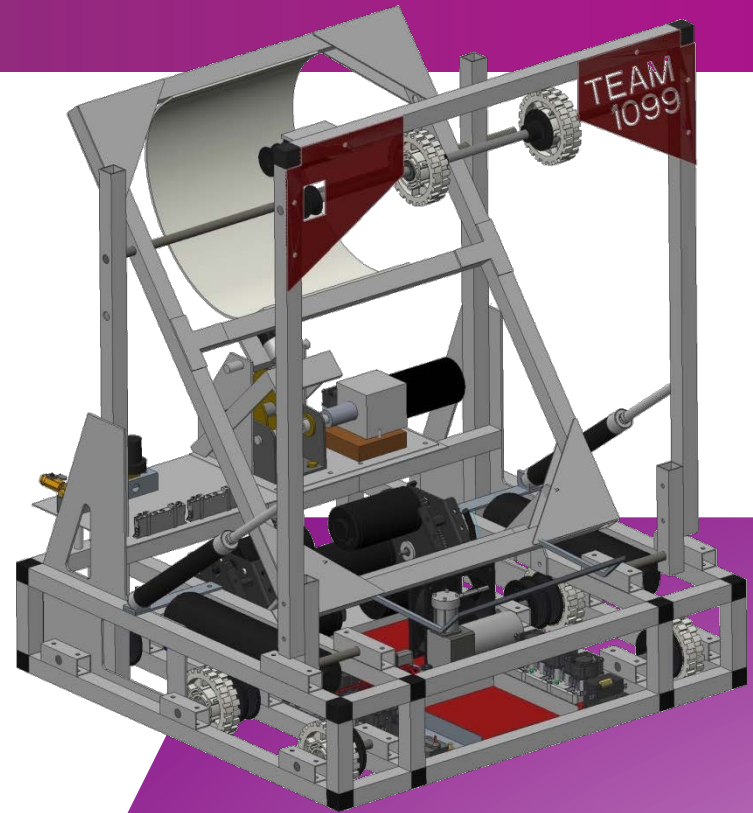
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Team Grants

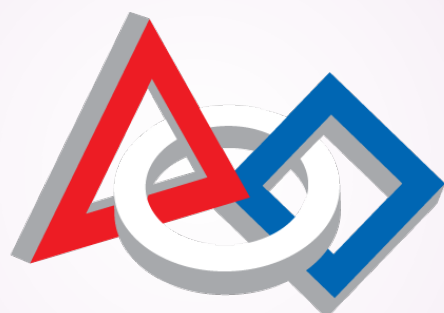


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Mechatronic Marvels

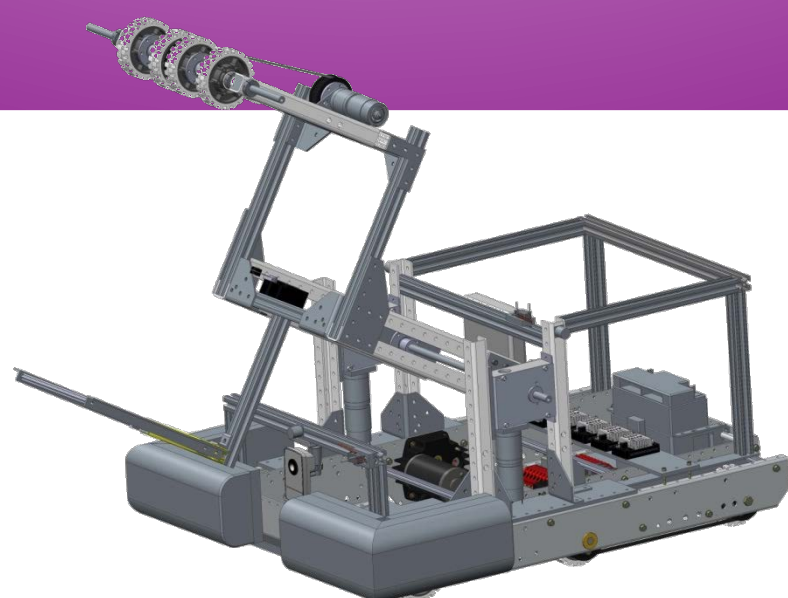
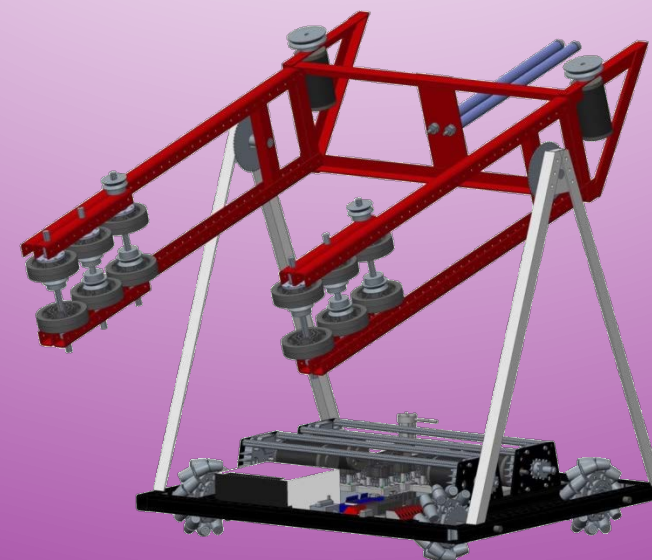
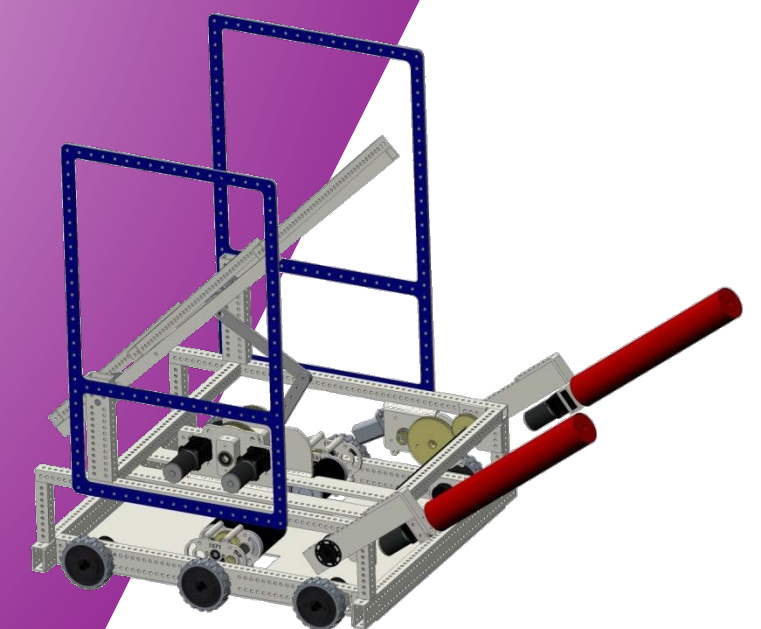
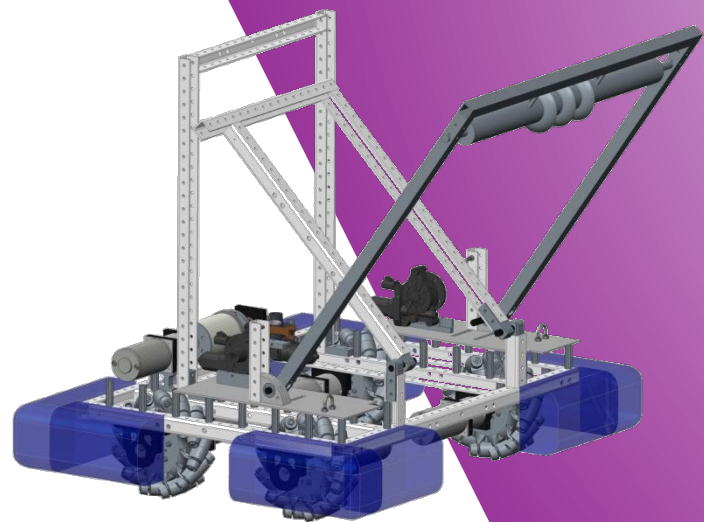
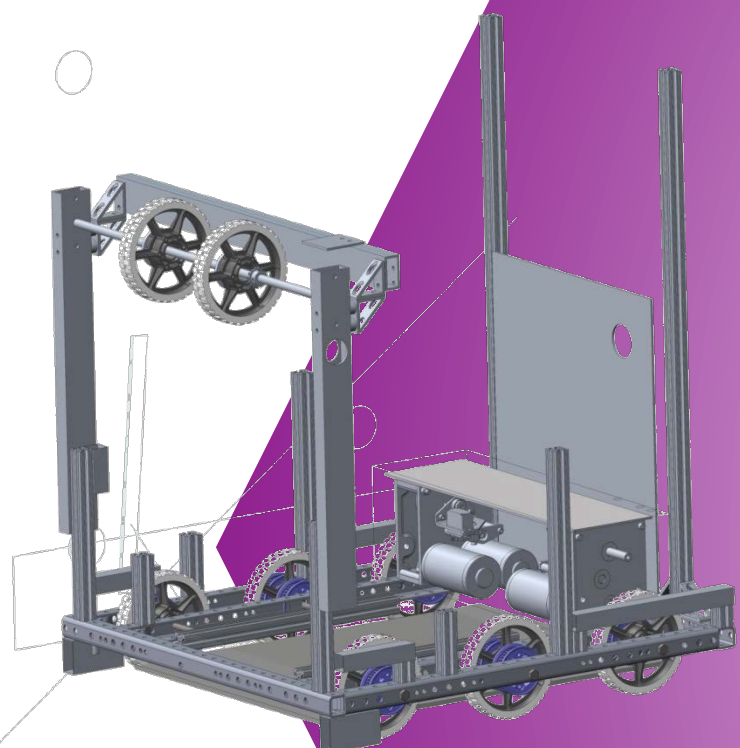
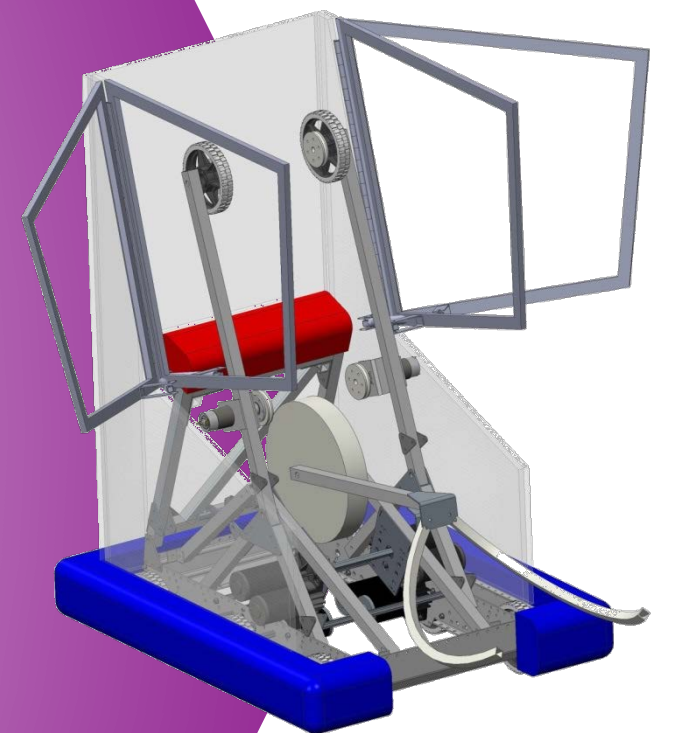


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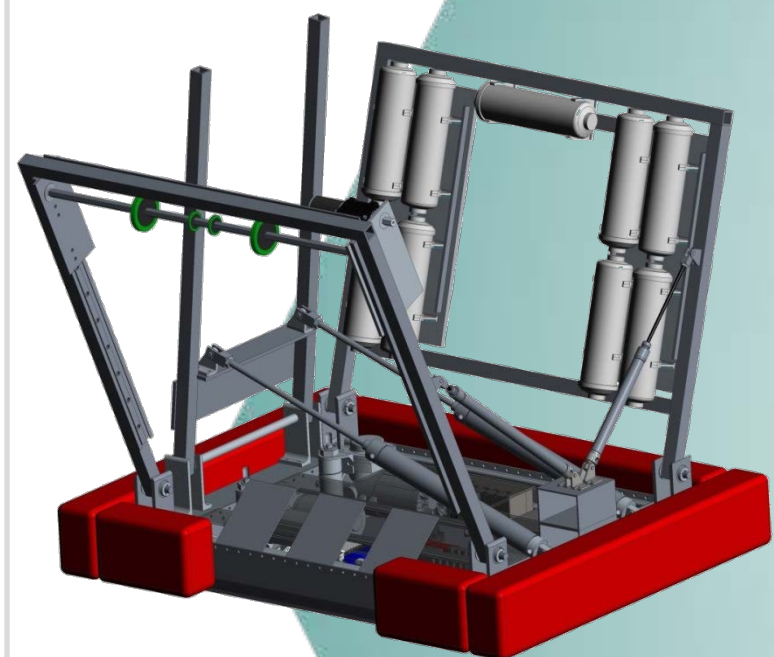
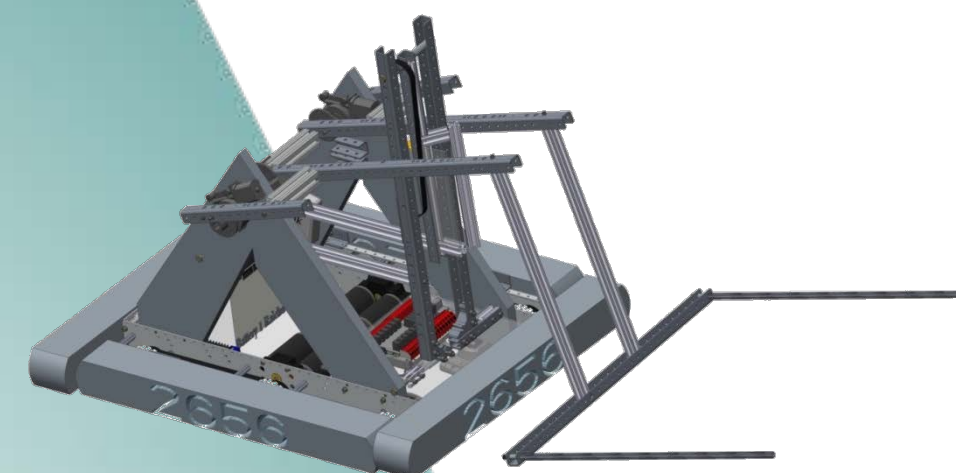
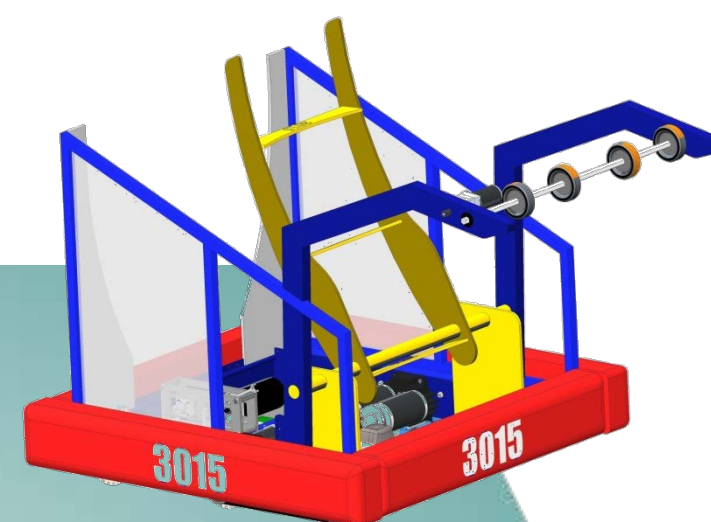
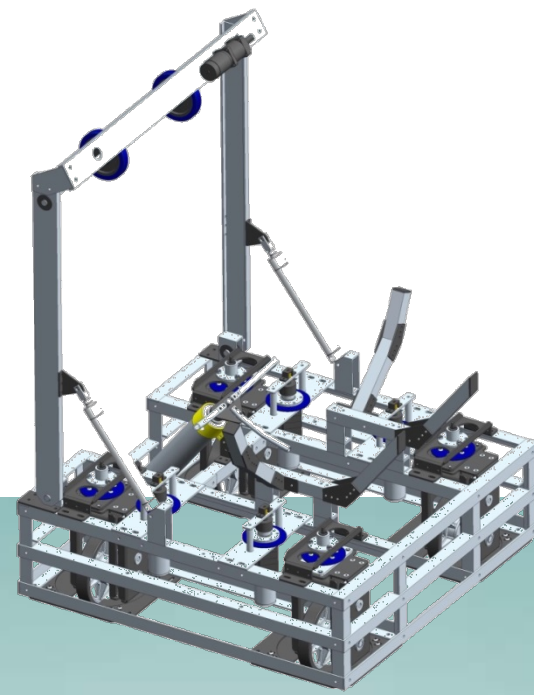
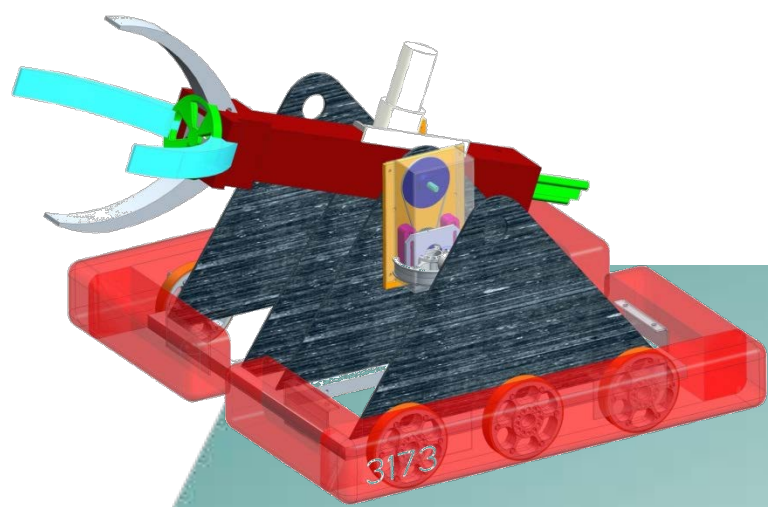
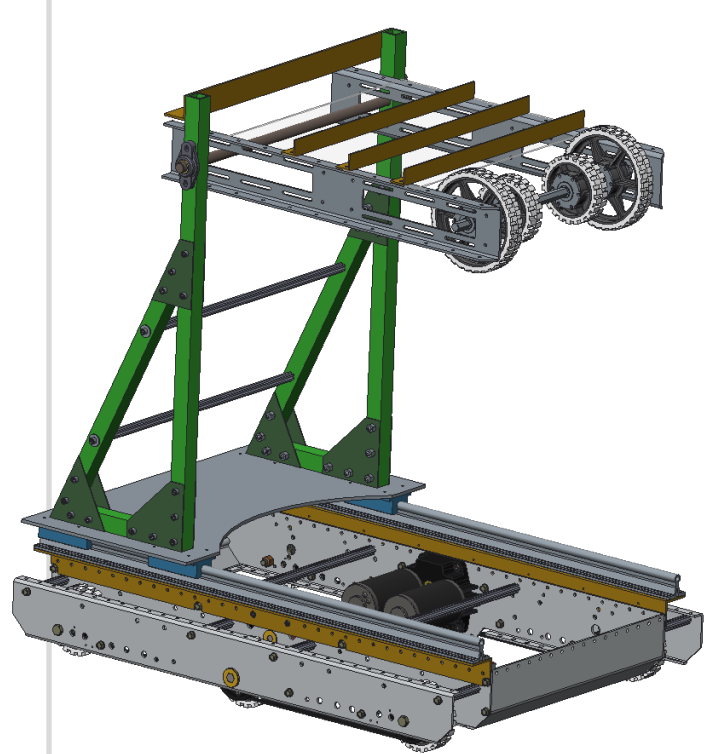


FRC

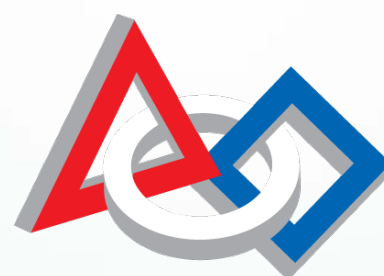
FIRST® Robotics Competition



Passion & Power

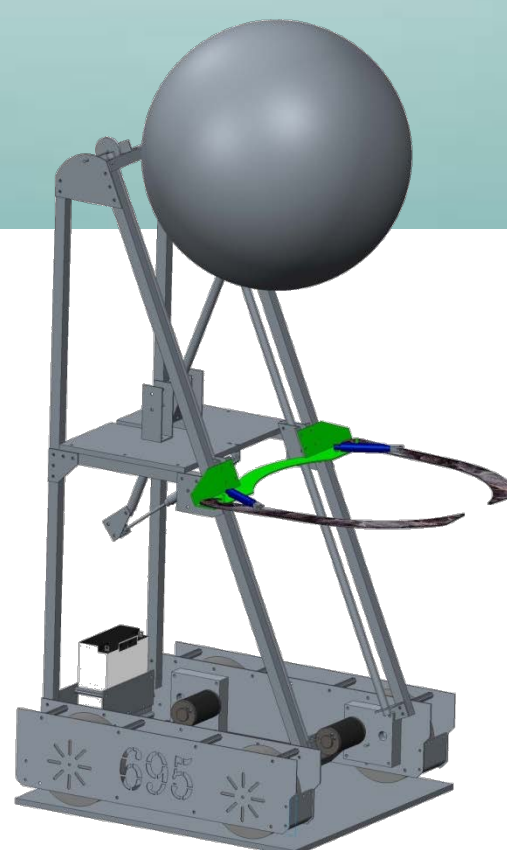
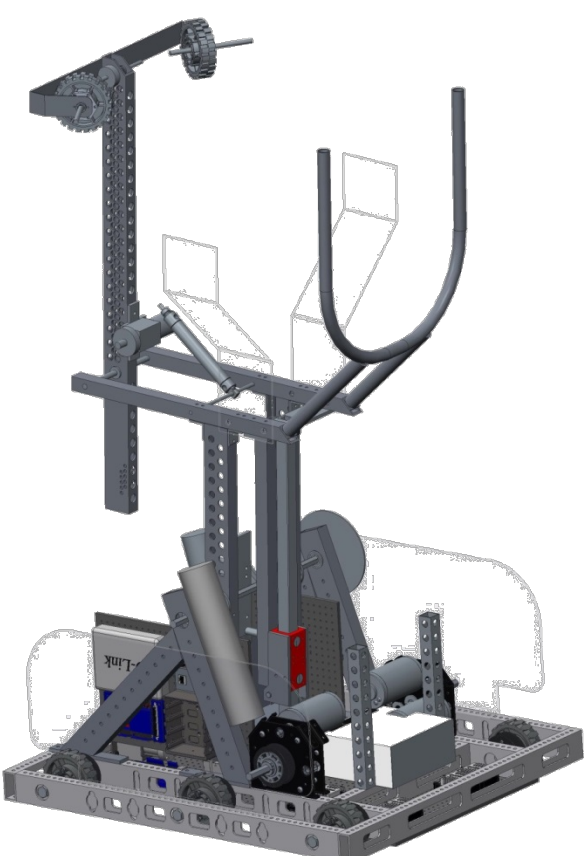
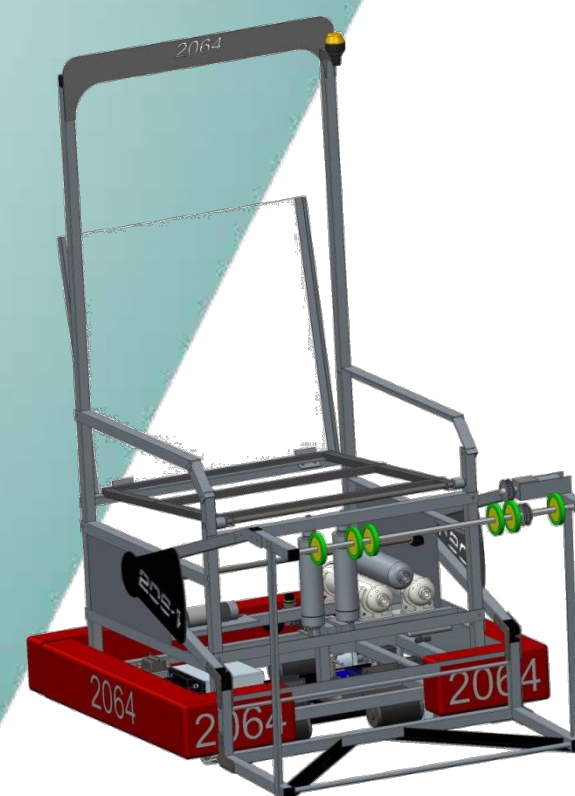
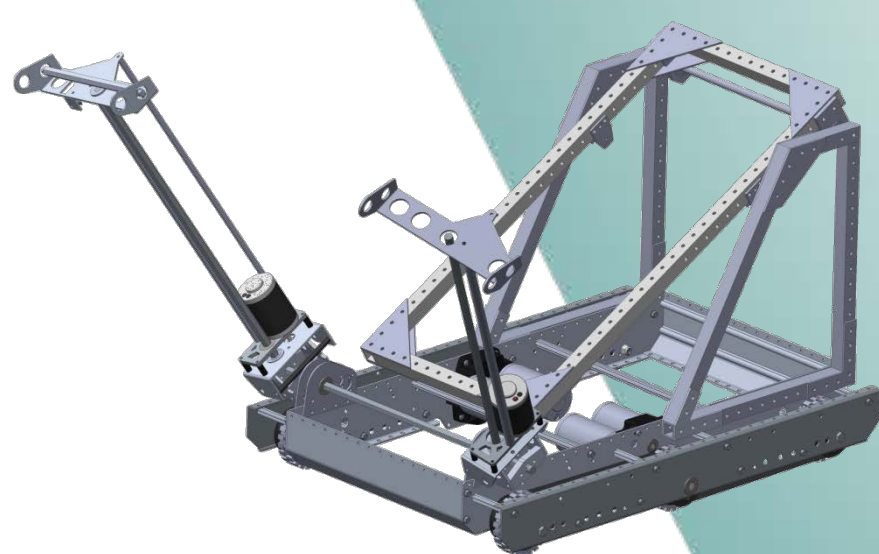
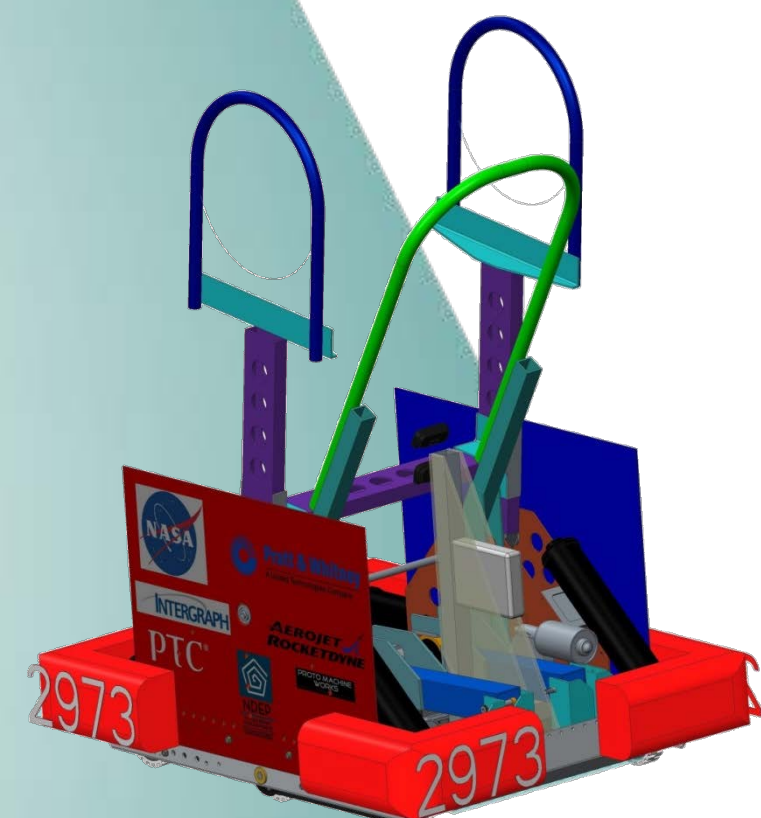


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Mechanical Motion

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