

Jordan Lin's Design Portfolio

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Brake Retraction System – UW Concrete Toboggan

What: Designed a mechanical system to return the deployed brake to its automatic latch after each brake release, replacing the existing need to manually pull the brake back into position

How: Modelled a V1 system in SolidWorks using a hand wheel crank and a gusseted mounting structure. V2 replaced V1 with a spring loaded cable return mechanism using a compression spring. Pulling the handle compresses the spring while resetting the brake into the automatic latch, after which the spring returns the handle and cable automatically

Review Findings: Design review identified inefficient force transfer, high manufacturing cost, and poor manufacturability in V1. The gusseted support would require either welding thin waterjet cut plates or machining significant material from a solid block, making the design unnecessarily complex and wasteful.

Status: V2 design in review

Structural Analysis

Material: 6061-T6 aluminum

Applied load: 102.8N

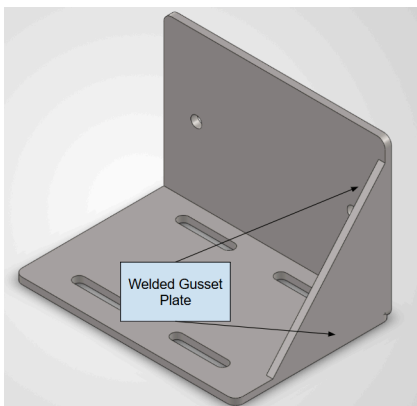
Max von Mises stress: 2.69MPa

Max displacement: 0.0023mm

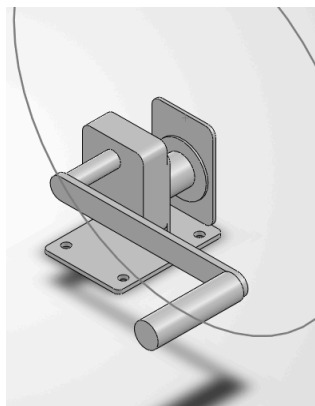
Factor of safety: ≈ 102

Fixture: line guard fixed at frame mounts

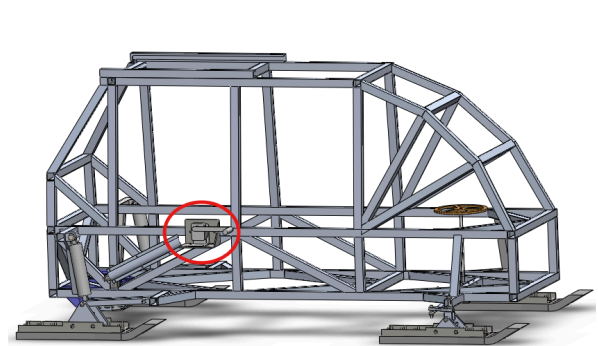
Result: Preliminary FEA shows the handle and line guard are heavily overbuilt (factor of safety ≈ 102) under the 102.8N design load. 6061-T6 was used because it matches the toboggan frame material, and the large margin leaves room to reduce material in a later revision



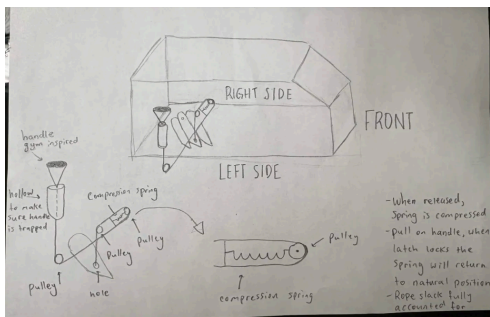
V1 concept



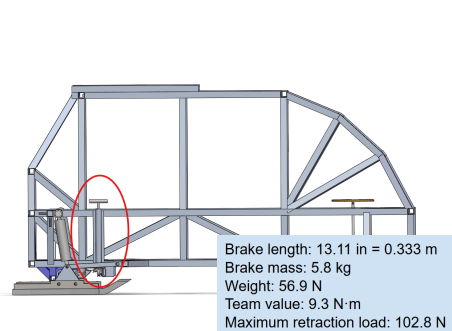
V1 crank wheel CAD



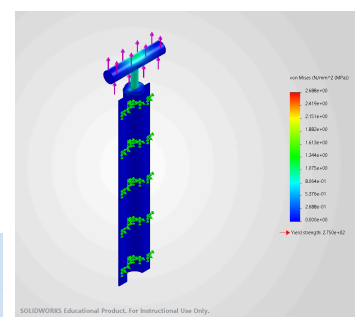
V1 on toboggan CAD



V2 concept sketch layout



V2 on toboggan CAD



Stress FEA

3D-Printed Racecar Team Design Project

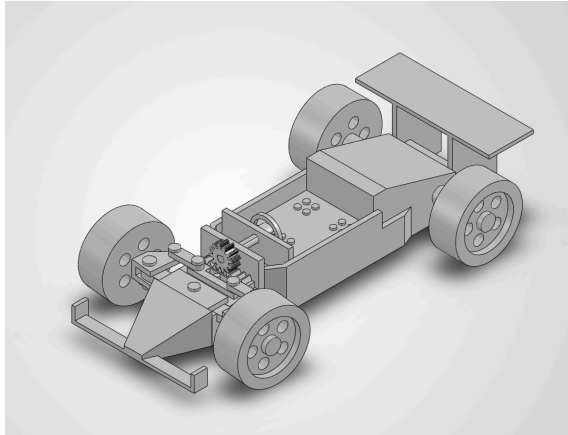
What: Designed, FDM printed, and assembled a multi-part V1 racecar with a rack and pinion steering mechanism

How: Developed V1 in SolidWorks and physically assembled the printed components to evaluate steering motion, component fit, clearances, and overall mechanical packaging

Result: Used observations from the V1 prototype to identify opportunities for improved steering geometry, additional braking functionality, and better integration of future electronics

V2: Redesigned the mechanical layout using revised rack and pinion steering mechanism, added a mechanical braking system, and created dedicated chassis space for the controller and space for remote control electronics. These changes address steering, packaging, and integration limitations observed during V1 assembly

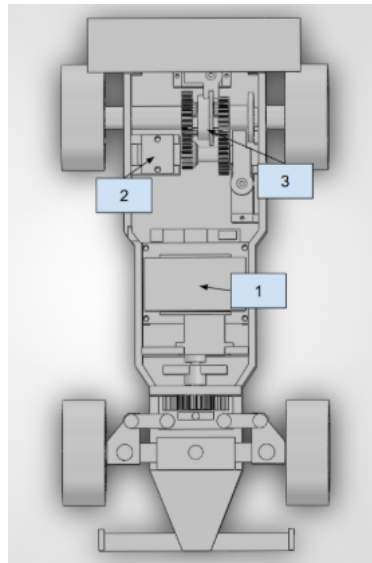
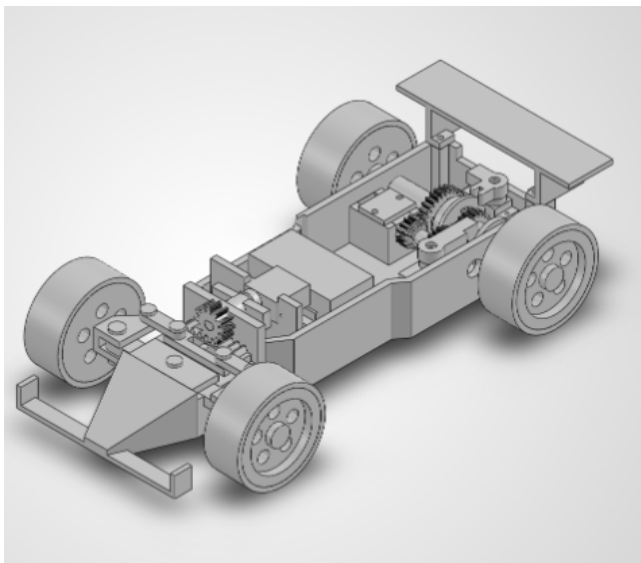
Status: V2 mechanical CAD in development



V1 SolidWorks assembly



FDM PLA printed and assembled V1 prototype



V2 CAD and FDM printed chassis: (1) electronics space (2) Arduino packaging (3) mechanical brake concept

Mechanical Snack Gripper – Personal Project

What: Designed a fully mechanical gripper, beginning with a V1 centre multi link mechanism and redesigning V2 into a handheld snack gripper for picking up snacks without direct hand contact

How: V1 used a slider linkage to convert linear input motion into synchronized jaw opening and closing, reaching a 44mm maximum opening. After reviewing V1, I identified limited jaw capacity and a lack of manufacturing clearances. V2 introduced a spring trigger mechanism and clearances at rotating pins and sliding interfaces. Geometry and trigonometry were used to determine the finger opening range and verified in SolidWorks. The V2 mechanism uses a trigger, slider, connecting links, pivoting jaws, and a flexible return element to reopen the jaws after release

Result: V2 meets the 10-60mm jaw-range target with 4.30mm slider travel and 9.41° trigger rotation. Static FEA in PLA under a conservative 50 N squeeze gave factors of safety of 2.9 for the jaw and 1.7 for the trigger. The trigger's lowest value sits at the slider pin slot, which was held fully fixed in the model, so the real stress there should be lower; the main trigger lever has a factor of safety of about 3.4

Engineering Analysis:

Jaw range: 10.0-59.9mm

Slider travel: 4.30mm

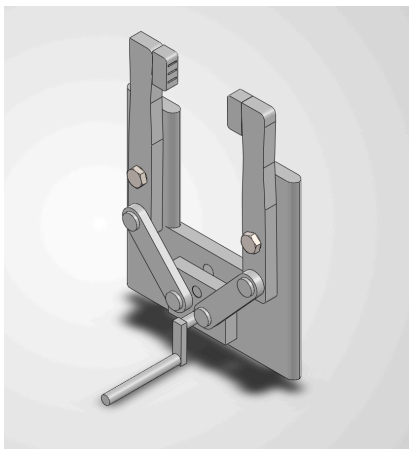
Trigger rotation: 9.41°

Calculated grip force: 13.7N/jaw at 50N squeeze

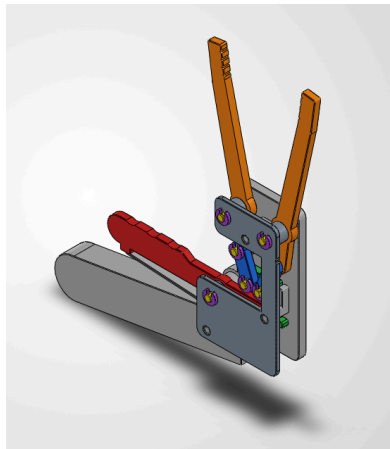
Jaw FEA: 17.3MPa, FoS 2.9

Trigger FEA: 29.7 MPa, FoS 1.7

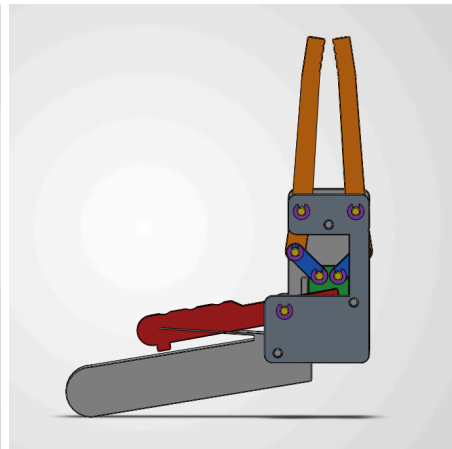
FDM Print: With PLA Basic, FDM 3D Printing, 0.4mm nozzle, 0.20mm layer height



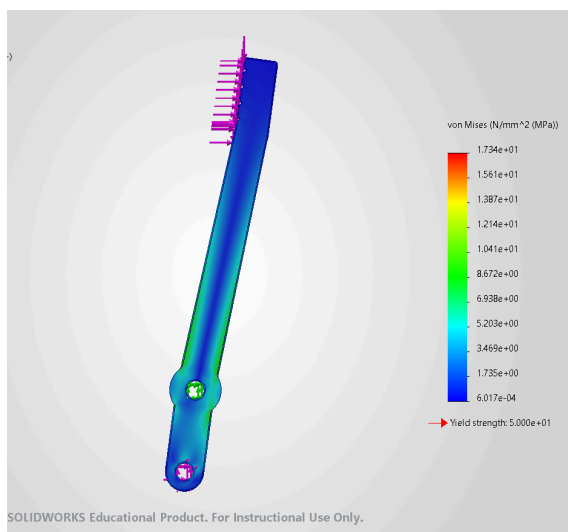
V1 isometric view



V2 isometric view



V2 fingers closed



Jaw Stress FEA



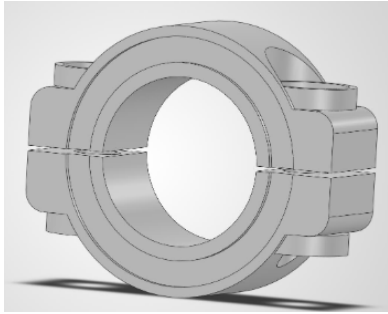
FDM PLA printed prototype

Shaft Collar Prototype – UW Formula Electric

What: Designed a shaft collar to constrain axial movement of the seatbelts along the chassis seatbelt tube

How: Modelled the collar in SolidWorks, FDM printed it, then performed physical fit checks on the seatbelt tube

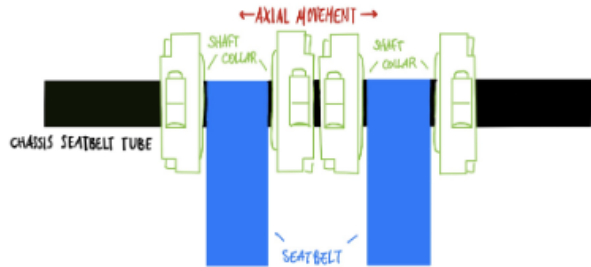
Result: Verified the collar fit and confirmed that it prevented the seatbelts from sliding axially along the tube



SolidWorks model



FDM prototype



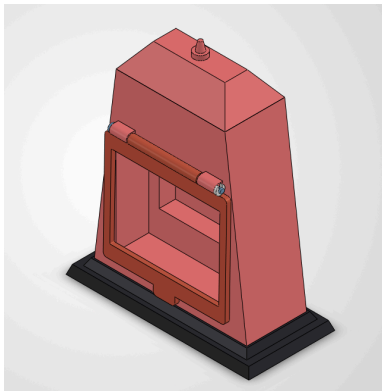
Sketch Diagram

Mechanical Enclosure for Arduino Based Metronome – Team Project

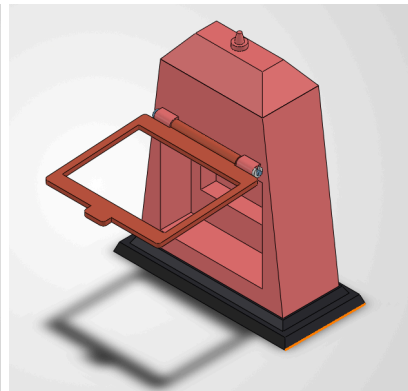
What: Designed a SolidWorks enclosure for an Arduino metronome with accessible internal electronics

How: Measured the PCB with a calliper to define enclosure geometry and added a hinged front frame for access

Result: Secured the electronics while allowing easier installation and serviceability



Metronome with hinge closed



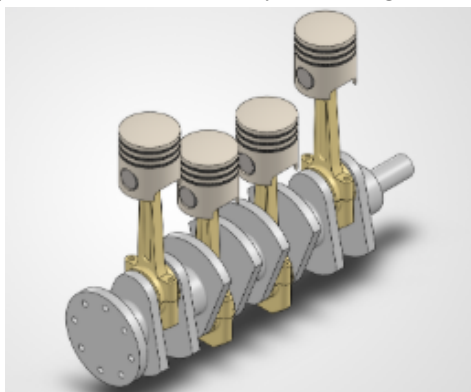
Metronome with hinge opened

Four Cylinder Engine – Modelling Practice

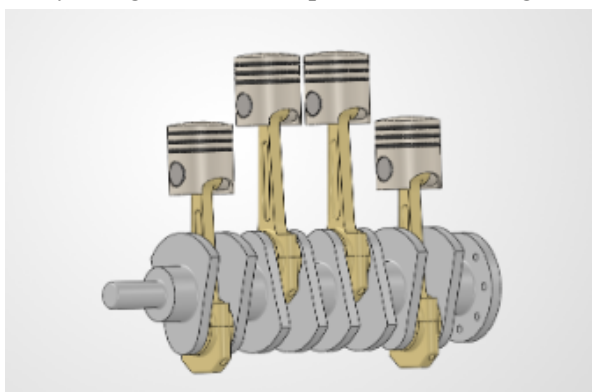
What: Modelled a four-cylinder engine assembly in SolidWorks as a CAD practice project

How: Followed a guided modelling tutorial to create and assemble each part and the final assembly

Result: Completed a detailed four-cylinder engine assembly and gained more experience modelling in SolidWorks



Isometric view



Engine in rotation