3D Printed Drivetrain Development for Inspection Robot

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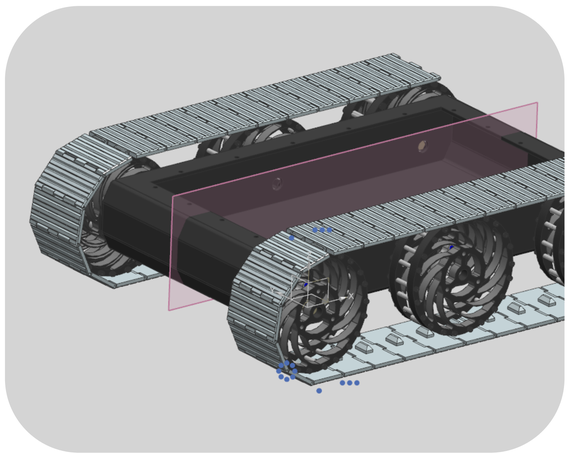
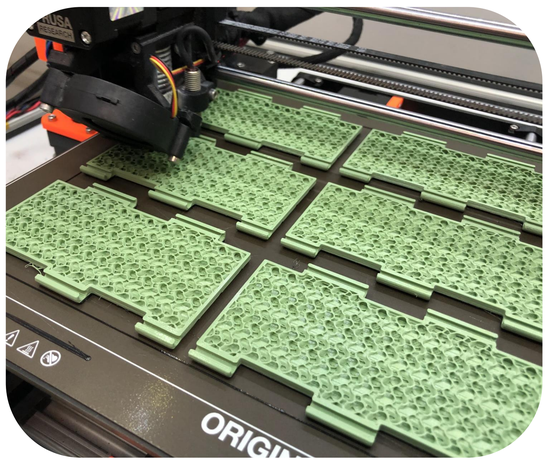
Remote Viewing Robot - Purpose and Goals

The Remote Viewing Robot (RVR) is a robot designed for investigating accelerator tunnels. It has a modular chassis mounting for attaching to different payloads, such as inspection cameras, tunnel-mapping equipment or radiation-measuring devices. The robot currently uses a Raspberry Pi communicating via Wi-Fi to a laptop. The goal of this project was to design a 3D-printable tank track system to that would perform well in RVR's application.



A CAD model of the new drivetrain was produced

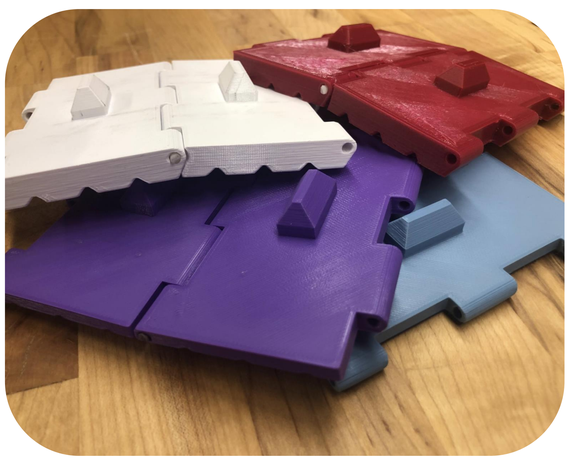


Partway through a 3D print of the track links.

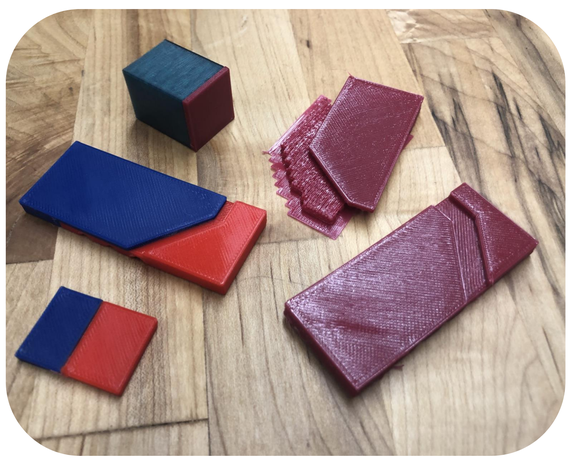
Design Process

The main criteria for the design were that the tracks be easily replaceable in case they became contaminated while operating in the accelerator tunnels. They also needed to be affordable so that frequent replacement wouldn't be an outsize cost. A design preference was that they be compatible with a pair of existing wheels.

3D printing the tracks had clear advantages as the solution. It was customizable, cheap, and could be designed to work with the existing wheels.



Prototype track link designs were made with different materials and thicknesses.



Test 3D prints experimented with various methods of combining different materials.

Several iterations of prototypes were necessary before choosing the final design. Throughout the design process changes were made improving the link joints, traction, print time and filament usage.

The track link's final design was printed out of two materials, TPU (black) on the bottom for traction and PETG (green) for structure and strength.

Final Track Design

The final track design was a mix of PETG, a hard durable plastic, and TPU, and softer rubber. The TPU was used on the bottom of the links for better traction on hard or smooth surfaces like concrete, while the PETG provides a stronger, less flexible structure for each link. There are 31 links per track and a pair of tracks can be printed using only two 1kg rolls of printer filament.

The new Raspberry Pi program runs motor commands sent from a laptop over Wi-Fi.

RVR shown in its final form with camera arm payload attached.

Getting RVR Mission Ready

In addition to design and building a new drivetrain for RVR, other work was done to get RVR mission ready. A program for driving RVR was imported from another robot project onto a new Raspberry Pi and modified to drive RVR.

In the future, more fine tuning is needed to the control program to optimize performance as well as increase reliability. This is a key obstacle that must be addressed before RVR can be deployed.

Additional goals include running simulated missions for RVR to practice use in real scenarios as well as test it's performance.