COLLEGE OF ENGINEERING
MULTIDISCIPLINARY DESIGN PROGRAM
UNIVERSITY OF MICHIGAN

Chassis for a Modular, Low-Cost 6-Legged Robot Platform for Dynamics and Control Experiments (FastANT)

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BIRDS lab

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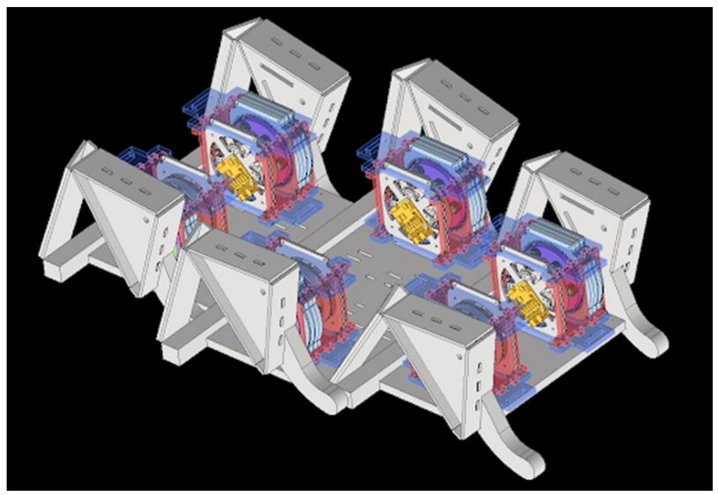
BACKGROUND:

FastANT is a modular, low-cost robot platform capable of inertia-dominated, multi-legged locomotion, for dynamics and controls experiments. The robot is driven by T-Motor U8 100 U-Power Series Motors coupled to planetary gearboxes. The laser cut ABS drivetrain modules with minimum number of 3D printed parts are mounted on a chassis made foam core sheets and reinforced with snap fitted aluminum rails.

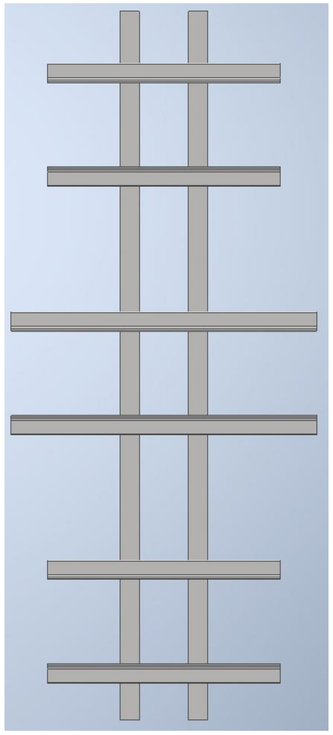
There are 2 configurations of legs planned to be tested on the same chassis of the robot. One of the setups consists of legs from another member of the hexapod family of robot platforms for the study of multilegged locomotion is the power autonomous legged vehicle, RHex. This robot is a power autonomous, compliant-legged robot that has six actuators, one located at each hip. This vehicle was designed by Uluc Saranli, Martin Buehler, and Daniel Koditschek at the University of Michigan in 2001. Mr. Koditschek continues developing iterations of the RHex through the Kod*lab. The second setup consists of flexible spring steel legs to provide a dynamic gait which would allow the retention of energy that would otherwise be lost to plastic collision. Thus, FastANT will be tested on steel spring legs, using the elasticity of the steel to prevent energy loss.



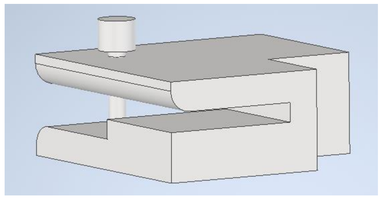
CAD model of the initial FastANT design

DESIGN:

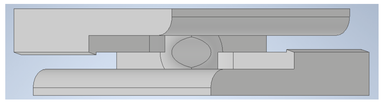
Design of FastANT chassis consists of mainly 4 parts: Aluminum rails, Foam boards (to provide compressive resistance to rails), Gearbox housing, Rail attachments (to provide flexibility by allowing rails to slide in limited movement)



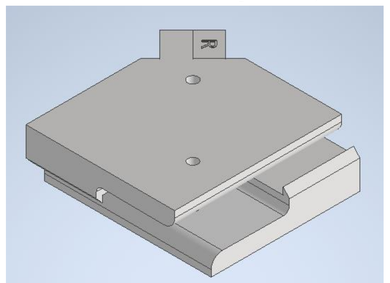
Aluminum rails grid



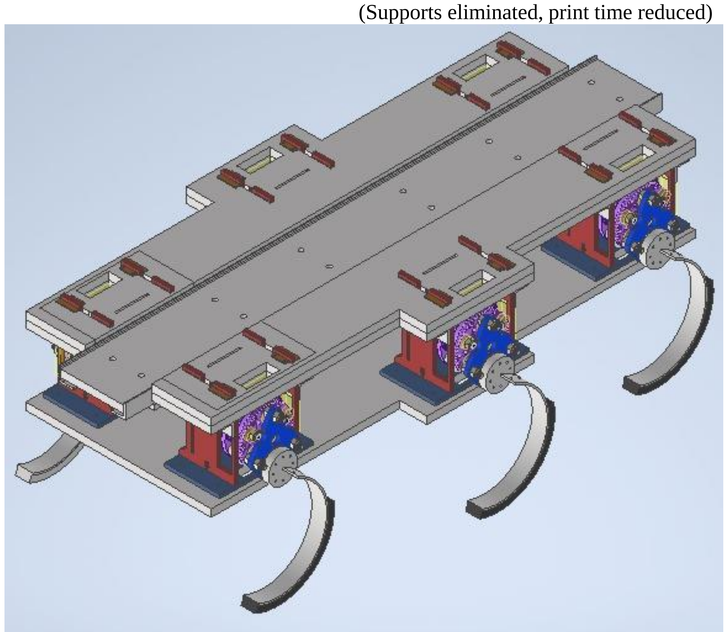
Concept for rails attachment
(3D printed with pin to constraint DOF)



Initial single piece design of rails attachment
(Introduction of snap feature)



Final 2-piece design for rails attachment
(Supports eliminated, print time reduced)

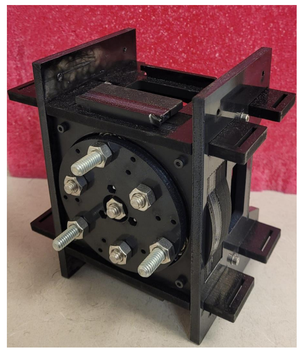


CAD model of the upcoming FastANT design, with the RHex legs

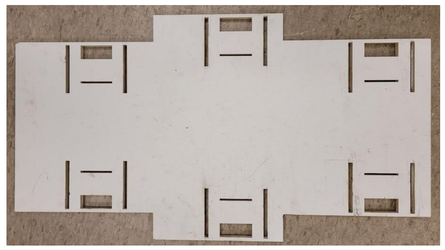
PROTOTYPE:

Prototyping enabled the validation of the design and helped in determining the manufacturing feasibility of the FastANT chassis.

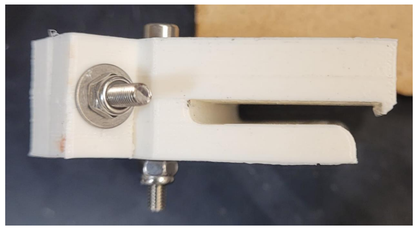
Base plate is made of foam board, Gearboxes of ABS sheets and minimum number of 3D printed parts, 3D printed nylon rails attachments, Aluminum extrusion rails.



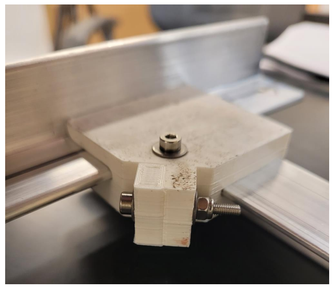
Assembled gearbox



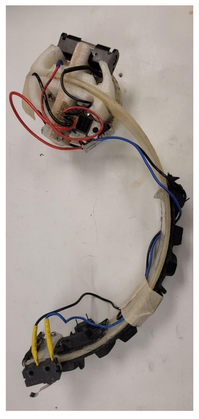
Foam board base



Rails attachment snap feature



Rails Attachment



Rhex leg



Spring steel leg

NEXT STEPS:

Once manufactured, FastANT will be tested using Rhex Legs on multiple test cases to establish a baseline. To take the testing further, 6 spring steel leg modules will be attached onto the FastANT chassis.