

# FastAnt: Gearbox Design

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## Introduction

FastANT is a hexapod robot currently being designed by MuRoAM and BIRDS Lab. This design will be a faster version of BigANT, another one of the lab's robots, and will use T-MOTOR U8 100 U-Power Series motors. This will require the use of planetary gearboxes to gear down the motors to an appropriate speed for locomotion.

The project described in this poster focuses on creating a gearbox that can be fabricated using the laser cutter and 3D printer in BIRDS lab. Other than functionality, our design goal was rapid manufacturing to allow fast design iterations.

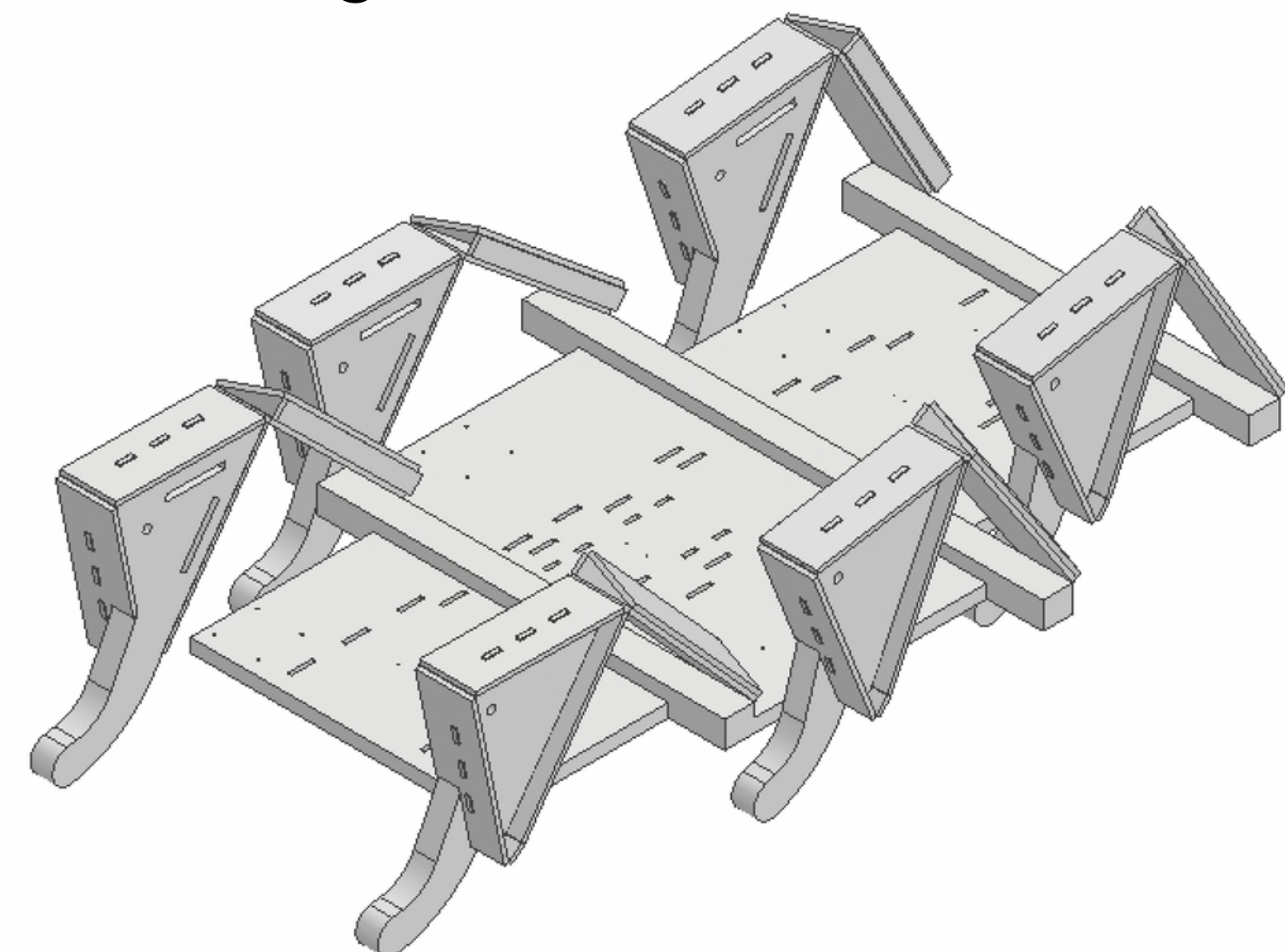


Figure 1: Original BigANT chassis

## Design Requirements

- Output mates to FastANT's leg rotary link
- Provides speed reduction
- Supports all forces applied to the output
- A single motor mounts to the assembly
- Dissipates heat adequately

Use of existing lab materials and manufacturing processes:

- Design only uses skateboard bearings
- M2.5 and M3 fasteners, standard in lab
- Parts may be 3D printed or laser cut

Parts should be easy to assemble, disassemble and replace

## Laser Cut Gearbox Design

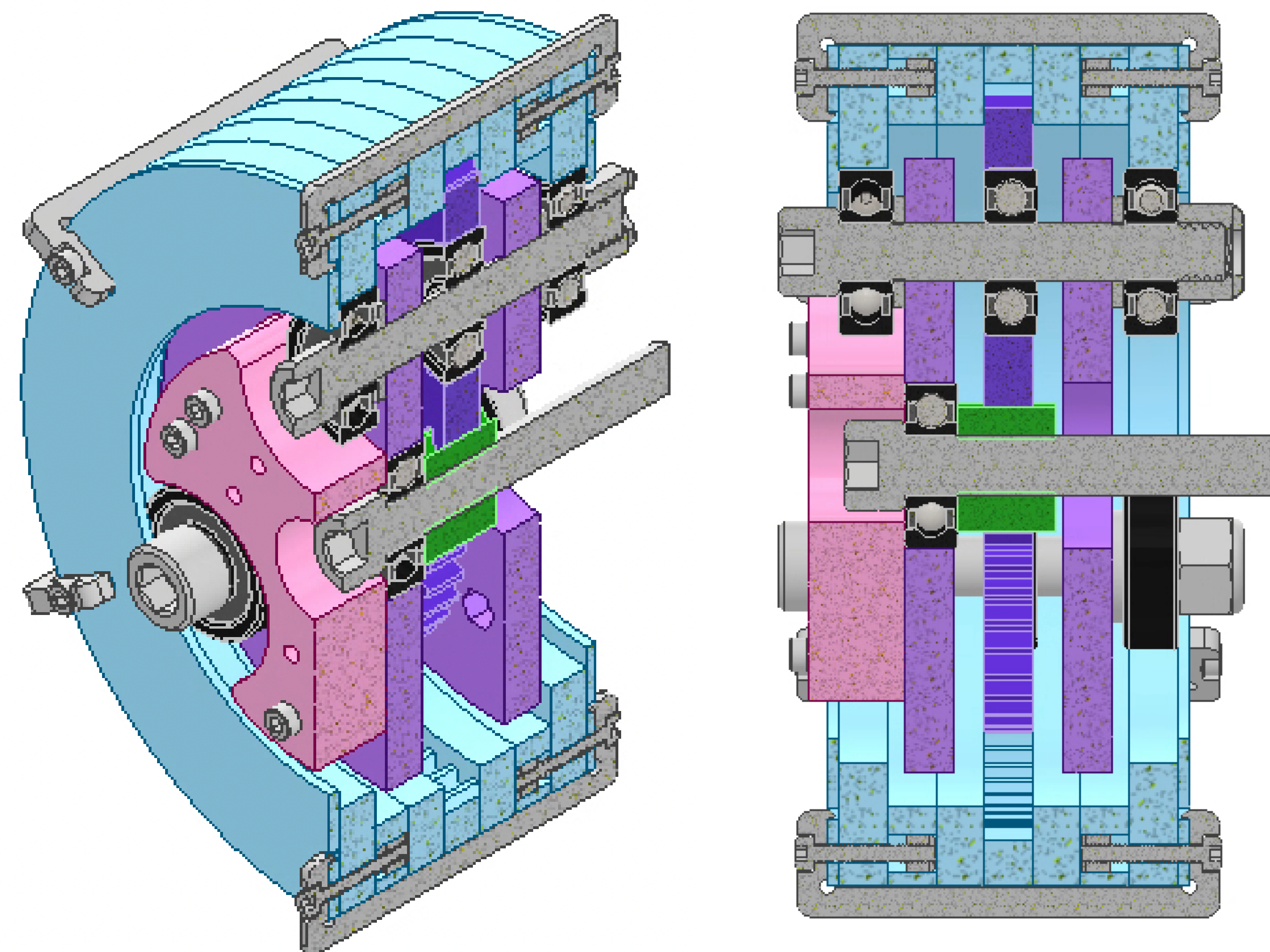


Figure 3: Section views of laser cut gearbox CAD showing the housing (light teal), clamps (gray, outer), sun (green) and planet gears (dark purple), carrier plates (light purple), output assembly (pink), bolts, and bearings.

## Design Timeline

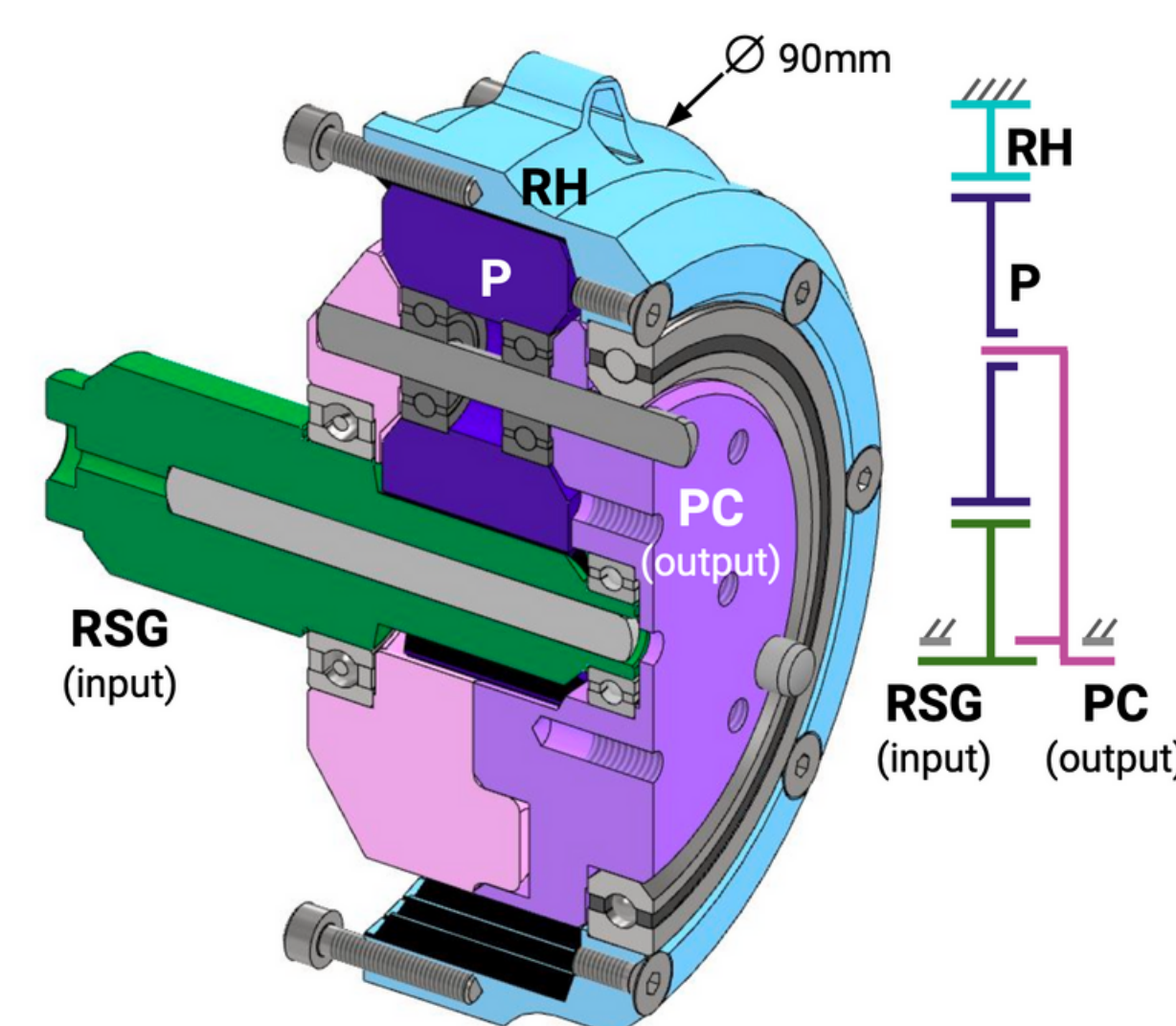


Figure 4: Original EMBIR lab's 3D printed gearbox

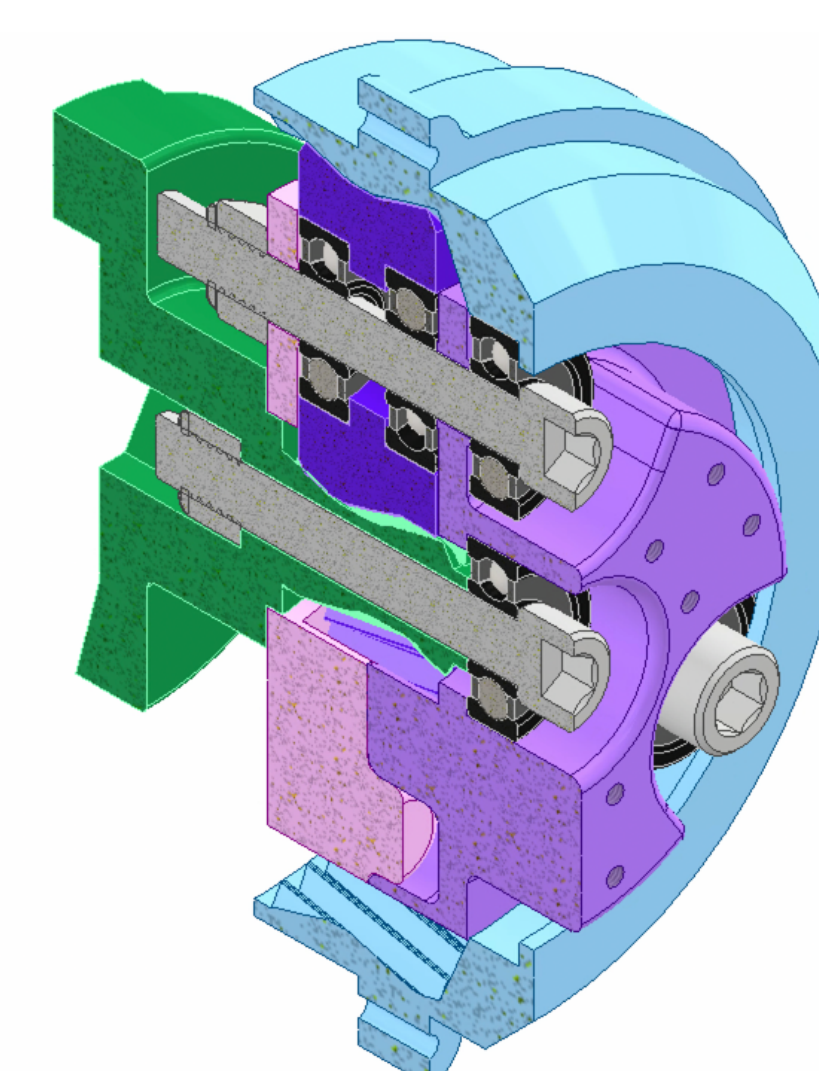


Figure 5: 3D printed gearbox with helical gears

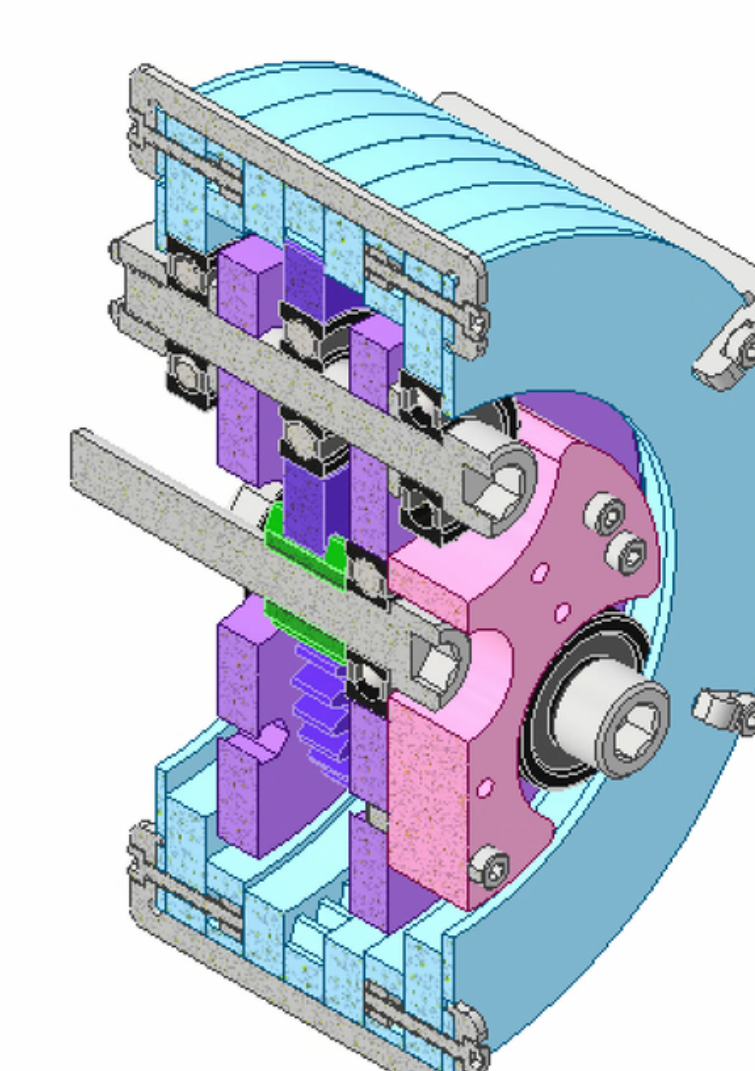


Figure 6: Laser cut gearbox

## Main Component Description

**Gears:** the planetary gearbox consists of a ring gear, a sun gear, and three planet gears. These gears were designed to provide a 7.5:1 gear ratio. Friction from their rotation is reduced by ball bearings.

**Carrier:** connects the rotation of the planets to the output.

**Output:** connects the gearbox assembly to a leg's rotaty link.

**Gearbox housing:** made primarily out of 1/4" ABS, with 1/16" outer layers to hold carrier bearings in place.

**Closing clips:** designed to close the gearbox assembly using standard lab screws.

## Future work

The first version of the laser cut gearbox is currently in the prototyping stage. Based on results from prototyping, future iterations of the laser cut gearbox might require a way to hold the planet gear's bearings in place if press-fitting them is not enough.

The sun gear's connection is still being designed. The final version will be tested along the gearbox to determined overall efficiency.

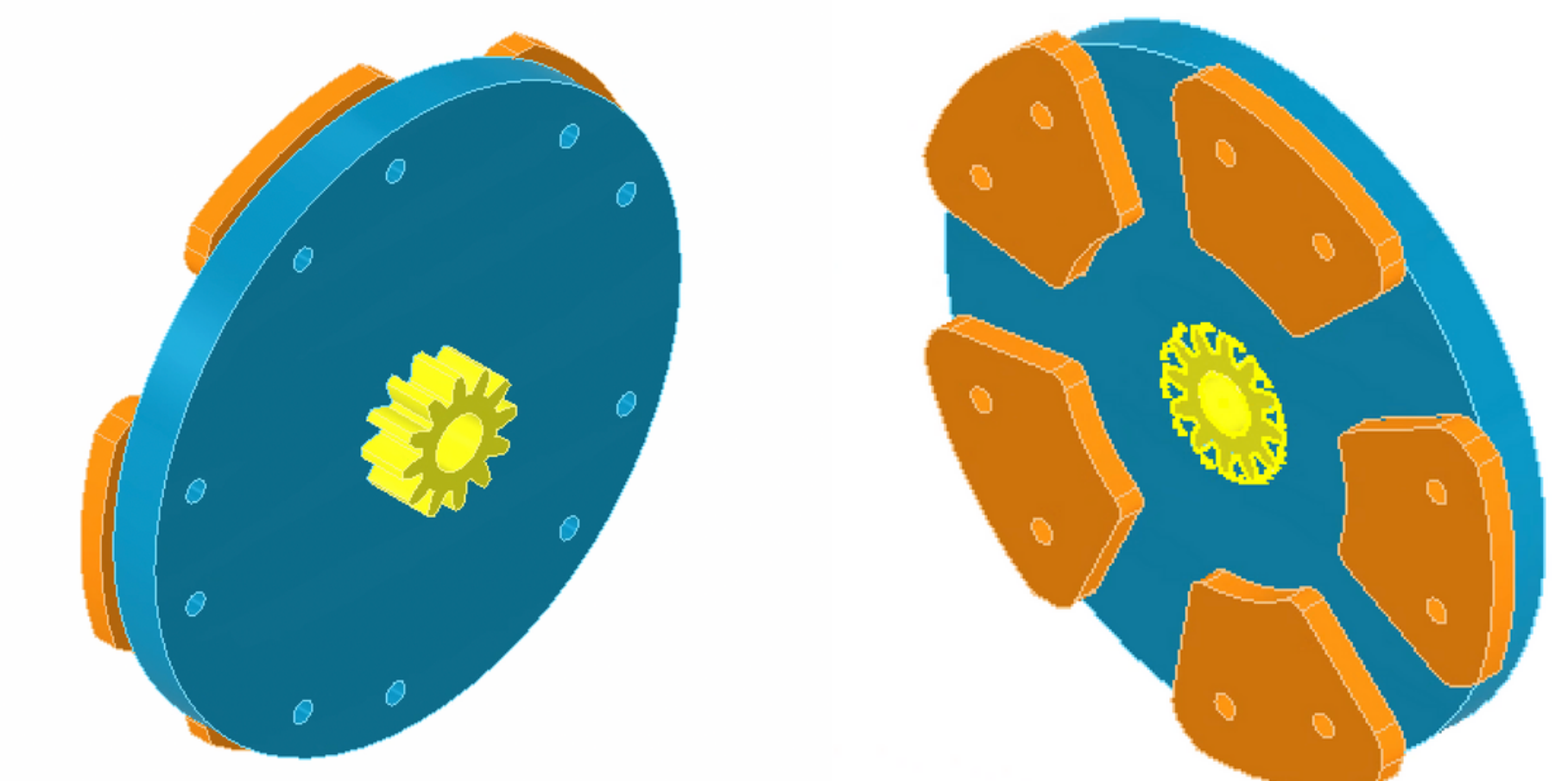


Figure 7: Current version of gearbox to motor connector

Specifics of the gearbox's mounting to FastANT's chassis and attachment to the leg also need to be determined and implemented.



