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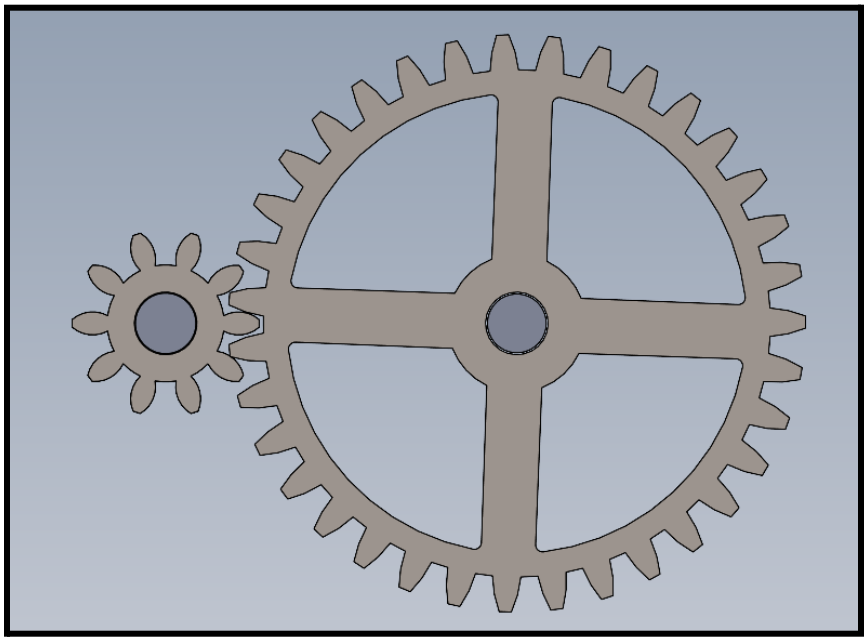
Justification:

Primary design choices: Our team decided to go with a parallel gearbox with a speed ratio of 12:1. The design will have input and output shafts that have co-linear axes of rotation, which are on opposite sides of the gearbox. The reason why we choose this kind of gearbox is because it would be easier to precisely achieve a 12:1 speed ratio with a parallel gearbox using a combination of 2 spur gears. Also, it would be easier and faster to 3d print the spur gears compared to the right-angle gearbox, which uses angled gears.

Parts selection:

We will be using straight spur gear in order to maximize printing speed.



Any trade-offs made:

We used the straight spur gears that had been cut out in the middle in order to reduce the printing time. While spur gears do not have relatively good mechanical performance (considerable backlash), we considered it to be sufficient for the gearbox design. While helical gears have lower noise, the gear tends to move back and forth along the shaft

while rotating, which requires angled roller bearing to mitigate such effect. This may increase printing time, so we eliminated such design choices. Also, in the design, we didn't include any bearings to the shaft in order to reduce the complexibility of the design and reduce the printing time. Finally, we made a cut in the gear teeths to reduce printing time, which increases pressure angle and therefore reducing the mechanical performance.

Analysis (make use of graphical communication to support your claims)

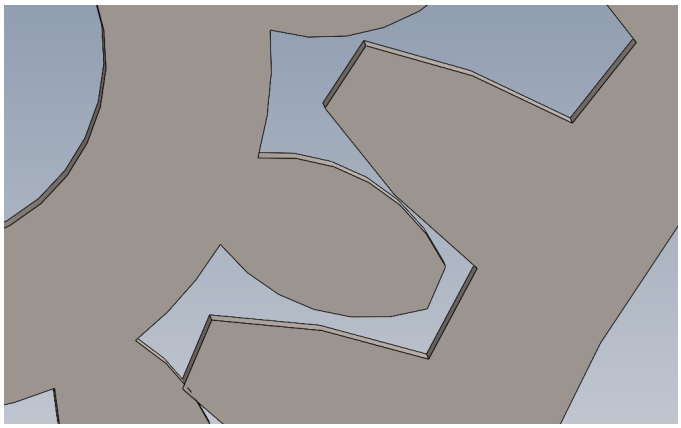
The strengths:

1. We have a locking mechanism that keeps the upper and the lower housing, which is in a rectangular shape.

2. Overall simple design with only 4 gears and 3 shafts, which allows fast assemble
3. High flexibility: The design currently has a collinear input and output, but with easy reassemble, the design could have non-collinear but parallel input and output.
4. The input and output are reversible.

The weaknesses:

1. Considerable backlash between the gears.



2. Considerable friction between the shafts and the housing due to lack of bearings.