4CBLA20 Multiped Robot

Self-Study Assignment
Group 42

SSA No.	Description
5	Modification of Legs
SSA Owner	
Pranav Joshi	

Introduction

The legs need to be screwed into the servo hub, for this the legs must be edited

Goal

To modify the legs of design in CAD and combine it with the servo hub.

Conclusion

The legs were successfully designed.

1 Elaboration

1.1 1 Bolt Servo Hub

Using the leg design from the canvas files page 1, the first change that needs to be made is to elongation of the legs. This allows the base of the leg to accommodate for the attachment hole (as shown in fig. 2) of the 1 bolt servo hub.

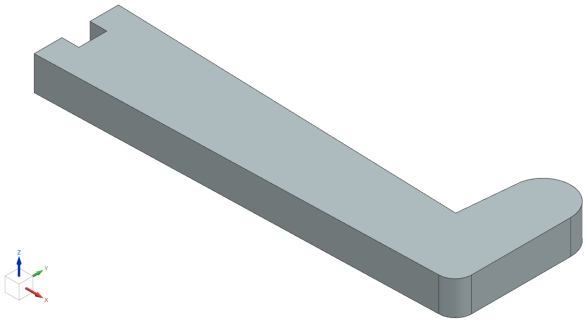

Figure 1: Initial Leg Design

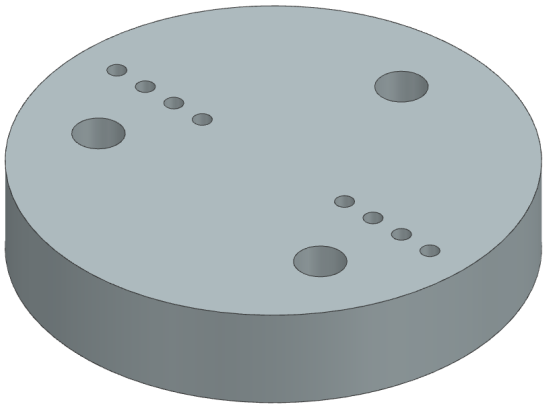

Figure 2: New Hub Design

The current design has teeth at the base so that the hub and leg prints as one. These sketches were deleted (as shown in fig. 3) before increasing the length of the leg.

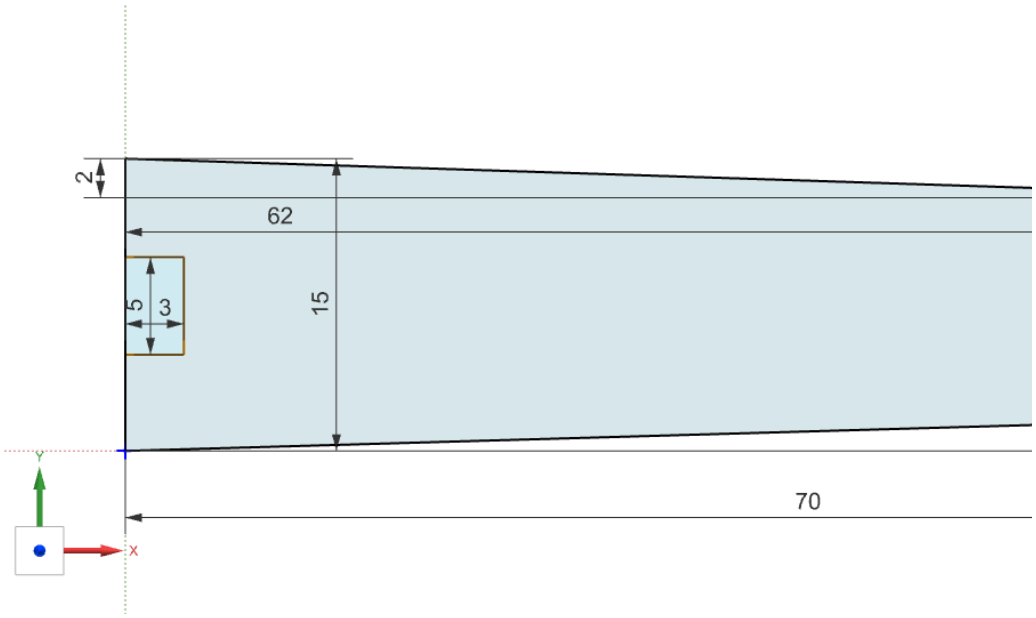

Figure 3: Teeth at base of leg

To understand the exact measurement by which the length of the leg needs to be changed, the sketch of the hub was examined (shown in fig. 4). As seen in this figure, the hole for the leg was 11.5 mm away from the centre and hence 4.5 mm away from the edge of the hub disc itself (since the radius of the hub disc is 20 mm).

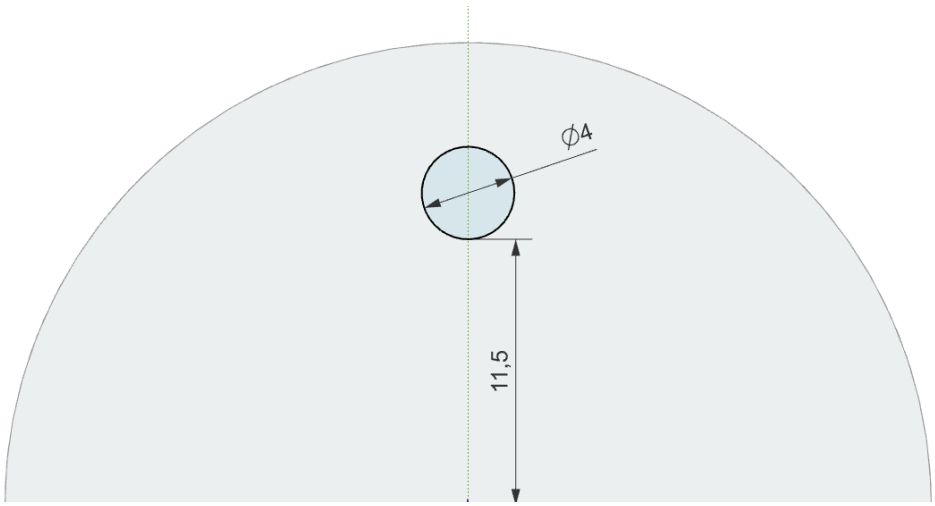

Figure 4: Enter Caption

Hence, the leg was elongated by a generous 12.5 mm, so that the base of the leg would be about 3 mm away from the M4 screw hole. This is shown in fig. 5

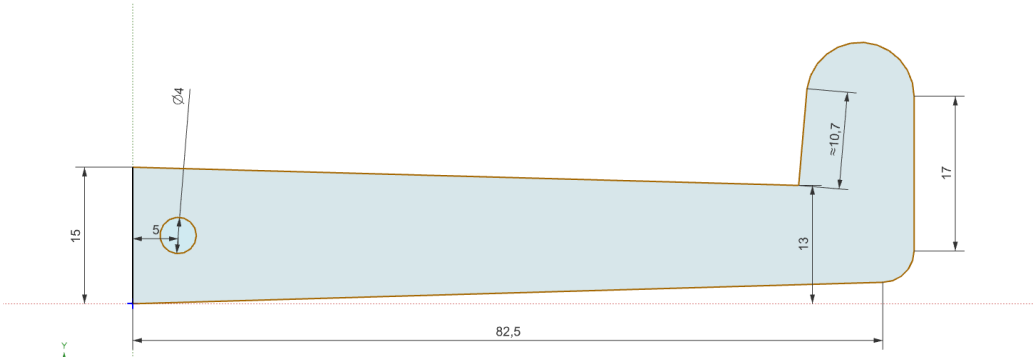

Figure 5: Sketch with hole

After extruding and assembling it with the servo hub a problem was found. The leg had a degree of freedom to rotate around the axis of the bolt (can be imagined by seeing fig. 7). This is undesirable, and hence using a hub with 2 bolts is appropriate.

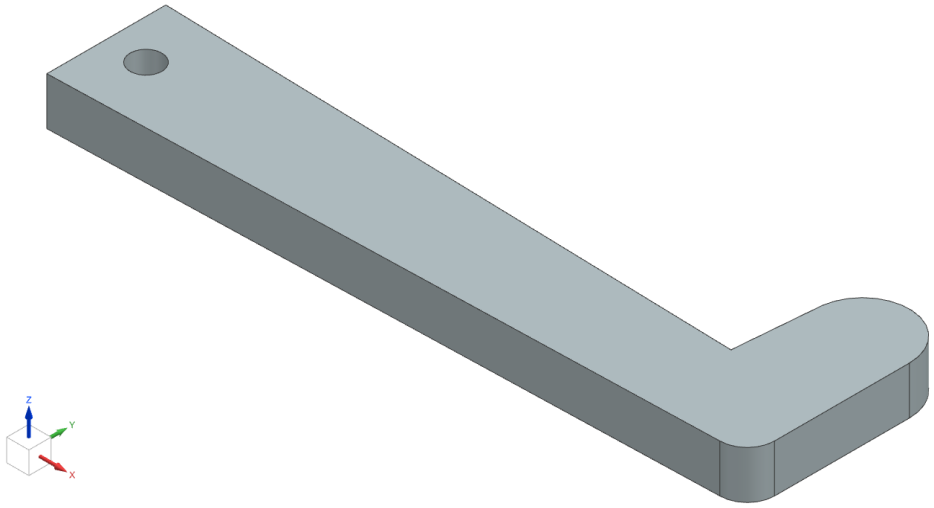

Figure 6: Extruded hole and sketch

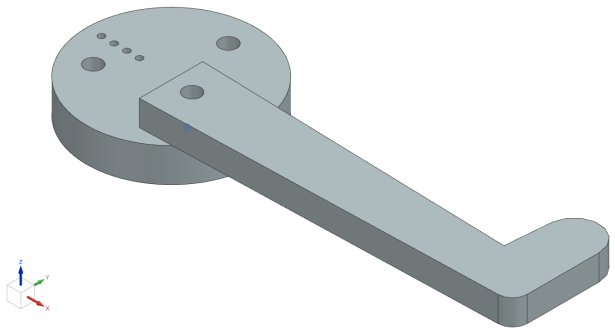

Figure 7: Assembly with one bolt servo hub

1.2 2 Bolt Servo Hub

Due to the reasons mentioned in the above subsection, the servo hub design with 2 bolts was used. The necessary holes were made at a distance of 3 mm from the base of the legs (a distance of 3 mm so that the shear forces of the bolts don't cause the legs to shear off) as shown in fig. 8

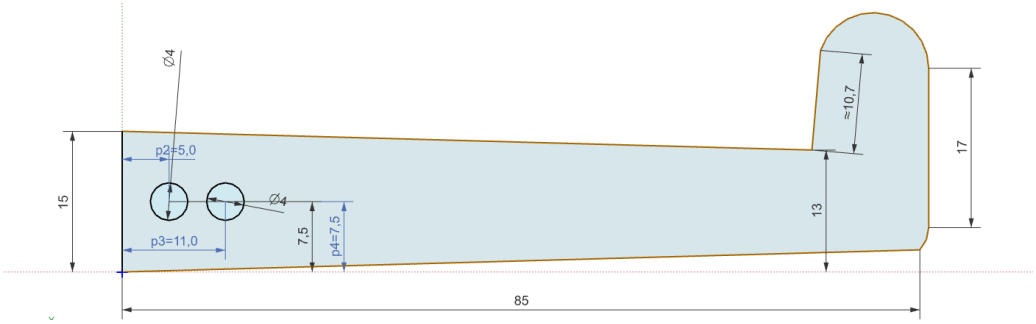

Figure 8: Sketch of leg with 2 bolt holes

After extruding and assembling one leg with the servo hub, the following was the result (as shown in fig. 9)

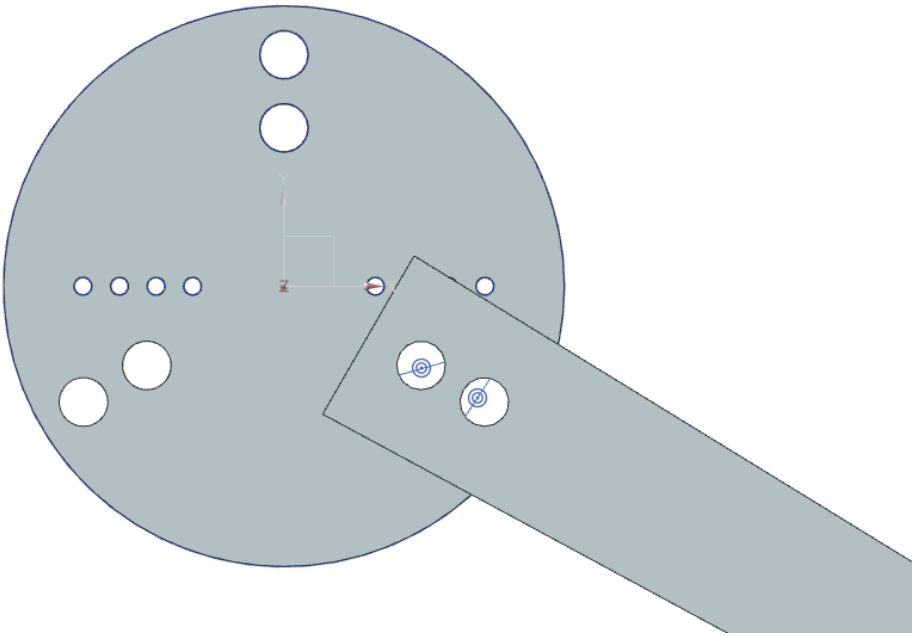

Figure 9: Assembly with 2 Bolt Hub

Clearly, this could become a problem, the legs of the wheel want to overlap with the holes for the servo head attachment. As a quick fix, the base of the leg was redesigned (as shown in fig. 10 and fig. 11) so that there is no overlap.

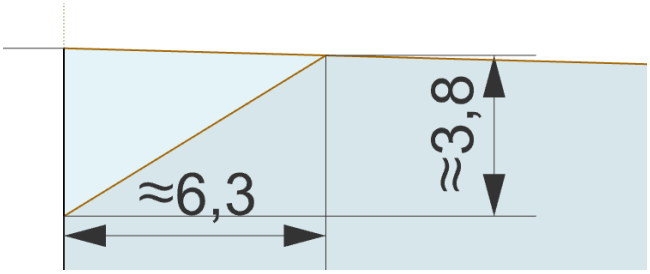

Figure 10: Enter Caption

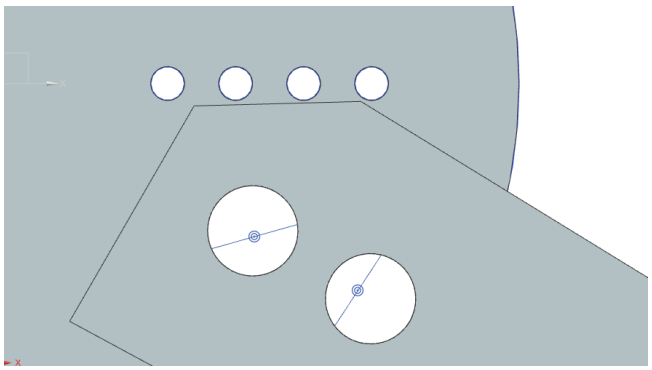

Figure 11: Redesigned base

This effect was mirrored for the other side, then the last leg was assembled as well. The finished wheel looked as shown below in fig. 12

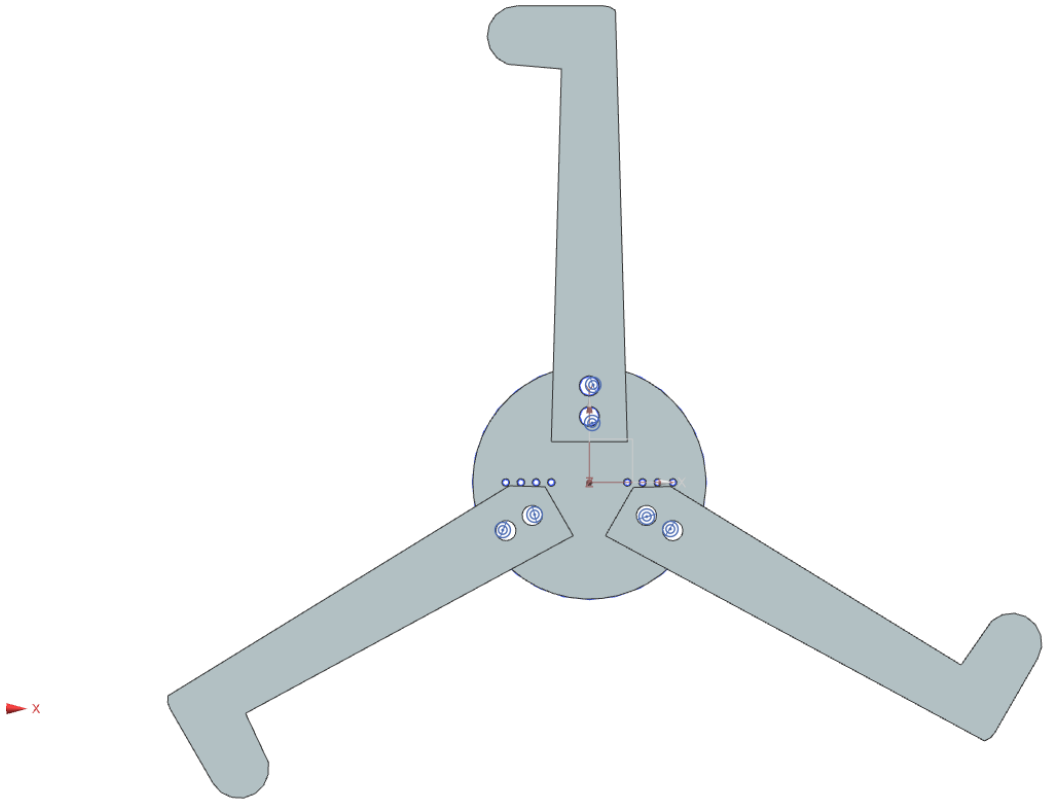

Figure 12: Final Assembly (Left Leg)

Subsequently, it was checked if the wheel fit in the geometric constraints. After making minor adjustments to the length of the legs, the wheel fit in the geometric constraints.

Cutting 2 copies of each leg (6 legs total) will be appropriate. Each leg can be flipped around and used for the other side.

Overleaf Link to this SSA

https://www.overleaf.com/read/fpqkbgqrqyxp#f3faa4