Leg_Foot_Analysis.

Analyzed File:	fulliam1.iam
Autodesk Inventor Version:	2023 (Build 270158000, 158)
Creation Date:	13/12/2022, 08:31
Study Author:	Rodgers O.
Summary:	

Static Analysis:1

General objective and settings:

Design Objective	Single Point
Study Type	Static Analysis
Last Modification Date	13/12/2022, 08:23
Model State	[Primary]
Design View	Default
Positional	[Primary]
Detect and Eliminate Rigid Body Modes	No
Separate Stresses Across Contact Surfaces	No
Motion Loads Analysis	No

iProperties

Summary

Author	Kazangyraktan

Project

Part Number	fulliam1
Designer	Kazangyraktan
Cost	Ksh0.00
Date Created	11/08/2022

Status

Design Status	WorkInProgress

Physical

Mass	3.29464 kg
Area	816819 mm^2
Volume	2656970 mm^3
Center of Gravity	x=-46.9427 mm y=-342.083 mm z=38.101 mm

Note: Physical values could be different from Physical values used by FEA reported below.

Mesh settings:

Avg. Element Size (fraction of model diameter)	0.1
Min. Element Size (fraction of avg. size)	0.2
Grading Factor	1.5

Max. Turn Angle	60 deg
Create Curved Mesh Elements	No
Use part based measure for Assembly mesh	Yes

Material(s)

Name	PLA Plastic	
General	Mass Density	1.24 g/cm^3
	Yield Strength	60 MPa
	Ultimate Tensile Strength	50 MPa
Stress	Young's Modulus	3.5 GPa
	Poisson's Ratio	0.3 ul
	Shear Modulus	1.34615 GPa
Part Name(s)	100x40mmexal1.ipt RMD-X10-S21.ipt ankle knee rod 21.ipt 65odbearing1.ipt 7655K4_High-Power Metal Miter Gear-opposite1.ipt leg-v4 final ankle calf-connection1.ipt legv4-calf-ankle-connecter 21.ipt calf-motor-attach-11.ipt 300mm threaded rod1.ipt bearing-cover-top1.ipt 190-rod1.ipt calf-motor-connector-21.ipt ankle-main-drive1.ipt ankle-foot-rotorv21.ipt 25mm m81.ipt bearing-cover-bottom1.ipt main-foot-bracket1.ipt heel-rotor-middle-mount1.ipt ankle-foot-rotorv31.ipt calf-knee-bracket-part2-center1.ipt toe-driver-gear-transmission1.ipt foot-front21.ipt heelrotor1.ipt chunk1.ipt ankle-gear-upgrade2_MIR1.ipt ankle-gear-upgrade2_test1.ipt heel-rotor-bearing-mount1.ipt knee-calf-interface1.ipt sole1.ipt ankle-gear-upgrade_MIR1.ipt center-ankle-gearbox1.ipt RMD-X8-Pro1.ipt heel1.ipt skateboardbearing1.ipt anterior-lateral-eminence1.ipt calf-knee-bracket-part21.ipt knee-calf-interface-center1.ipt toes21.ipt foot-front-rotor-mount1.ipt foot-front11.ipt 30mm m81.ipt	

Operating conditions

Moment:1

Load Type	Moment
Magnitude	4000.000 N mm
Vector X	85.926 N mm
Vector Y	454.451 N mm
Vector Z	3973.171 N mm

Selected Face(s)

Moment:2

Load Type	Moment
Magnitude	4500.000 N mm
Vector X	-96.667 N mm
Vector Y	-511.258 N mm
Vector Z	-4469.818 N mm

Selected Face(s)

Gravity

Load Type	Gravity
Magnitude	9810.000 mm/s^2
Vector X	-1335.510 mm/s^2
Vector Y	-9652.409 mm/s^2
Vector Z	1132.925 mm/s^2

Selected Face(s)

Fixed Constraint:1

Constraint Type	Fixed Constraint

Selected Face(s)

Pin Constraint:4

Constraint Type	Pin Constraint
Fix Radial Direction	Yes
Fix Axial Direction	Yes
Fix Tangential Direction	No

Selected Face(s)

Pin Constraint:5

Constraint Type	Pin Constraint
Fix Radial Direction	Yes
Fix Axial Direction	Yes
Fix Tangential Direction	No

Selected Face(s)

Pin Constraint:6

Constraint Type	Pin Constraint
Fix Radial Direction	Yes
Fix Axial Direction	Yes
Fix Tangential Direction	No

Selected Face(s)

Pin Constraint:7

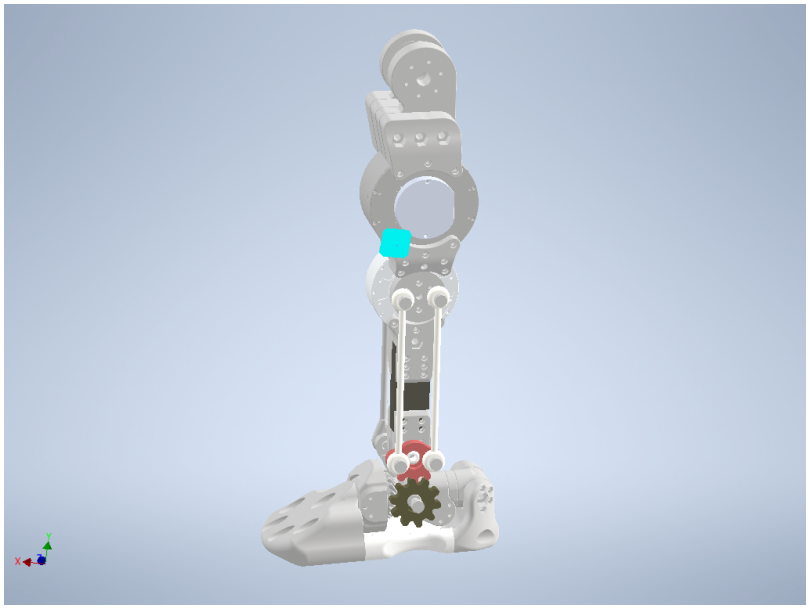
Constraint Type	Pin Constraint
Fix Radial Direction	Yes
Fix Axial Direction	Yes
Fix Tangential Direction	No

Selected Face(s)

Pin Constraint:8

Constraint Type	Pin Constraint
Fix Radial Direction	Yes
Fix Axial Direction	Yes
Fix Tangential Direction	No

Selected Face(s)



Pin Constraint:9

Constraint Type	Pin Constraint
Fix Radial Direction	Yes
Fix Axial Direction	Yes
Fix Tangential Direction	No

Selected Face(s)

Pin Constraint:10

Constraint Type	Pin Constraint
Fix Radial Direction	Yes
Fix Axial Direction	Yes
Fix Tangential Direction	No

Selected Face(s)

Pin Constraint:11

Constraint Type	Pin Constraint
Fix Radial Direction	Yes
Fix Axial Direction	Yes
Fix Tangential Direction	No

Selected Face(s)

Results

Reaction Force and Moment on Constraints

Constraint Name	Reaction Force		Reaction Moment	
	Magnitude	Component (X,Y,Z)	Magnitude	Component (X,Y,Z)
Fixed Constraint:1	2.60546 N	1.78221 N	2.56982 N m	-0.351176 N m
		1.7787 N		-0.3081 N m
		0.669614 N		-2.527 N m
Pin Constraint:4	80.3597 N	10.3026 N	0.0300099 N m	0.0288932 N m
		79.1215 N		-0.00810372 N m
		-9.55588 N		0.000319538 N m

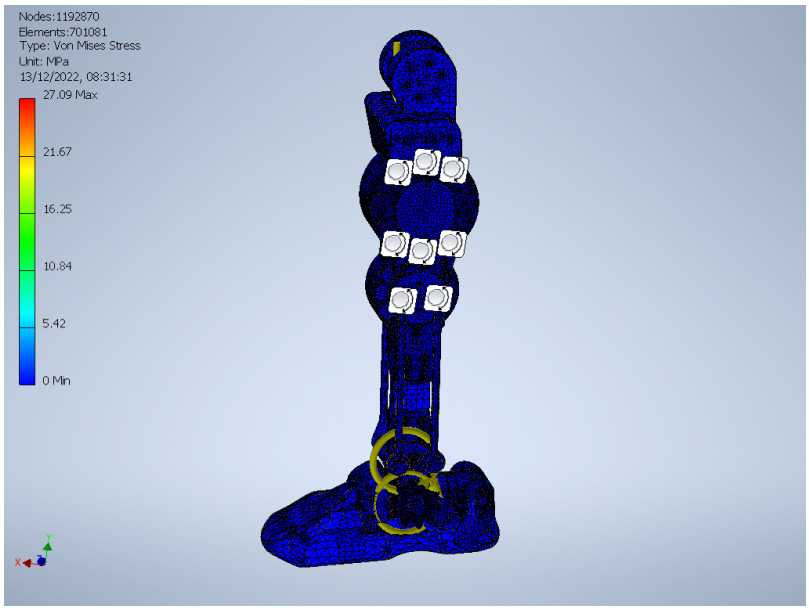
Pin Constraint:5	61.3426 N	-8.53681 N	0.0640824 N m	-0.0639006 N m
		-60.2059 N		0.00474805 N m
		8.08026 N		0.000853633 N m
Pin Constraint:6	2.46795 N	-0.427736 N	0.0143784 N m	-0.0143261 N m
		2.40868 N		0.00121366 N m
		-0.325713 N		0.000170265 N m
Pin Constraint:7	3.11621 N	0.0610257 N	0.00269847 N m	-0.00268106 N m
		2.54981 N		0.000305237 N m
		1.7904 N		0.000022764 N m
Pin Constraint:8	2.50165 N	0.733618 N	0.00234026 N m	-0.00233165 N m
		2.39141 N		0.000198625 N m
		0.0350637 N		0.0000273636 N m
Pin Constraint:9	1.32098 N	0.324282 N	0.0122323 N m	-0.0122266 N m
		1.21986 N		0.000293989 N m
		-0.389596 N		0.00023091 N m
Pin Constraint:10	3.69829 N	0.200477 N	0.0209506 N m	-0.0207447 N m
		0.597833 N		0.00292795 N m
		-3.64414 N		0.000113653 N m
Pin Constraint:11	2.12837 N	0.180686 N	0.0136067 N m	-0.0133838 N m
		2.08132 N		0.00245261 N m
		-0.406733 N		0 N m

Result Summary

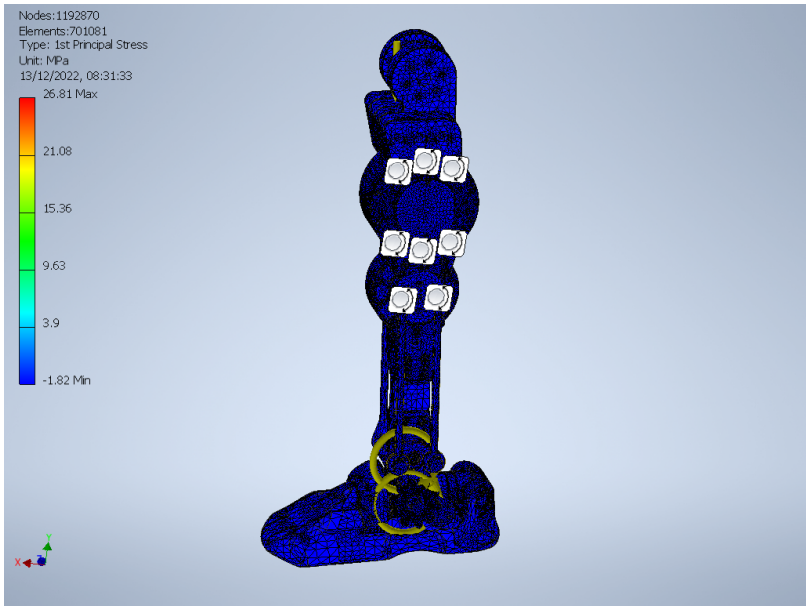
Name	Minimum	Maximum
Volume	2656980 mm^3	
Mass	3.29465 kg	
Von Mises Stress	0.0000000779296 MPa	27.09 MPa
1st Principal Stress	-1.82399 MPa	26.8102 MPa
3rd Principal Stress	-10.9536 MPa	1.73077 MPa
Displacement	0 mm	0.264842 mm
Safety Factor	2.21484 ul	15 ul
Stress XX	-7.53265 MPa	9.5764 MPa
Stress XY	-7.53666 MPa	7.48785 MPa
Stress XZ	-5.04904 MPa	5.04907 MPa
Stress YY	-10.2142 MPa	26.5051 MPa
Stress YZ	-5.31466 MPa	6.06235 MPa
Stress ZZ	-6.19289 MPa	4.07123 MPa
Equivalent Strain	0.0000000000197861 ul	0.0068581 ul
1st Principal Strain	-0.000000544007 ul	0.00768776 ul
3rd Principal Strain	-0.0033188 ul	0.000000457857 ul
Strain XX	-0.00277305 ul	0.00296656 ul
Strain XY	-0.00279933 ul	0.0027812 ul
Strain XZ	-0.00187536 ul	0.00187537 ul
Strain YY	-0.00281871 ul	0.00757445 ul
Strain YZ	-0.00197402 ul	0.00225173 ul
Strain ZZ	-0.0027967 ul	0.00085968 ul
Contact Pressure	0 MPa	141.035 MPa
Contact Pressure X	-6.7114 MPa	15.9195 MPa
Contact Pressure Y	-6.50723 MPa	139.795 MPa
Contact Pressure Z	-9.72976 MPa	5.53889 MPa

Figures

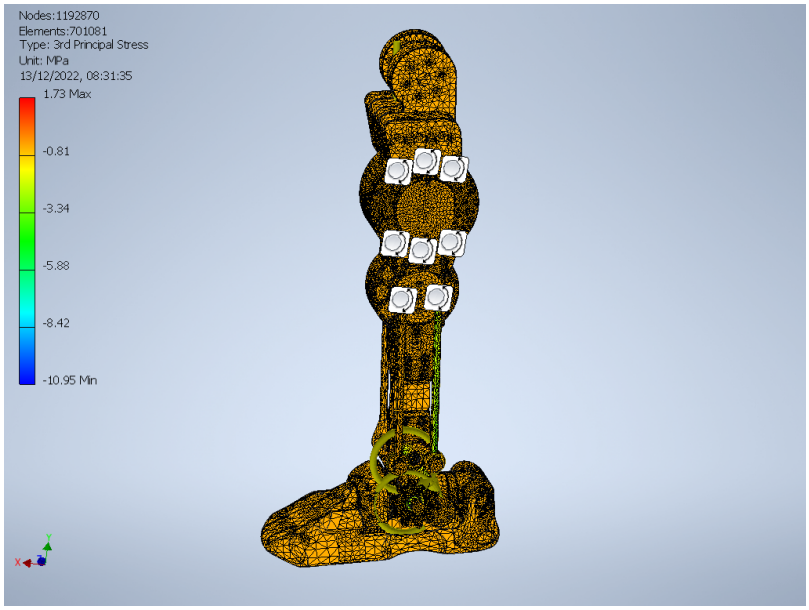
Von Mises Stress



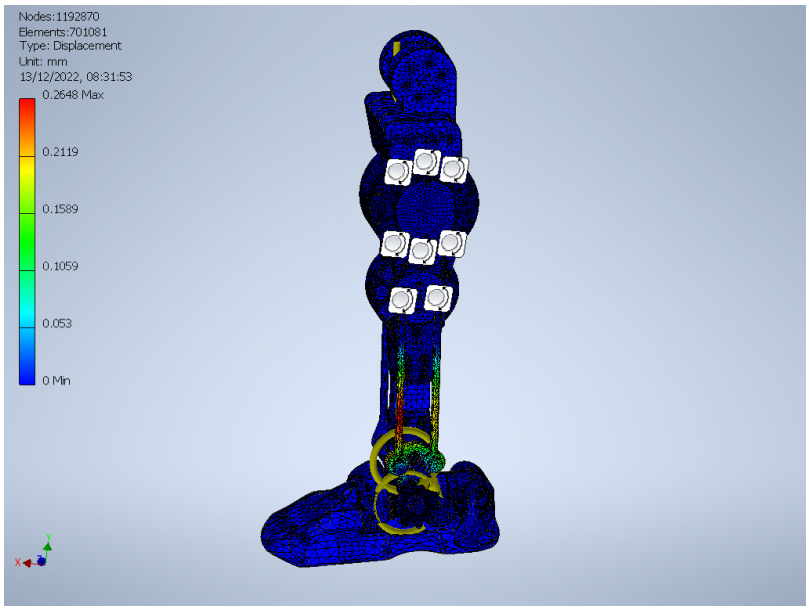
1st Principal Stress



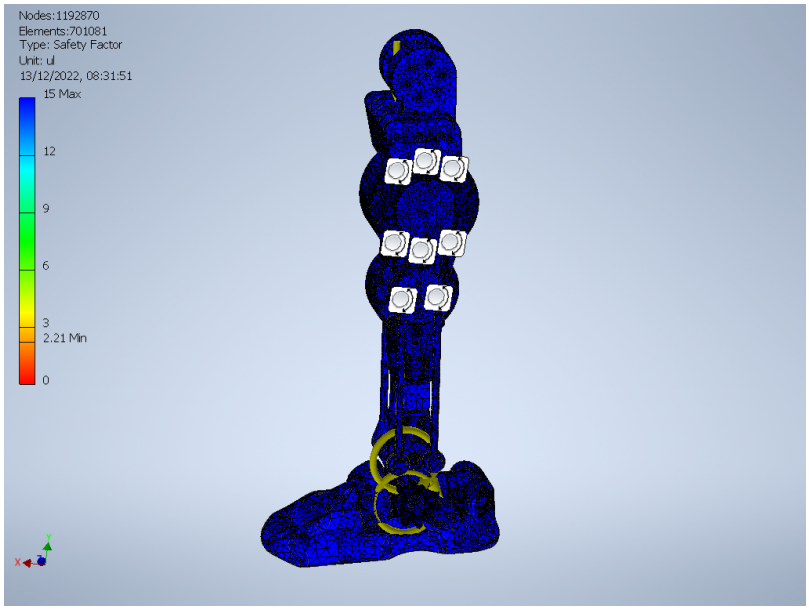
3rd Principal Stress



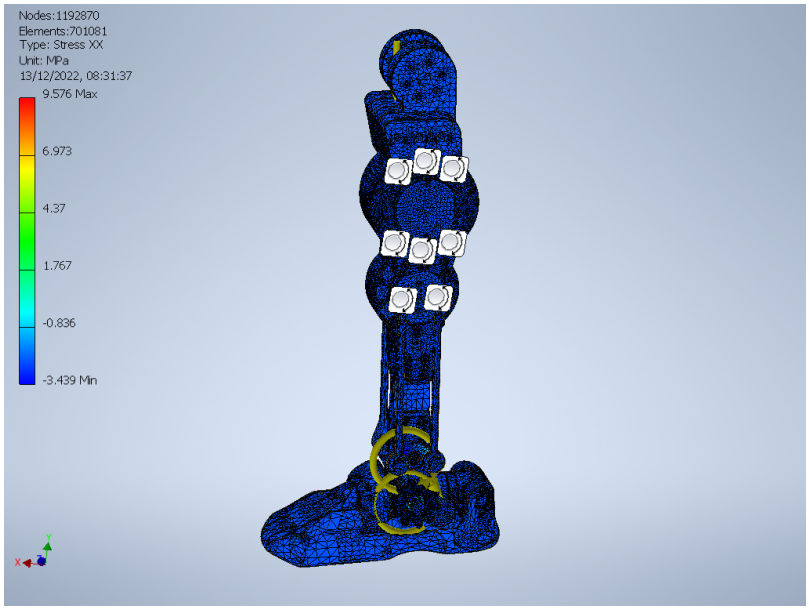
Displacement



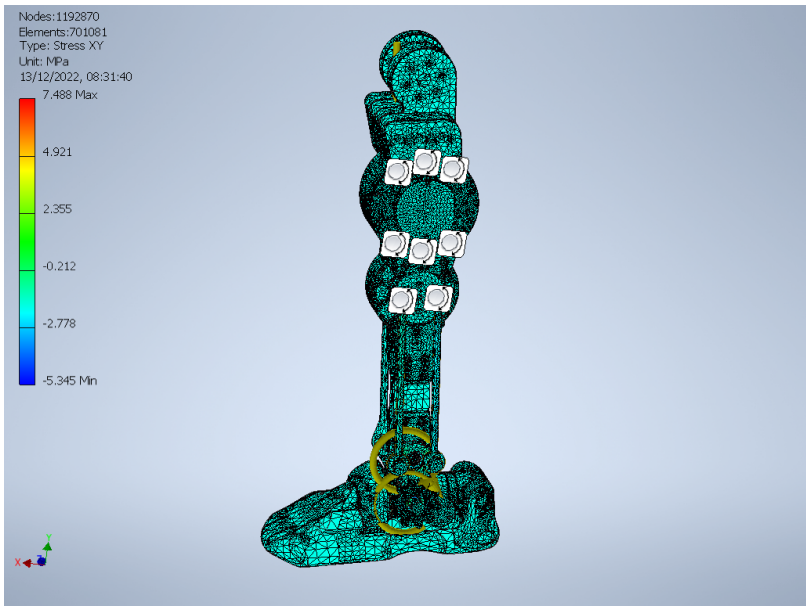
Safety Factor



Stress XX

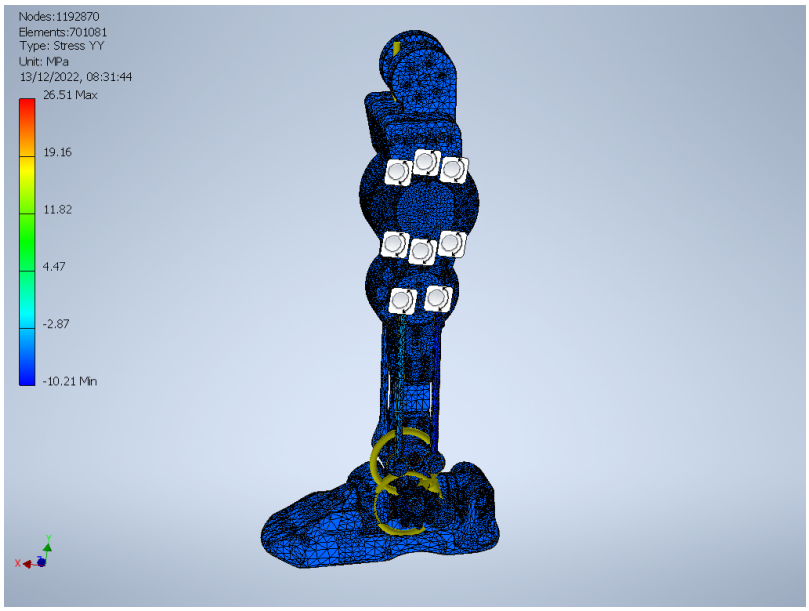


Stress XY



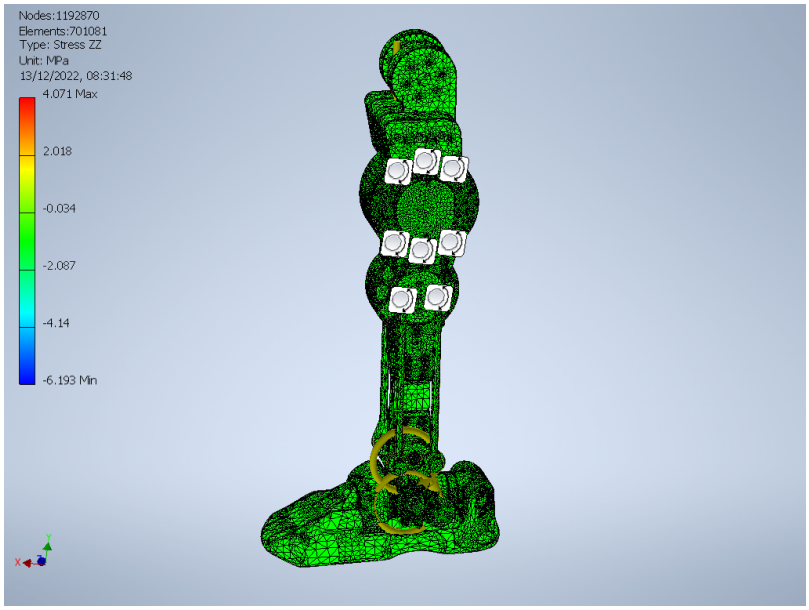
Stress XZ

Stress YY

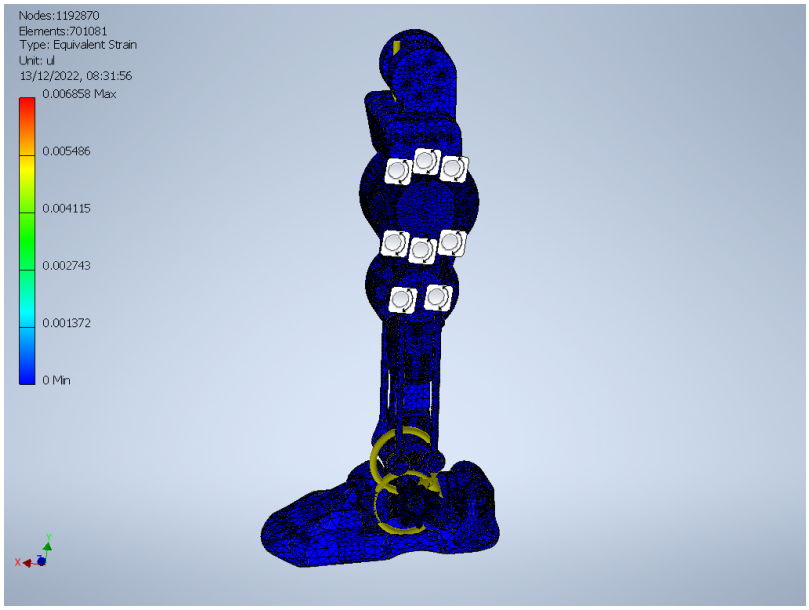


Stress YZ

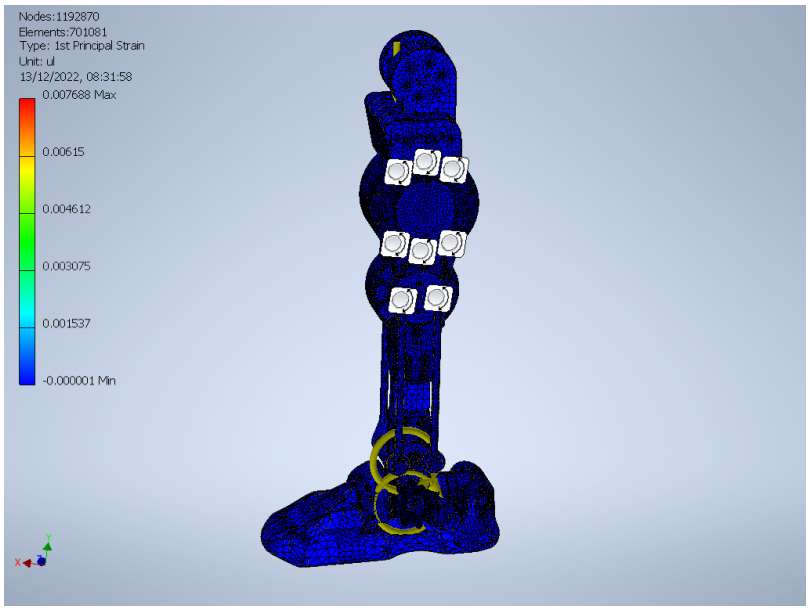
Stress ZZ



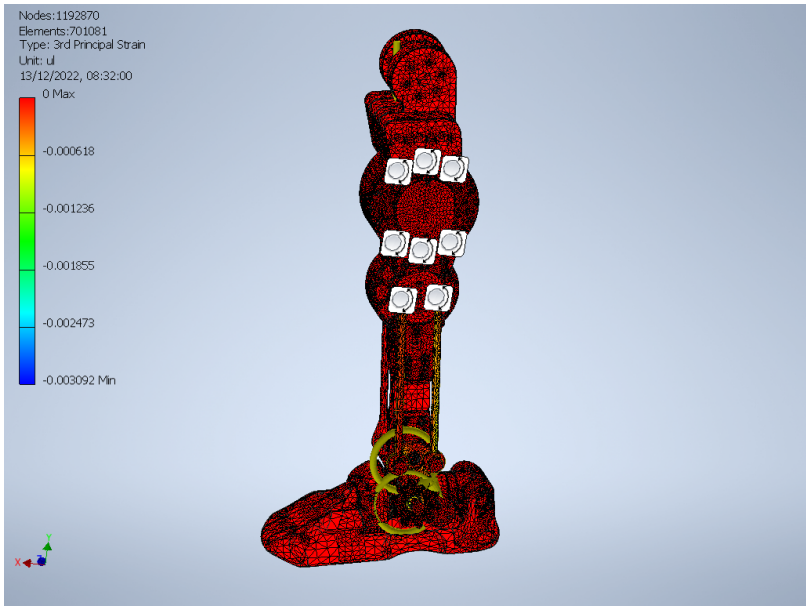
Equivalent Strain



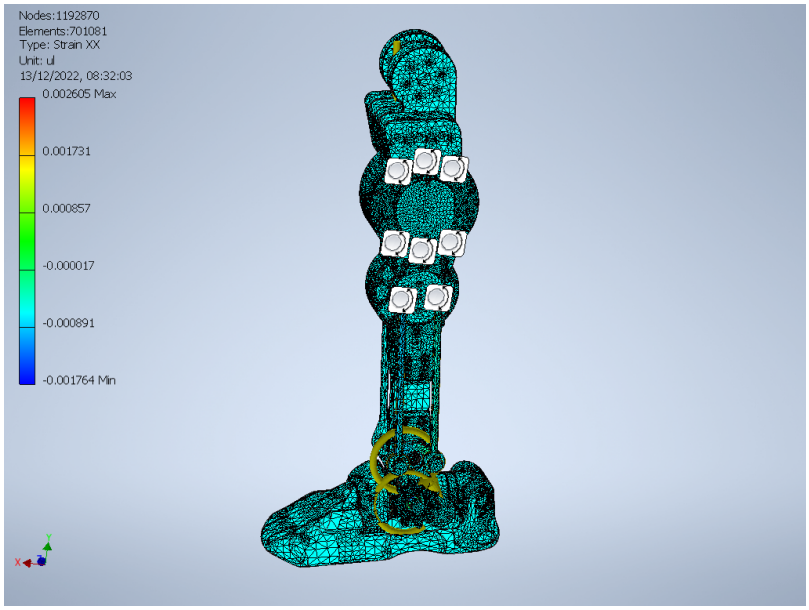
1st Principal Strain



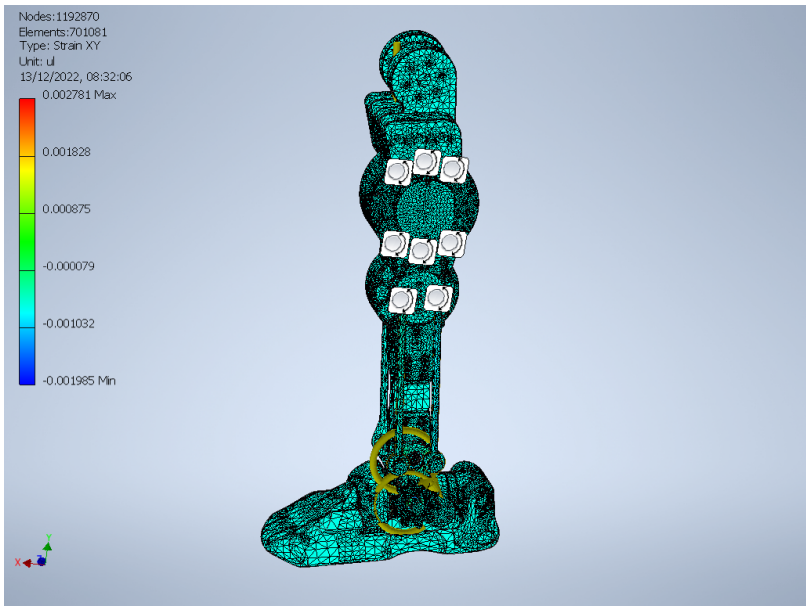
3rd Principal Strain



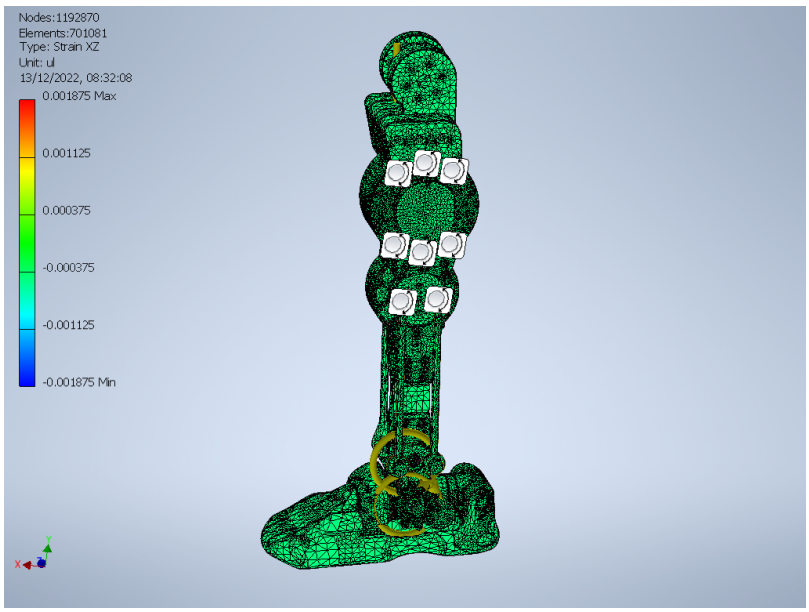
Strain XX



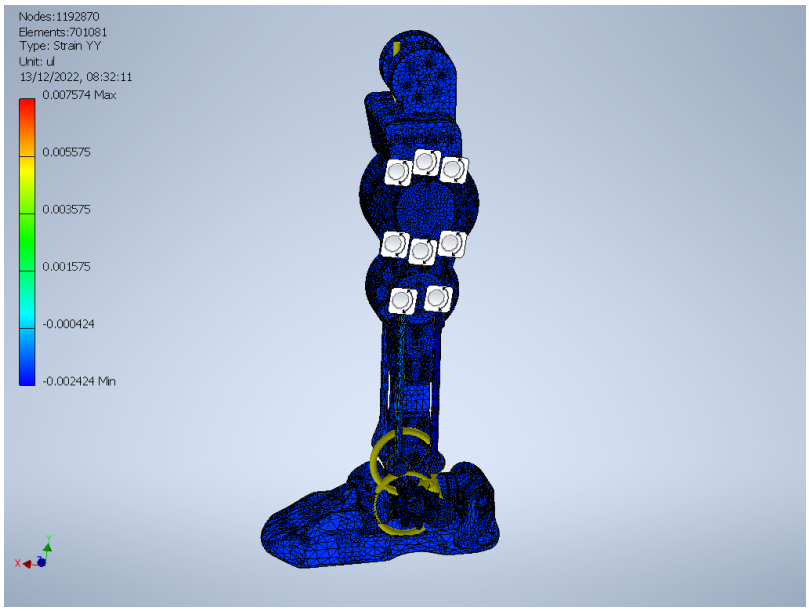
Strain XY



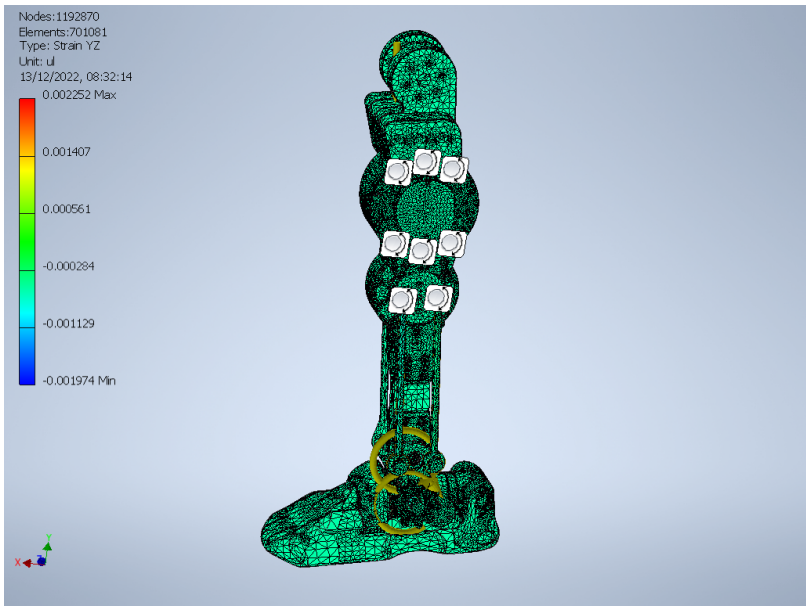
Strain XZ



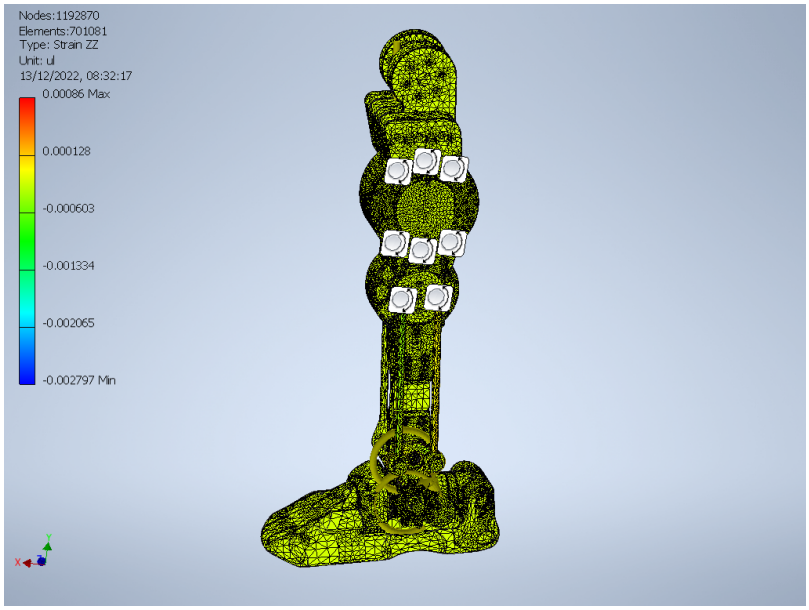
Strain YY



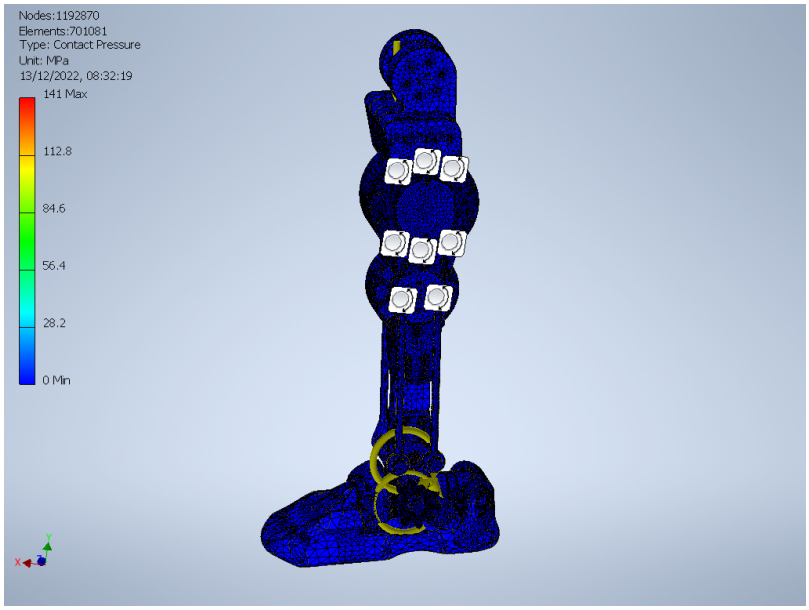
Strain YZ



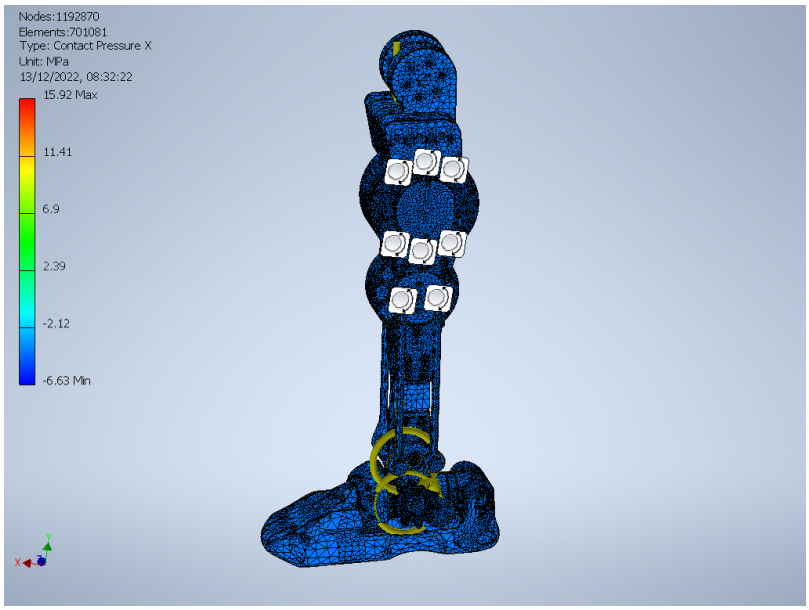
Strain ZZ



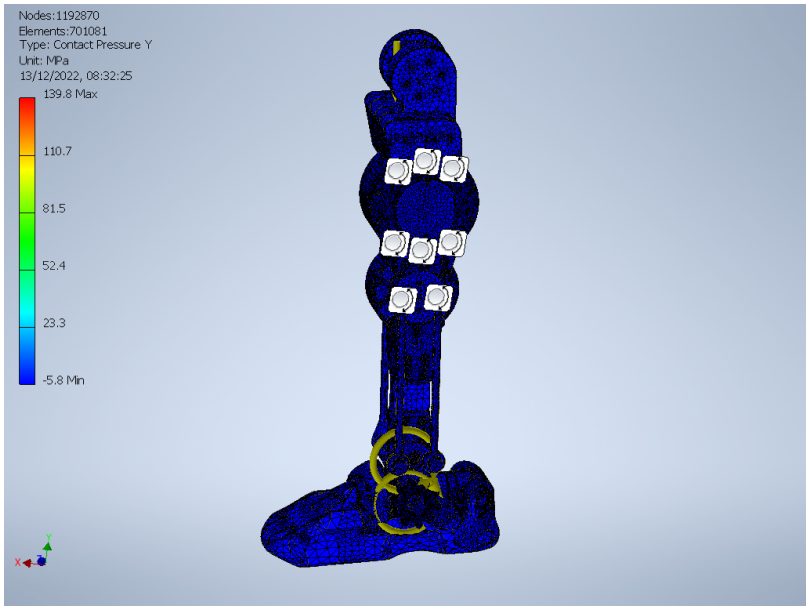
Contact Pressure



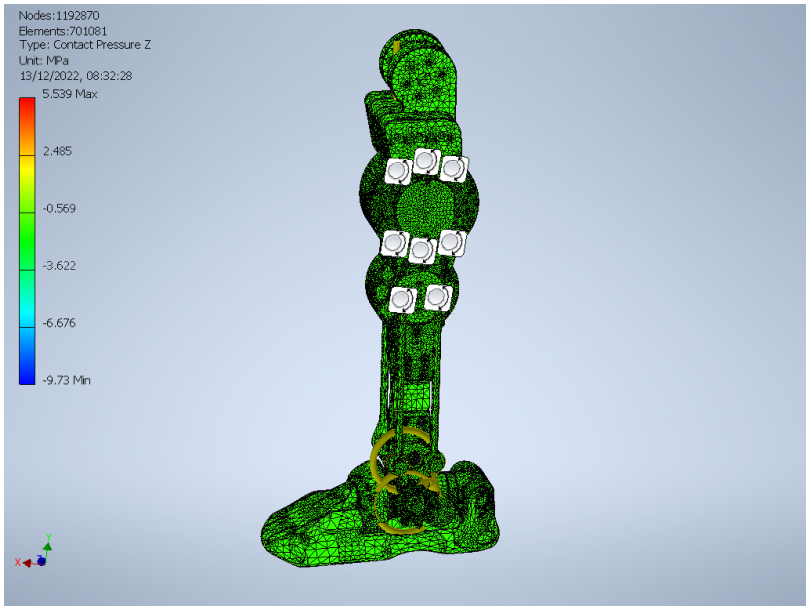
Contact Pressure X



Contact Pressure Y



Contact Pressure Z



C:\Users\rodge\OneDrive\Desktop\Bot\Drop bear .iam\fulliam1.iam