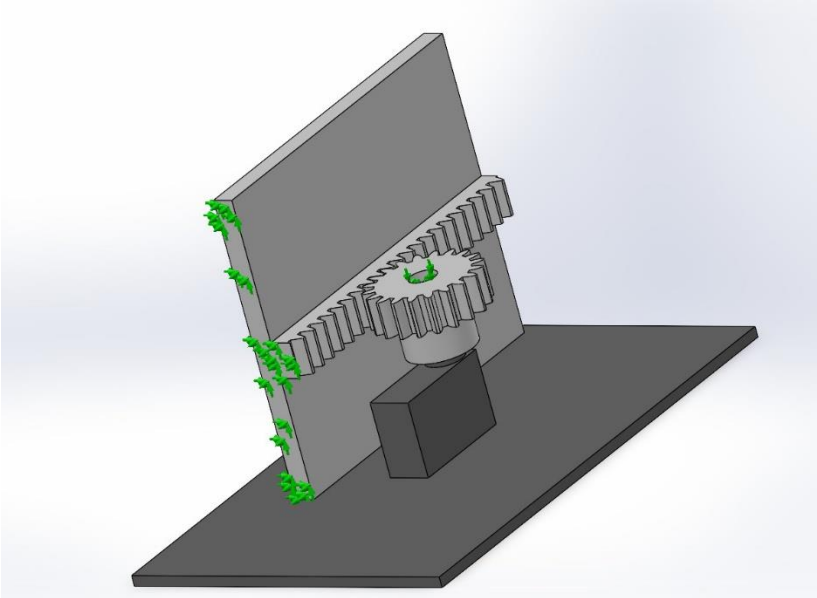


Simulation of Rack and Pinion

Date: Saturday, May 18, 2024
Designer: Solidworks
Study name: Static 1
Analysis type: Static

Table of Contents

Description

Mechanism of Smart home gate

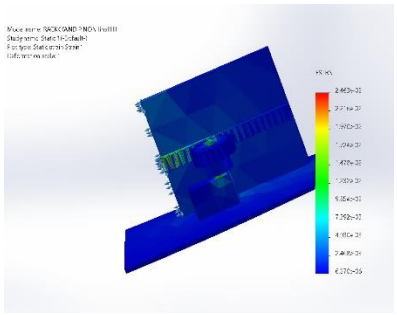
Study Properties

Study name	Static 1
Analysis type	Static
Mesh type	Solid Mesh
Thermal Effect:	On
Thermal option	Include temperature loads
Zero strain temperature	298 Kelvin
Include fluid pressure effects from SOLIDWORKS Flow Simulation	Off
Solver type	Automatic
Inplane Effect:	Off
Soft Spring:	Off
Inertial Relief:	Off
Incompatible bonding options	Automatic
Large displacement	On
Compute free body forces	On
Friction	Off
Use Adaptive Method:	Off
Result folder	SOLIDWORKS document

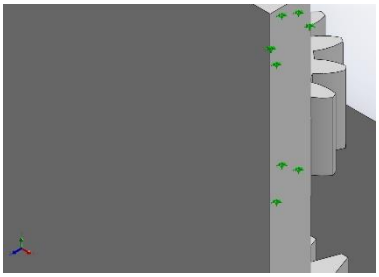
Units

Unit system:	SI (MKS)
Length/Displacement	mm
Temperature	Kelvin
Angular velocity	Rad/sec
Pressure/Stress	N/m^2

Material Properties

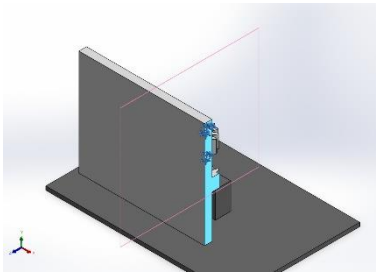
Model Reference	Properties	Components
	**Name:** Polylactic acid (pla) **Model type:** Linear Elastic Isotropic **Default failure criterion:** Max von Mises Stress **Yield strength:** 2.608e+07 N/m^2 **Tensile strength:** 5e+07 N/m^2 **Elastic modulus:** 3.5e+09 N/m^2 **Poisson's ratio:** 0.35 **Mass density:** 1,240 kg/m^3 **Shear modulus:** 3.189e+08 N/m^2	SolidBody 1(Boss-Extrude5)(base gate-1), SolidBody 1(Boss-Extrude1)(head servo-1), SolidBody 1(Boss-Extrude1)(rack-2), SolidBody 1(Cut-Extrude1)(spur gear-1)
Curve Data:N/A		

Loads and Fixtures

Fixture name	Fixture Image	Fixture Details
On Cylindrical Faces-1		**Entities:** 1 face(s) **Type:** On Cylindrical Faces **Translation:** 0, -0.087266 rad., 0 **Units:** mm

Resultant Forces

Components	X	Y	Z	Resultant
Reaction force(N)	270.172	-88.3361	1,504.12	1,530.74
Reaction Moment(N.m)	0	0	0	0

Fixture name	Fixture Image	Fixture Details
Reference Geometry-1		**Entities:** 1 face(s), 1 plane(s) **Reference:** Right Plane **Type:** Use reference geometry **Translation:** 0, 0, 0 **Units:** mm

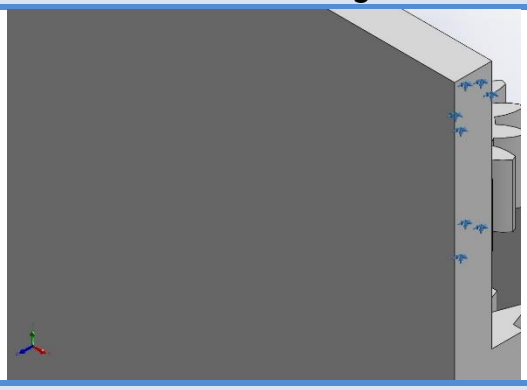
Resultant Forces

Components	X	Y	Z	Resultant
Reaction force(N)	-194.561	66.4383	-1,806.31	1,817.97
Reaction Moment(N.m)	0	0	0	0

Connector Definitions

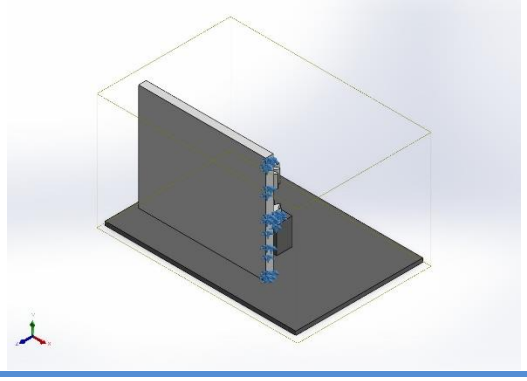
No Data

Interaction Information

Interaction	Interaction Image	Interaction Properties
Local Interaction-7		**Type:** Contact interaction pair **Entities:** 87 face(s) **Advanced:** Surface to surface

Contact/Friction force

Components	X	Y	Z	Resultant
Contact Force(N)	-2.7395E-14	3.6138E-14	-3.828E-13	3.8548E-13

Global Interaction		**Type:** Bonded **Components:** 1 component(s) **Options:** Independent mesh

Mesh information

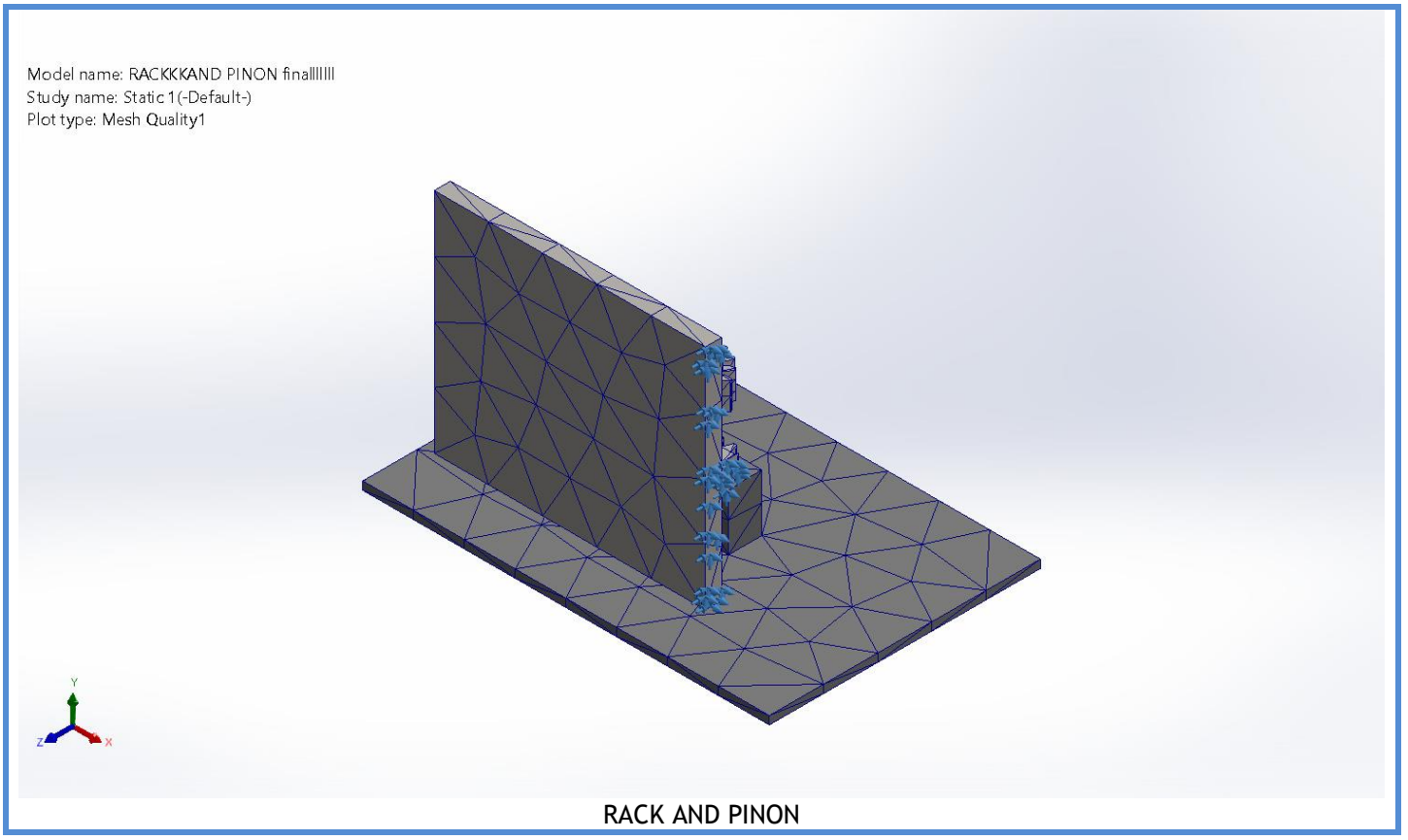
Mesh type	Solid Mesh
Mesher Used:	Blended curvature-based mesh
Jacobian points for High quality mesh	16 Points
Maximum element size	19.7259 mm
Minimum element size	3.06147 mm
Mesh Quality	High
Remesh failed parts independently	Off
Reuse mesh for identical parts in an assembly (Blended curvature-based mesher only)	Off

Mesh information - Details

Total Nodes	6180
Total Elements	3110
Maximum Aspect Ratio	24.941
% of elements with Aspect Ratio < 3	61.2
Percentage of elements with Aspect Ratio > 10	2.32
Percentage of distorted elements	0
Time to complete mesh(hh;mm;ss):	00:00:13
Computer name:	FARAH

Mesh Quality Plots

Name	Type	Min	Max
Quality1	Mesh	-	-



RACK AND PINON

Resultant Forces

Reaction forces

Selection set	Units	Sum X	Sum Y	Sum Z	Resultant
Entire Model	N	-288.702	66.0532	50.1787	300.382

Reaction Moments

Selection set	Units	Sum X	Sum Y	Sum Z	Resultant
Entire Model	N.m	0	0	0	0

Free body forces

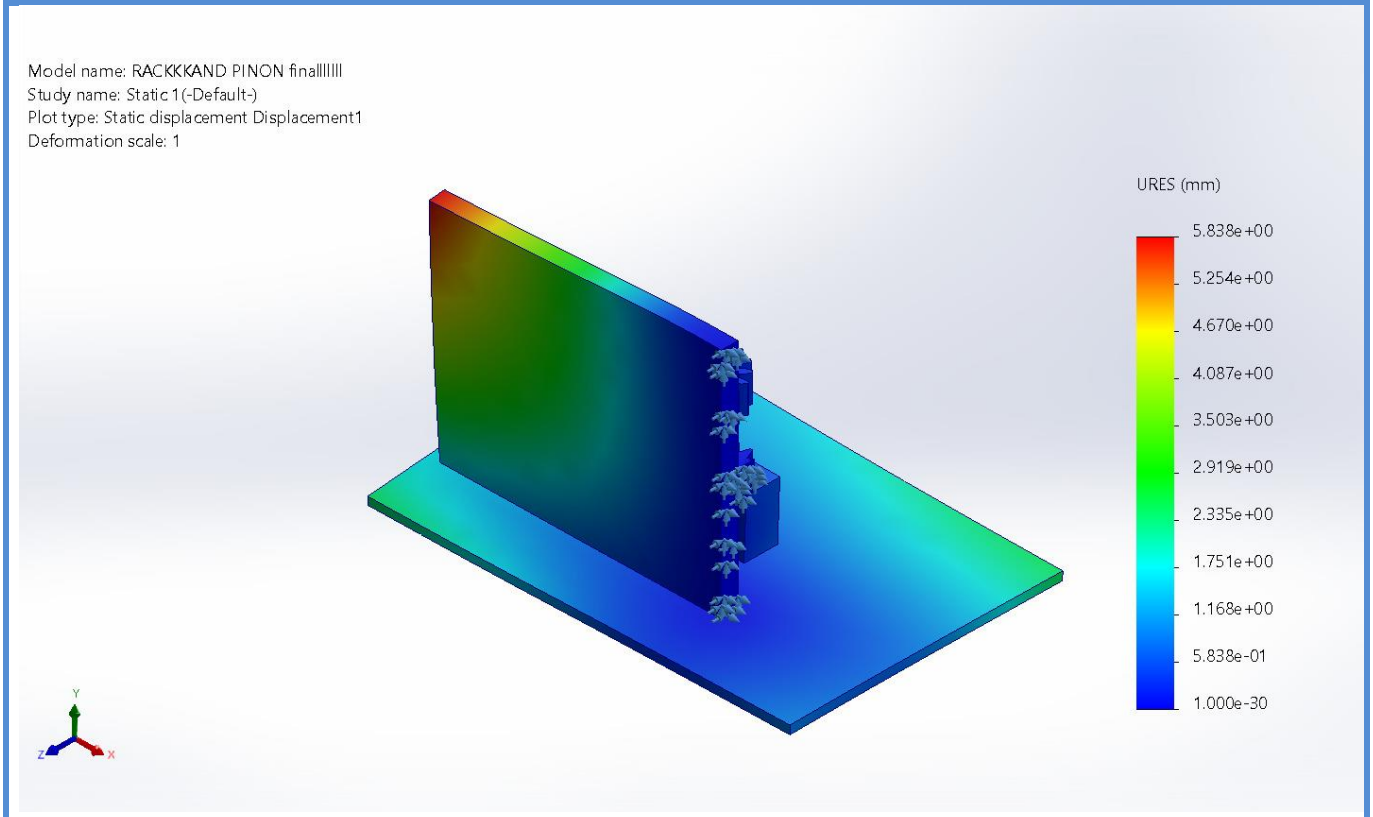
Selection set	Units	Sum X	Sum Y	Sum Z	Resultant
Entire Model	N	0	0	0	0

Free body moments

Selection set	Units	Sum X	Sum Y	Sum Z	Resultant
Entire Model	N.m	0	0	0	0

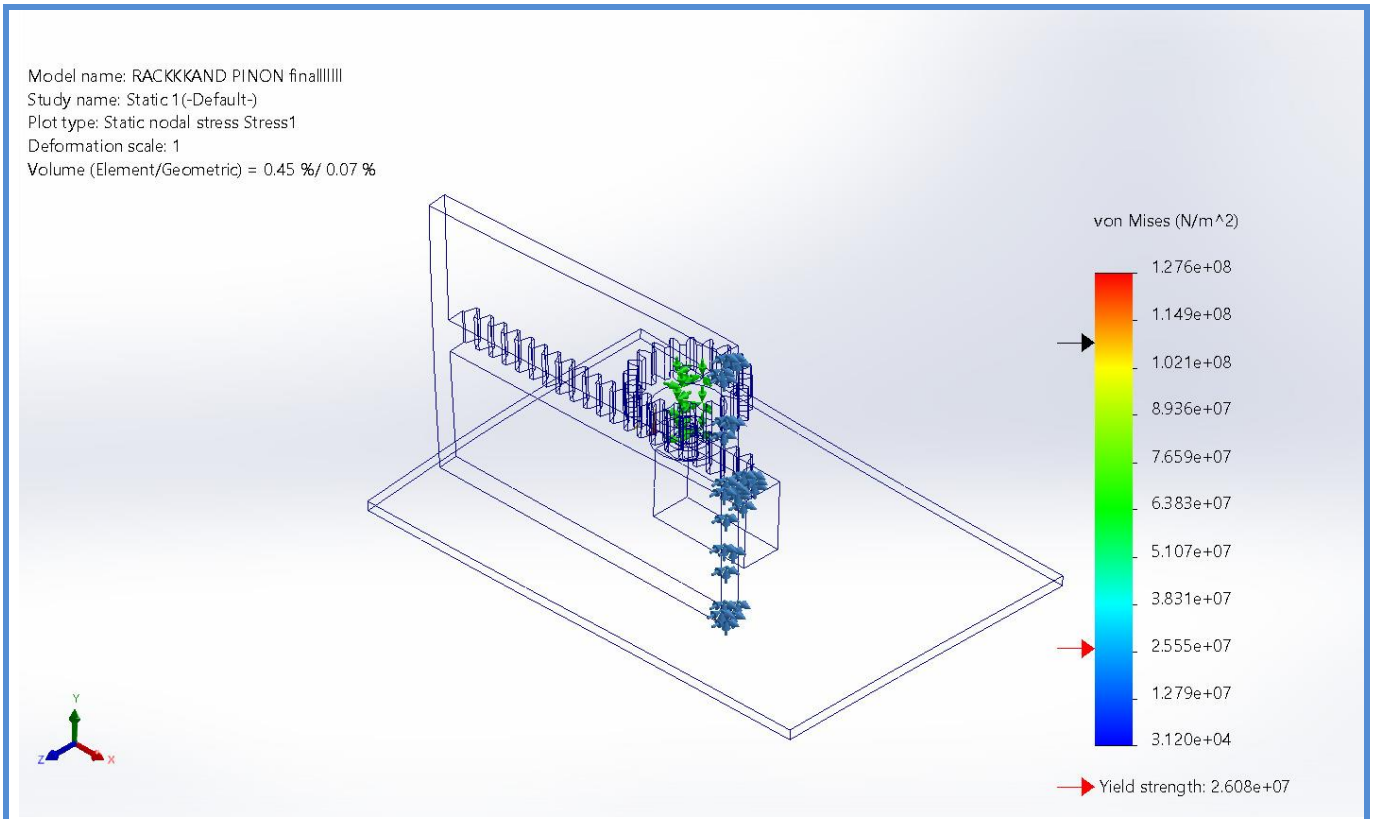
Study Results

Name	Type	Min	Max
Displacement1	URES: Resultant Displacement	0.000e+00mm Node: 1524	5.838e+00mm Node: 1517



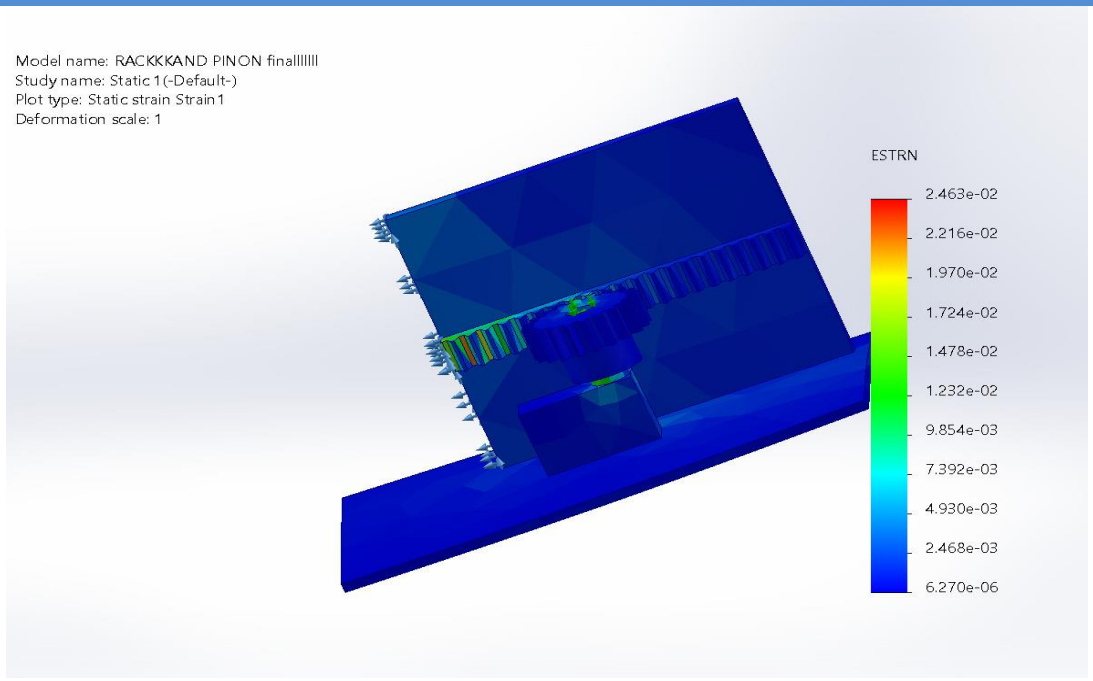
RACKKKAND PINON finallllllll-Static 1-Displacement-Displacement1

Name	Type	Min	Max
Stress1	VON: von Mises Stress	3.120e+04N/m^2 Node: 5527	1.276e+08N/m^2 Node: 5411



RACKKKAND PINON finallllllll-Static 1-Stress-Stress1

Name	Type	Min	Max
Strain1	ESTRN: Equivalent Strain	6.270e-06 Element: 2235	2.463e-02 Element: 1931



RACKKKAND PINON finallllllll-Static 1-Strain-Strain1

Image-1