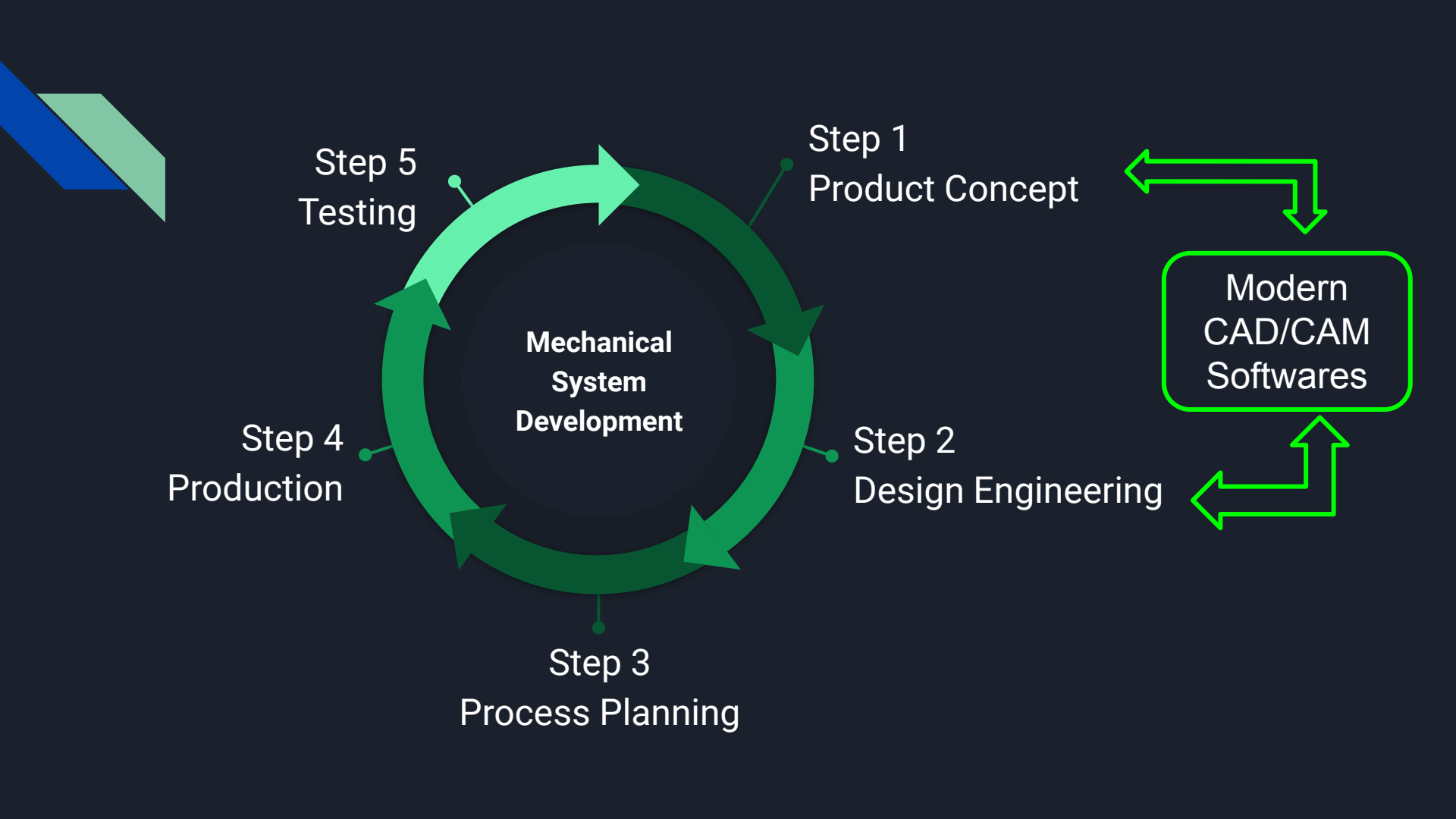
Mechanical Softwares

- Tejas Rane


Step 5
Testing
Step 1
Product Concept
Modern
CAD/CAM
Softwares
Mechanical
System
Development
Step 4
Production
Step 2
Design Engineering
Step 3
Process Planning

What is CAD/CAM/CAE?

CAD - Computer Aided Designing

CAM - Computer Aided Manufacturing

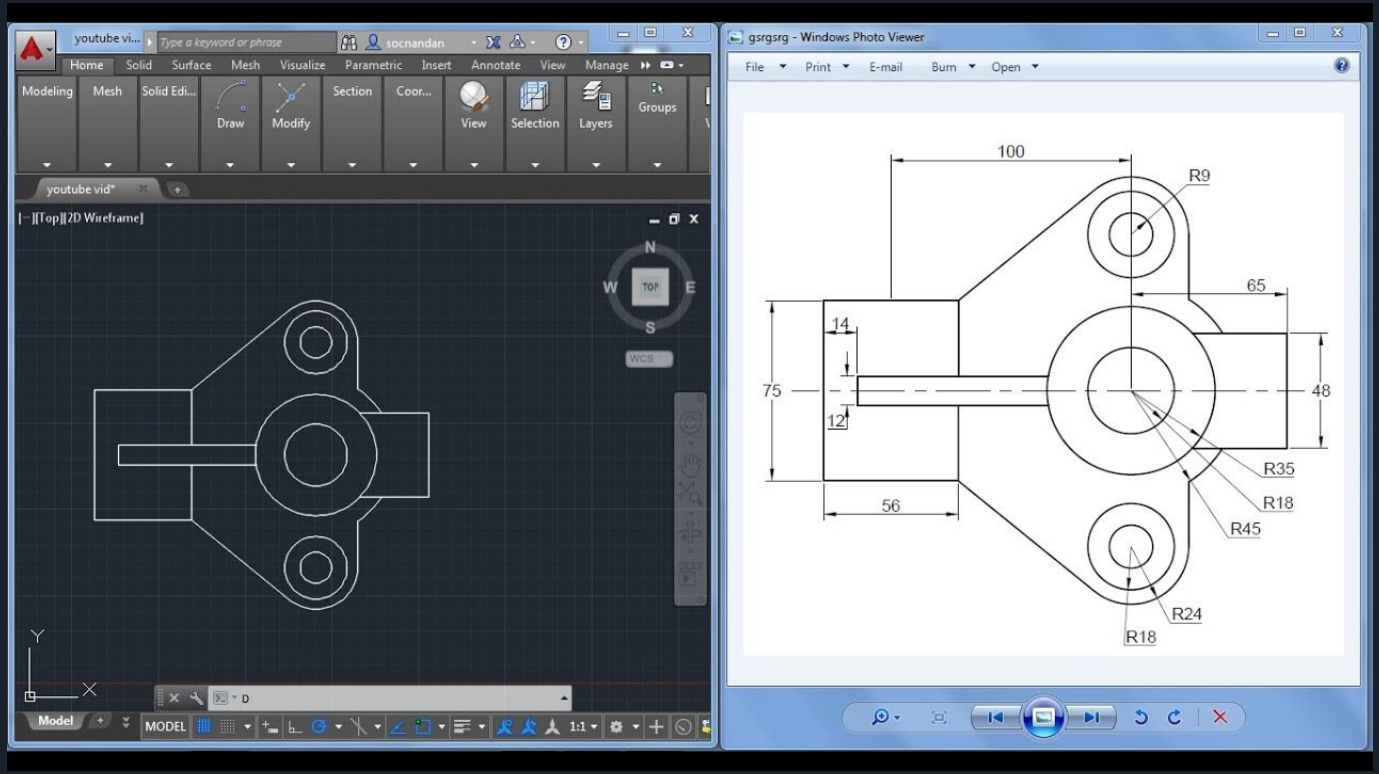
CAE - Computer Aided Engineering

Some Softwares...

- AutoCAD
- SolidWorks
- Fusion 360
- ANSYS
- Autodesk Flow Design
- MATLAB
- SimuLink

Designing Softwares

AutoCAD - CAD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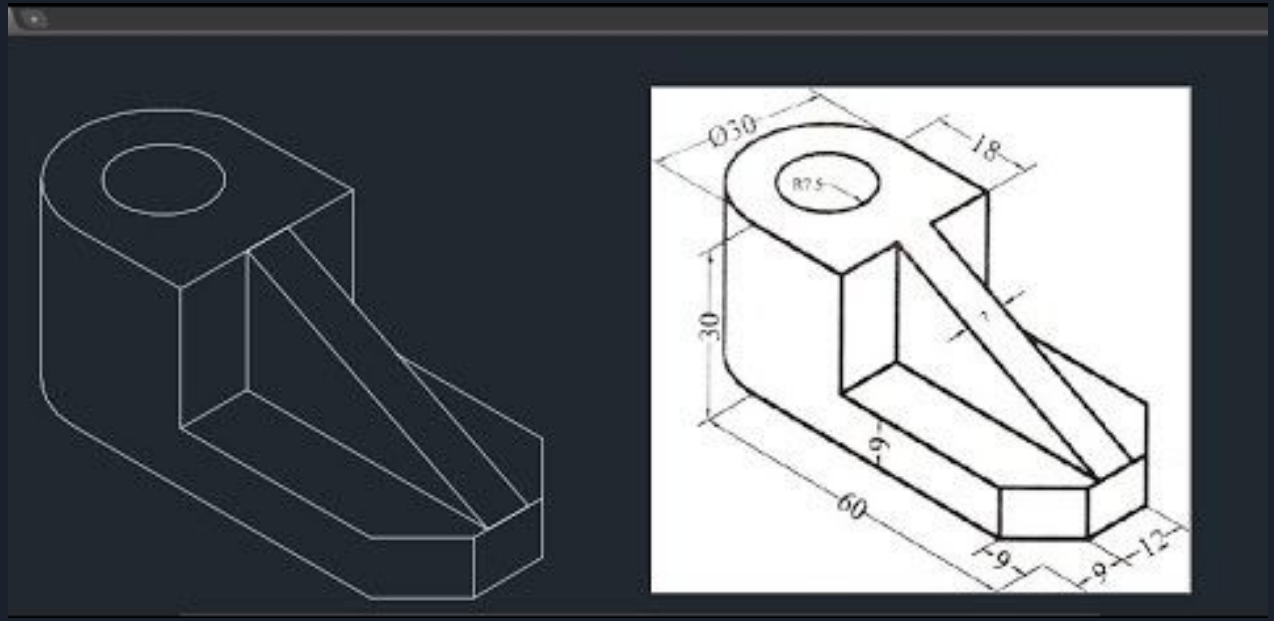
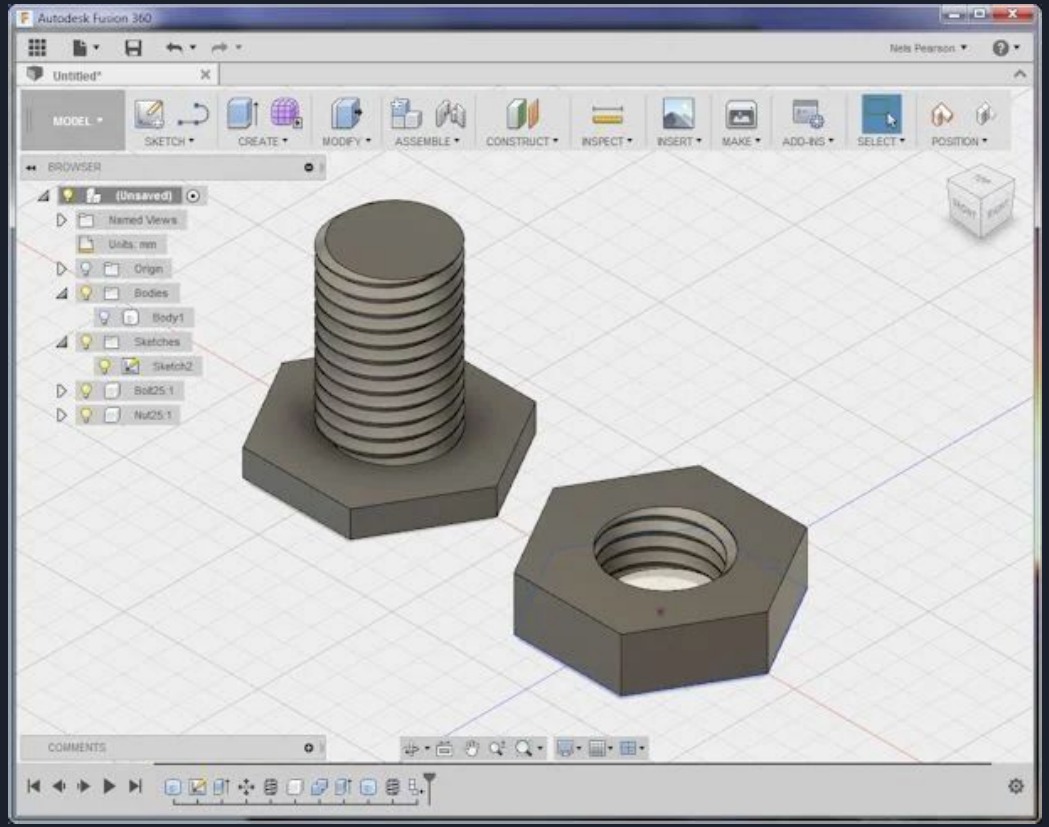
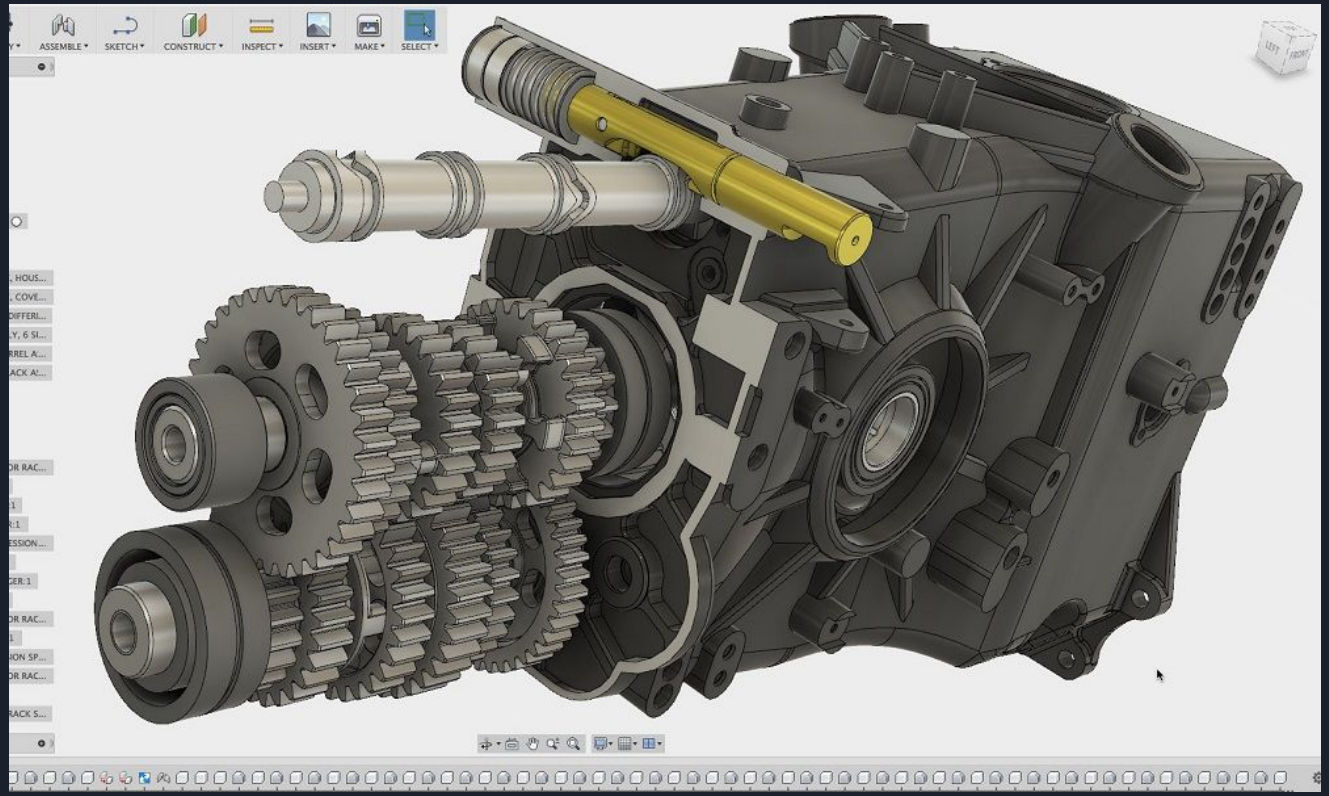
AutoCAD



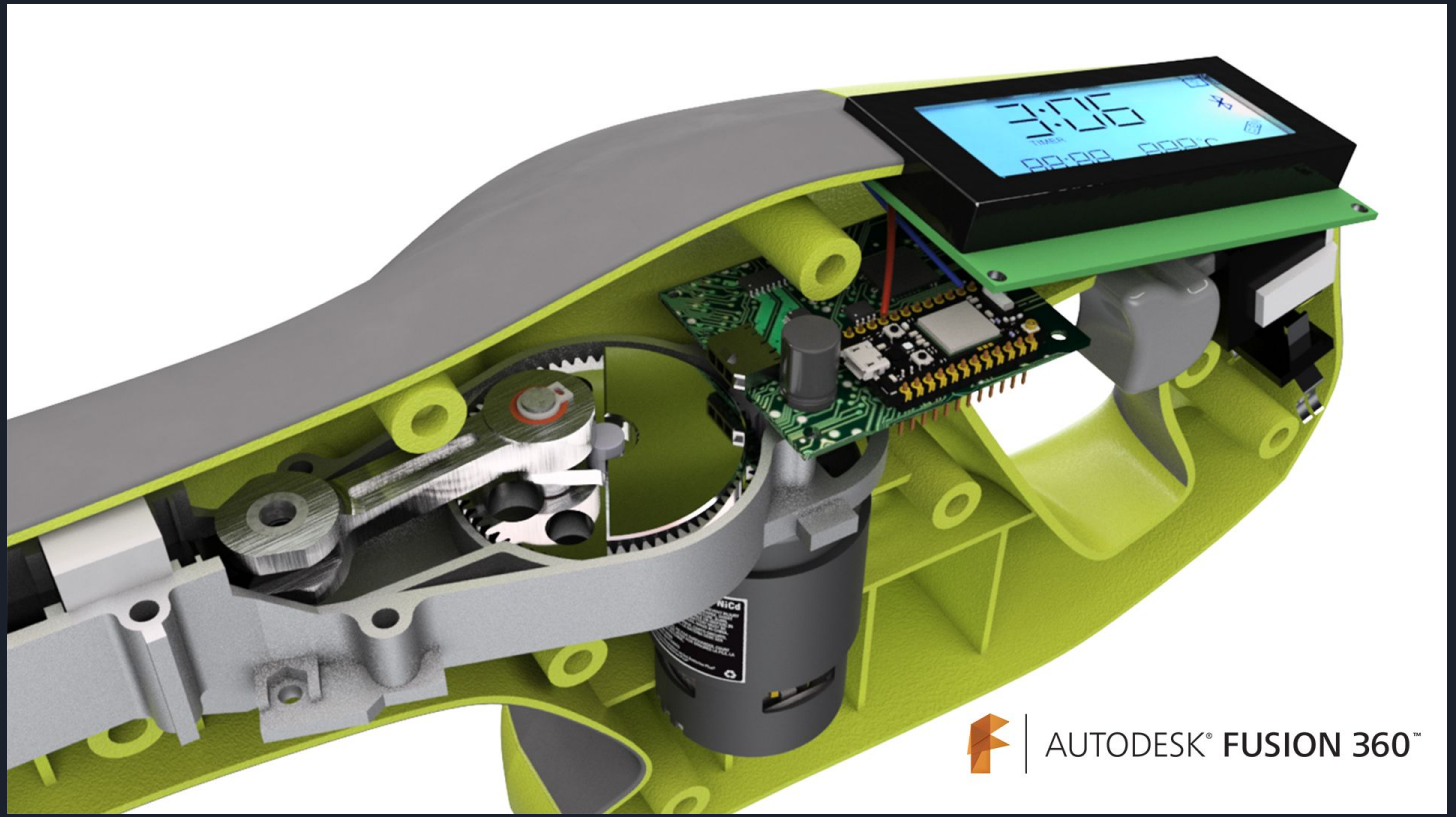
Fusion 360 - CAD+CAM



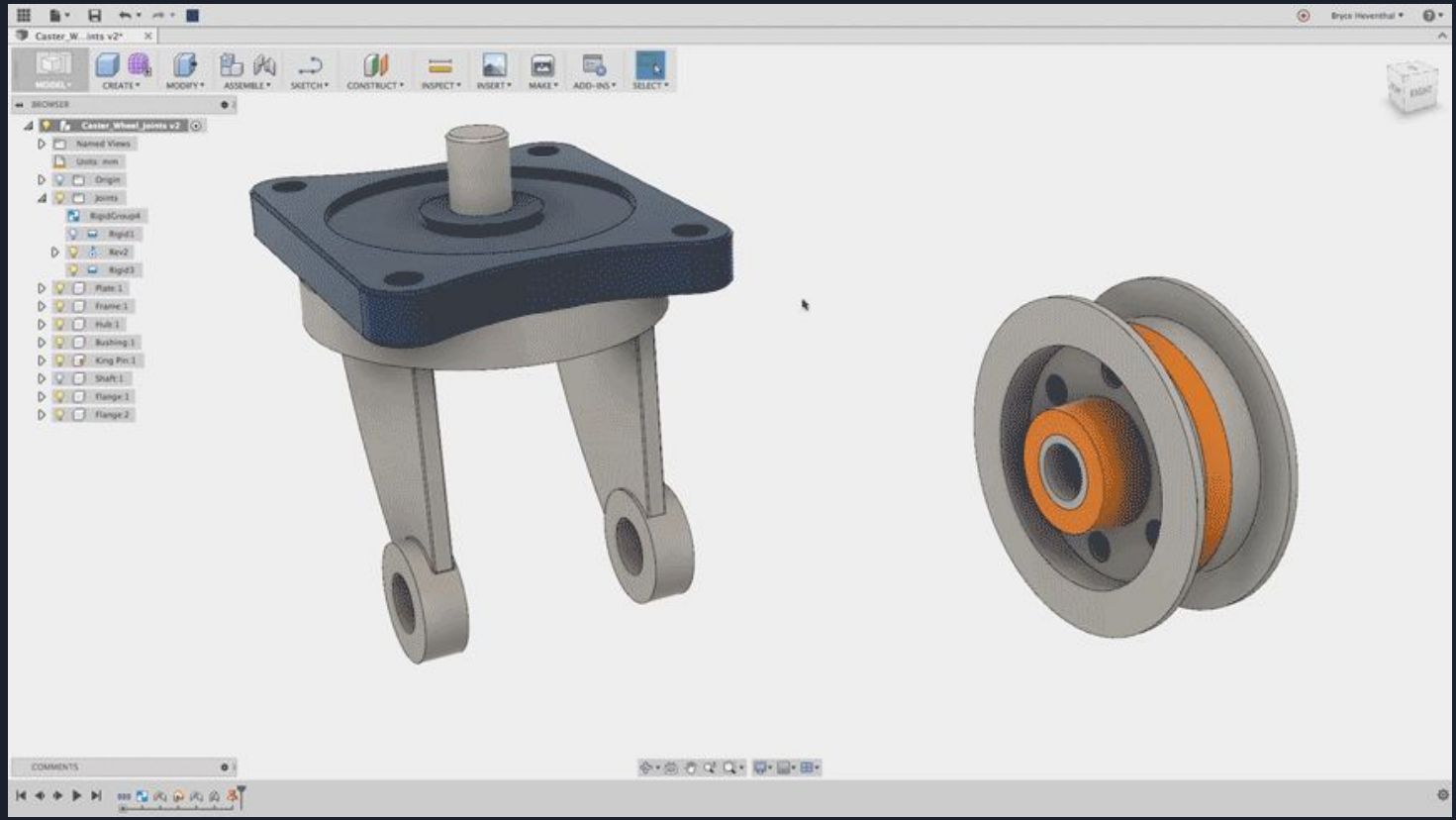
Fusion 360



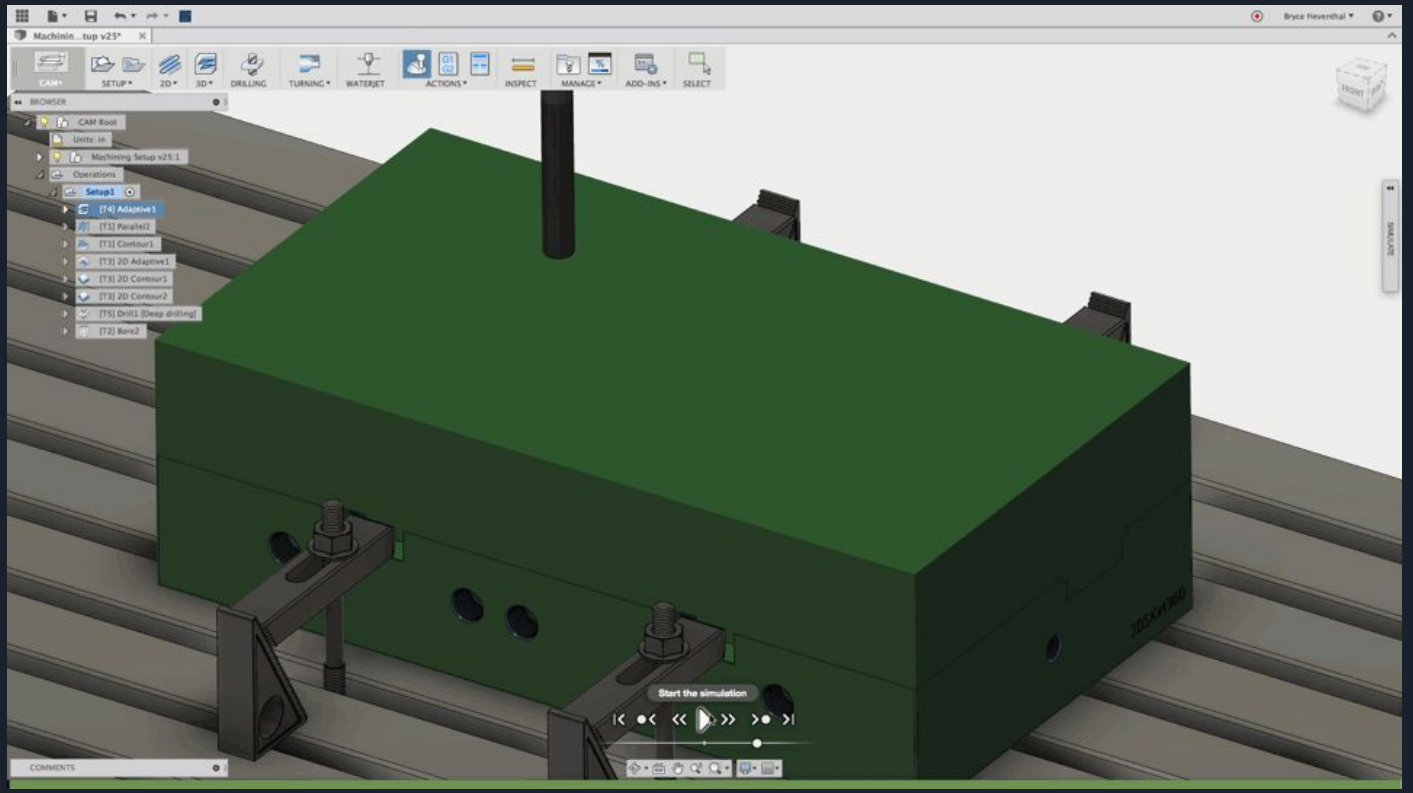
Fusion 360



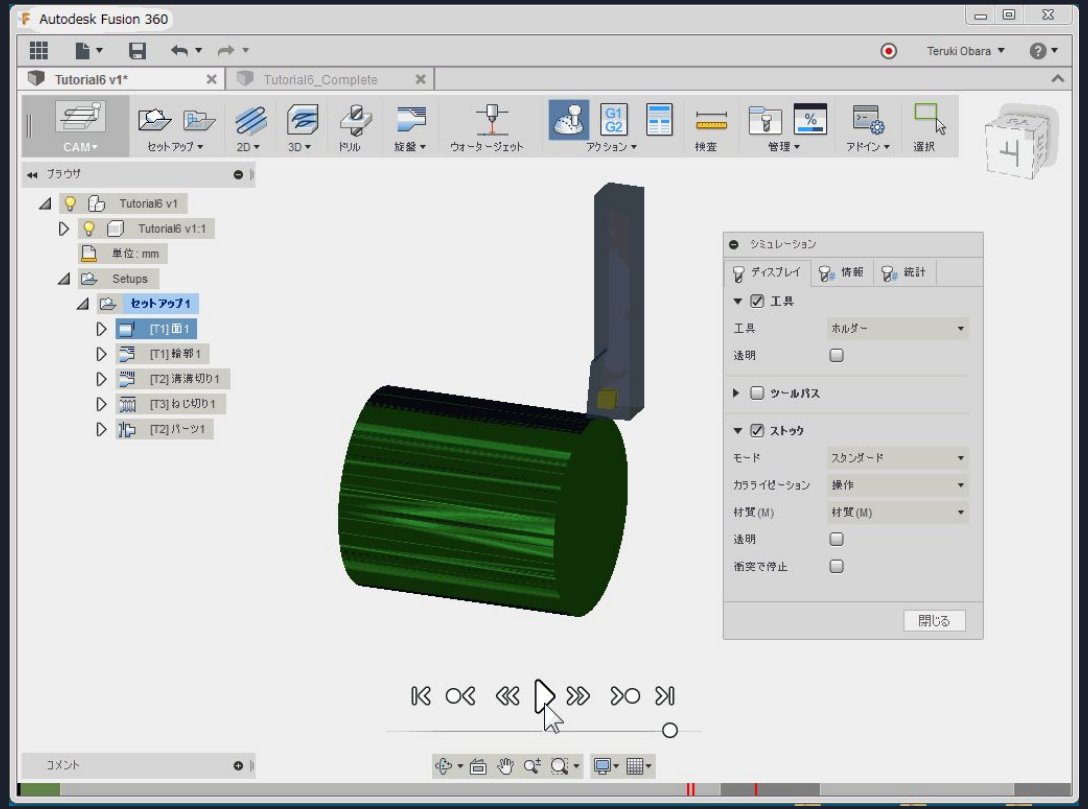
Fusion 360


MODEL
CREATE
MODIFY
ASSEMBLE
SKETCH
CONSTRUCT
INSPECT
INSERT
MAKE
ADD-INS
SELECT
BROWSER
Named Views
Origin
Joints
Plate:1
Frame:1
Hub:1
Bushing:1
King Pin:1
Shaft:1
Flange:1
Flange:2
COMMENTS

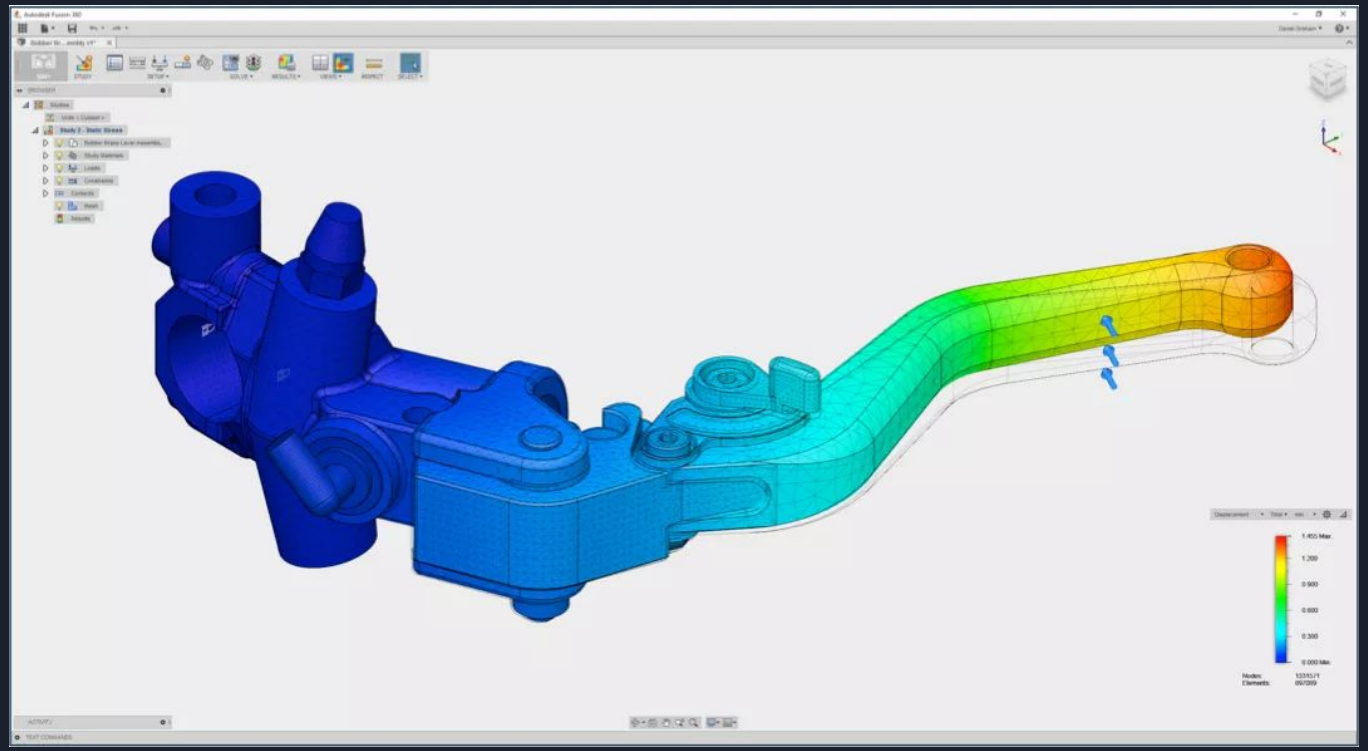
Fusion 360



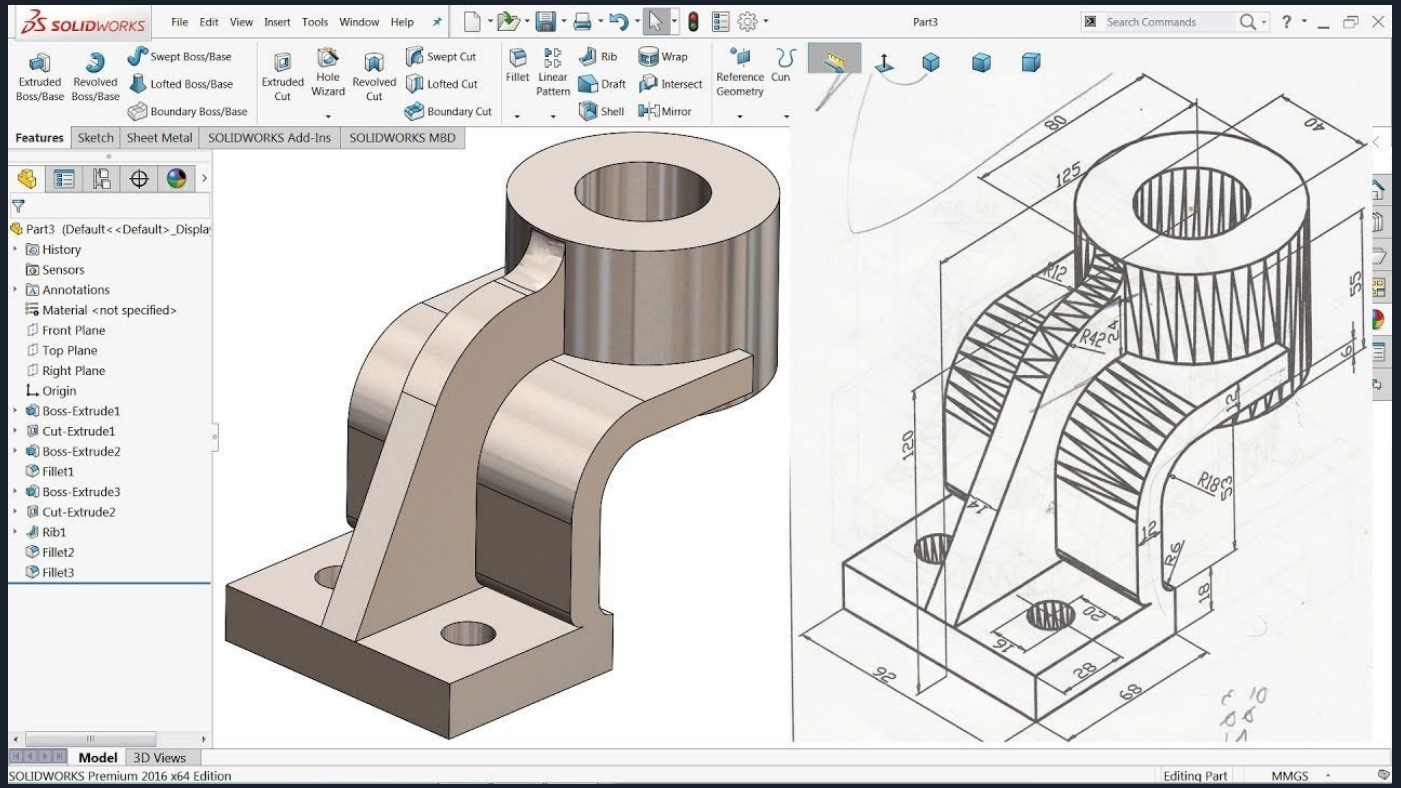
Fusion 360


Autodesk Fusion 360
Teruki Obara
Tutorial6 v1*
Tutorial6_Complete
CAM
セットアップ
2D
3D
ドリル
旋盤
ウォータージェット
アクション
検査
管理
アドイン
選択
ブラウザ
Tutorial6 v1
Tutorial6 v1:1
単位: mm
Setups
セットアップ1
[T1] 面1
[T1] 輪郭1
[T2] 溝溝切り1
[T3] ねじ切り1
[T2] パーツ1
シミュレーション
ディスプレイ
情報
統計
工具
工具
ホルダー
透明
ツールパス
ストック
モード
スタンダード
カラライゼーション
操作
材質 (M)
材質 (M)
透明
衝突で停止
閉じる
コメント

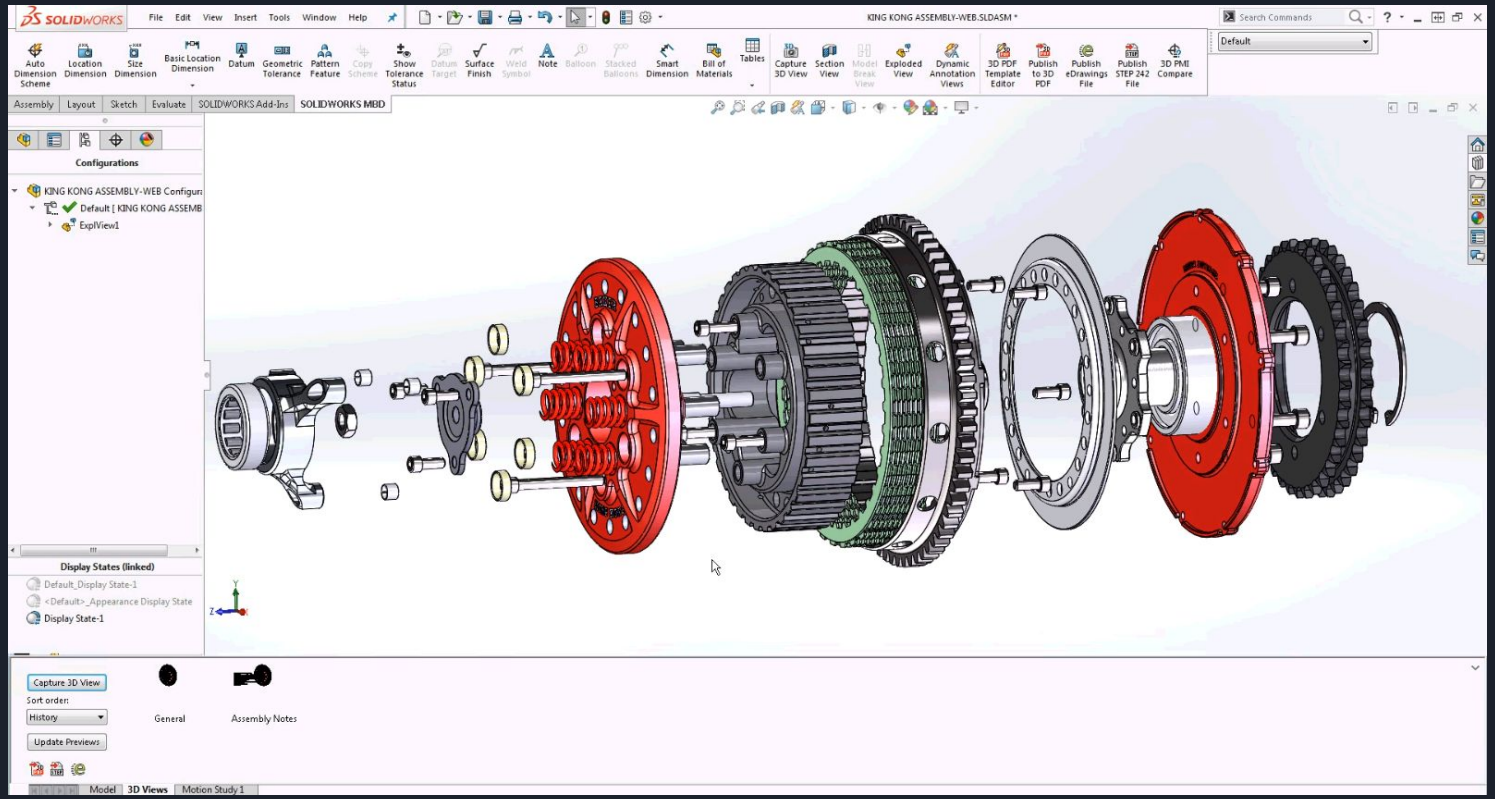
Fusion 360



SolidWorks - CAD+CAM+CAE



SolidWorks


SOLIDWORKS
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Search Commands
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Location Dimension
Size Dimension
Basic Location Dimension
Datum
Geometric Tolerance
Pattern Feature
Copy Scheme
Show Tolerance Status
Datum Target
Surface Finish
Weld Symbol
Note
Balloon
Stacked Balloons
Smart Dimension
Bill of Materials
Tables
Capture 3D View
Section View
Model Break View
Exploded View
Dynamic Annotation Views
3D PDF Template Editor
Publish to 3D PDF
Publish eDrawings File
Publish STEP 242 File
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Assembly
Layout
Sketch
Evaluate
SOLIDWORKS Add-Ins
SOLIDWORKS MBD
Configurations
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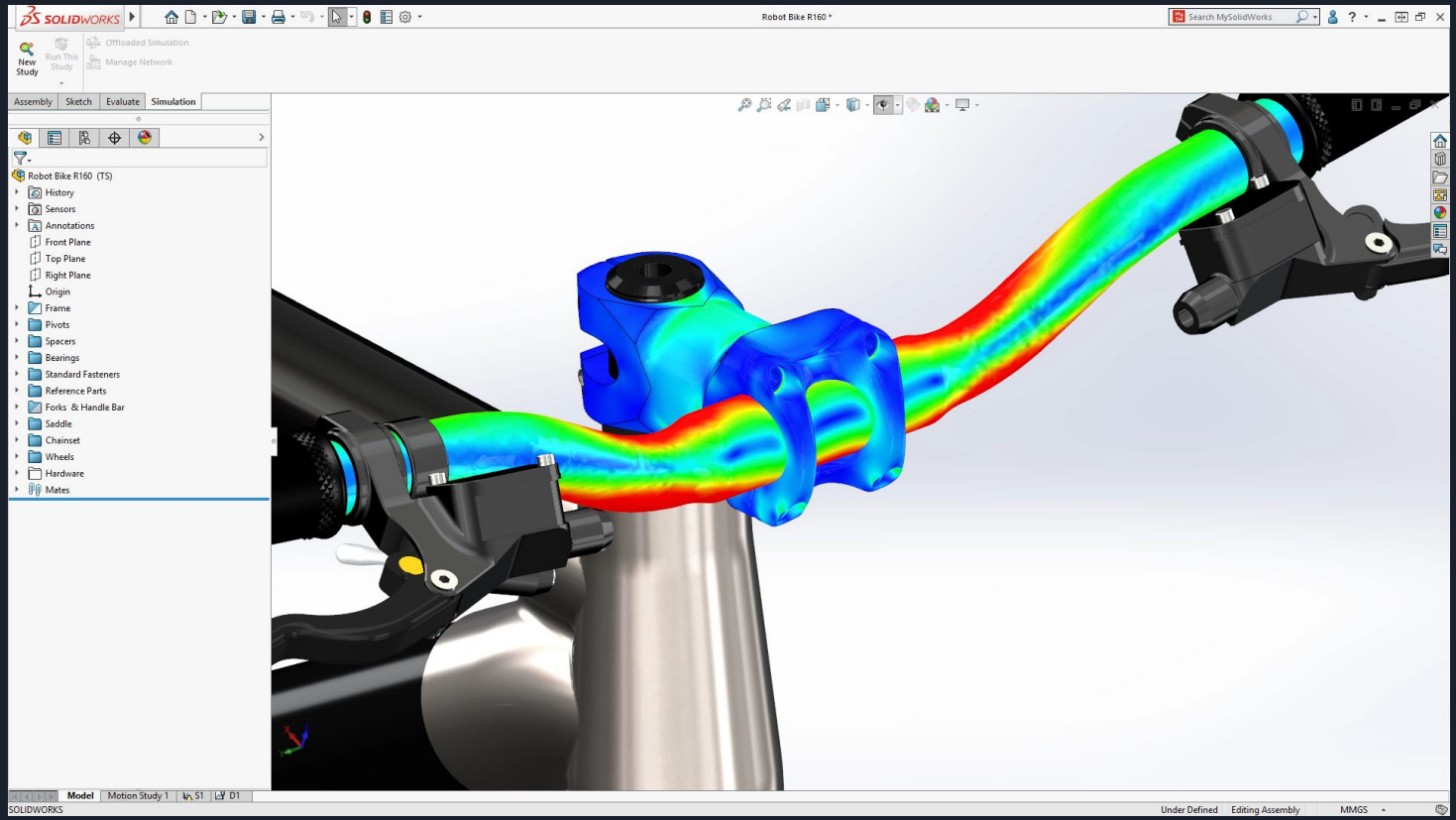
Sort order:
History
Update Previews
General
Assembly Notes
Model
3D Views
Motion Study 1

SolidWorks


SOLIDWORKS
Robot Bike R160 *
Search MySolidWorks
New Study
Run This Study
Offloaded Simulation
Manage Network
Assembly
Sketch
Evaluate
Simulation
Robot Bike R160 (TS)
History
Sensors
Annotations
Front Plane
Top Plane
Right Plane
Origin
Frame
Pivots
Spacers
Bearings
Standard Fasteners
Reference Parts
Forks & Handle Bar
Saddle
Chainset
Wheels
Hardware
Mates
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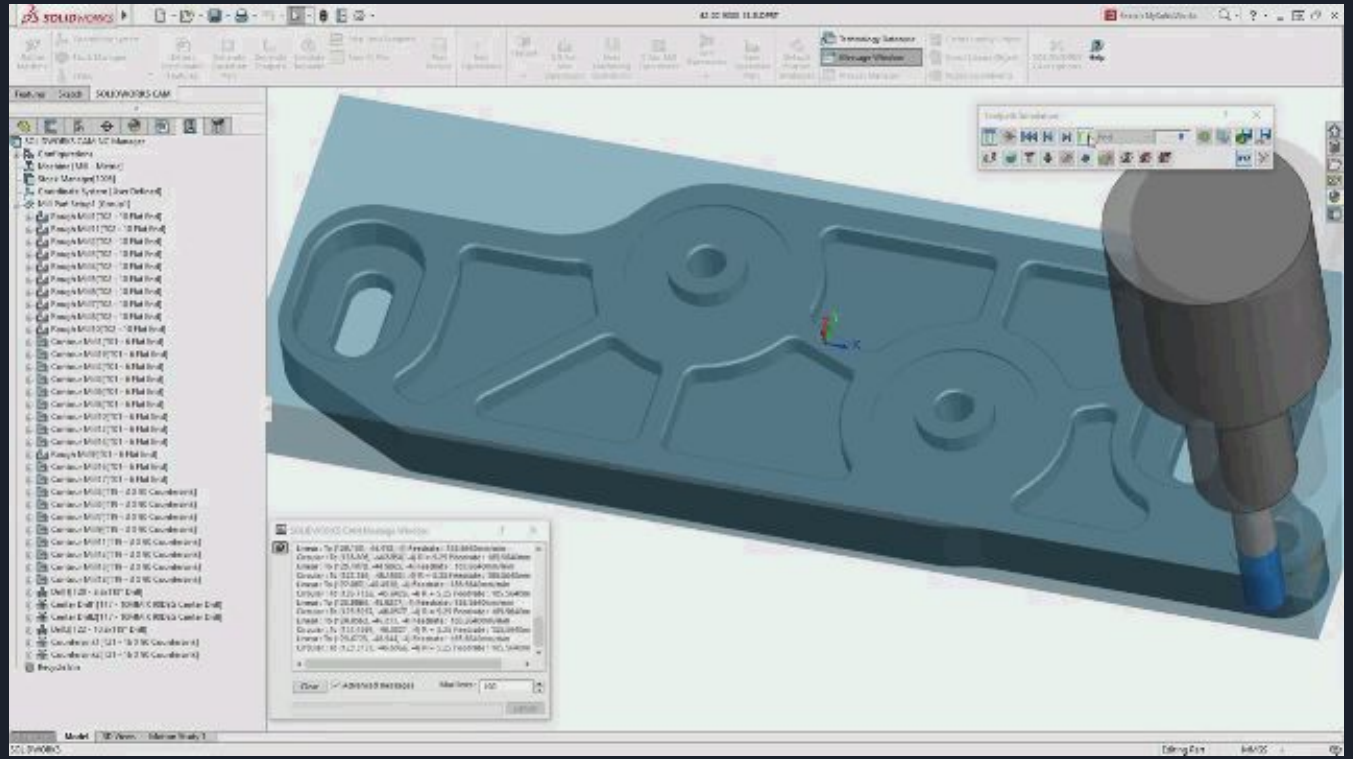
Editing Assembly
MMGS

SolidWorks



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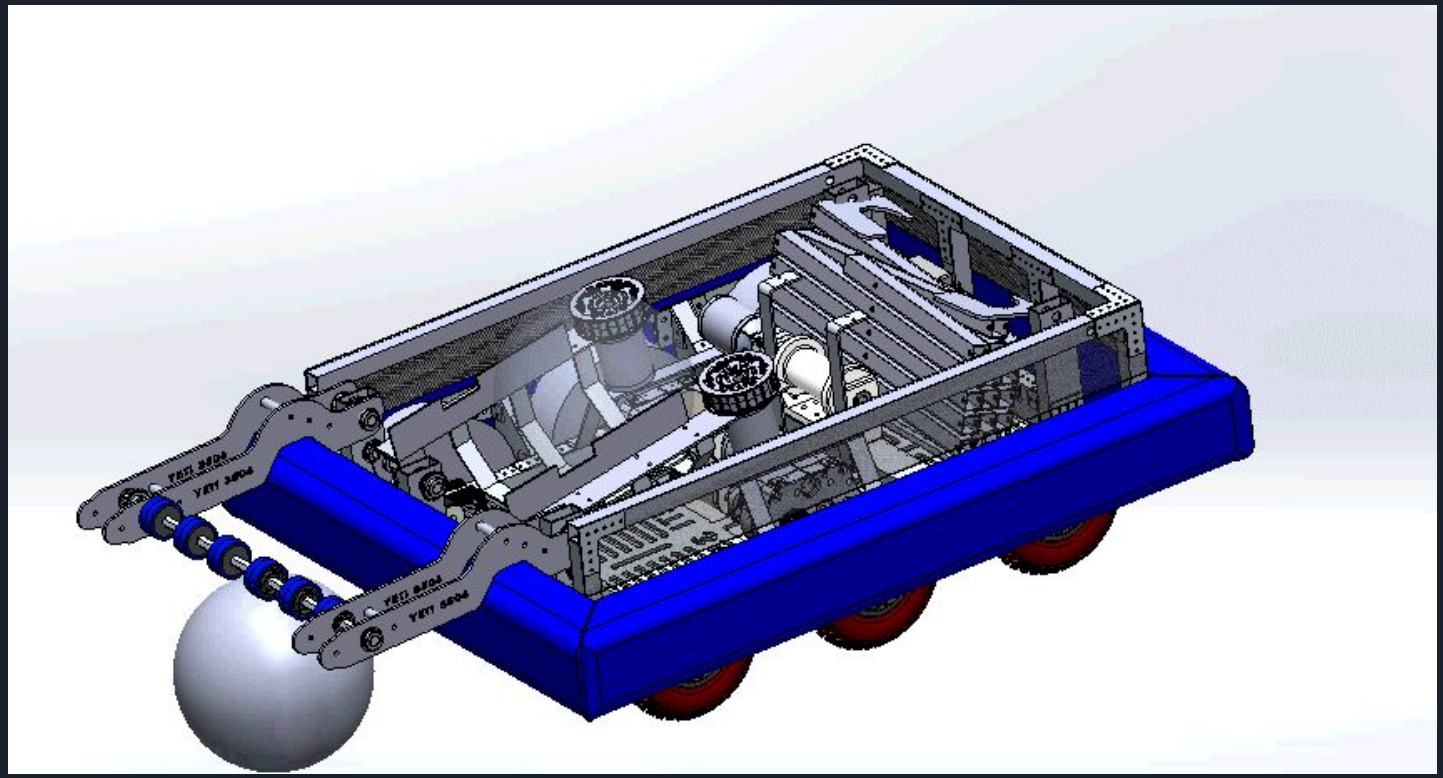
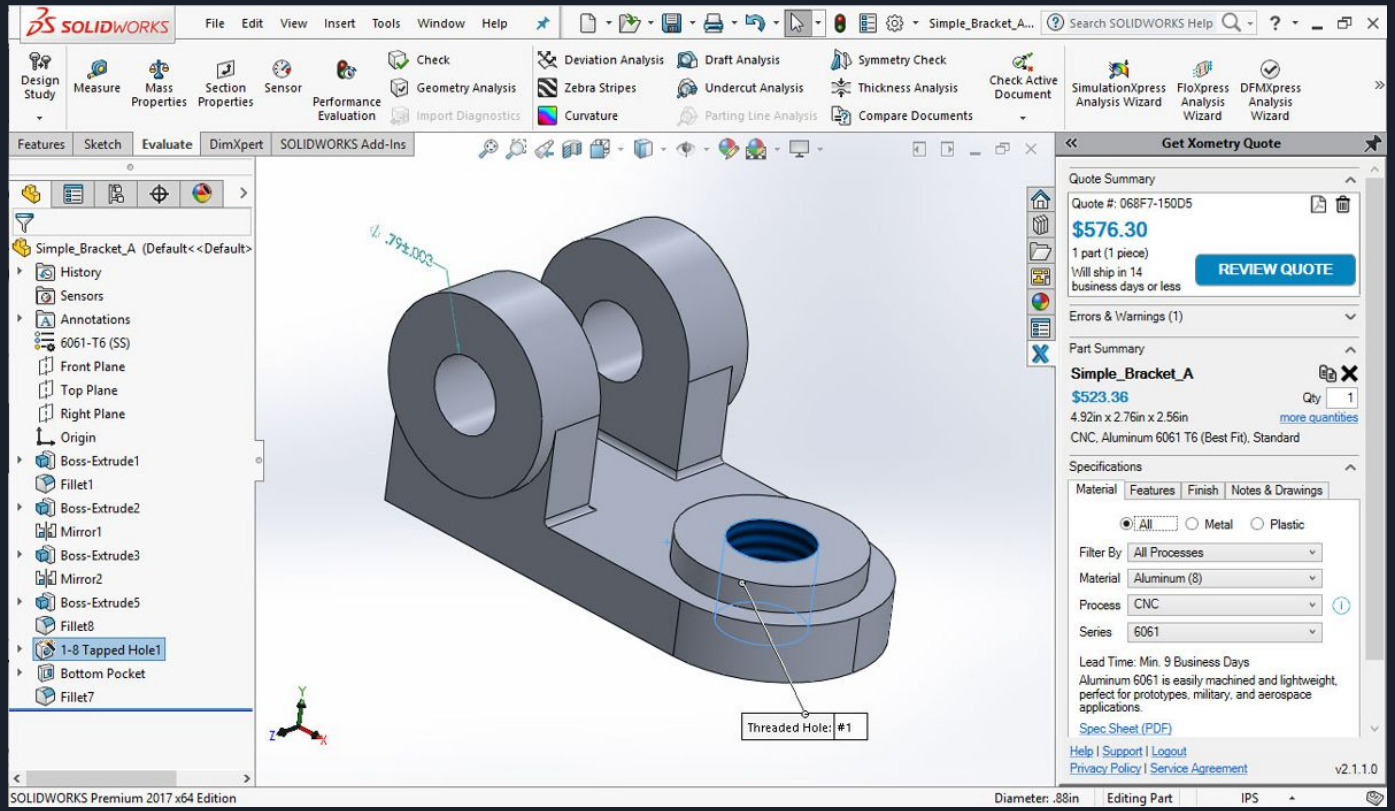


SolidWorks


SOLIDWORKS
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Design Study
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Sensor
Performance Evaluation
Check
Geometry Analysis
Import Diagnostics
Deviation Analysis
Zebra Stripes
Curvature
Draft Analysis
Undercut Analysis
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Symmetry Check
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FloXpress Analysis Wizard
DFMXpress Analysis Wizard
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Sensors
Annotations
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Top Plane
Right Plane
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Fillet1
Boss-Extrude2
Mirror1
Boss-Extrude3
Mirror2
Boss-Extrude5
Fillet8
1-8 Tapped Hole1
Bottom Pocket
Fillet7
.79±.003
Threaded Hole: #1
Get Xometry Quote
Quote Summary
Quote #: 068F7-150D5
$576.30
1 part (1 piece)
Will ship in 14 business days or less
REVIEW QUOTE
Errors & Warnings (1)
Part Summary
Simple_Bracket_A
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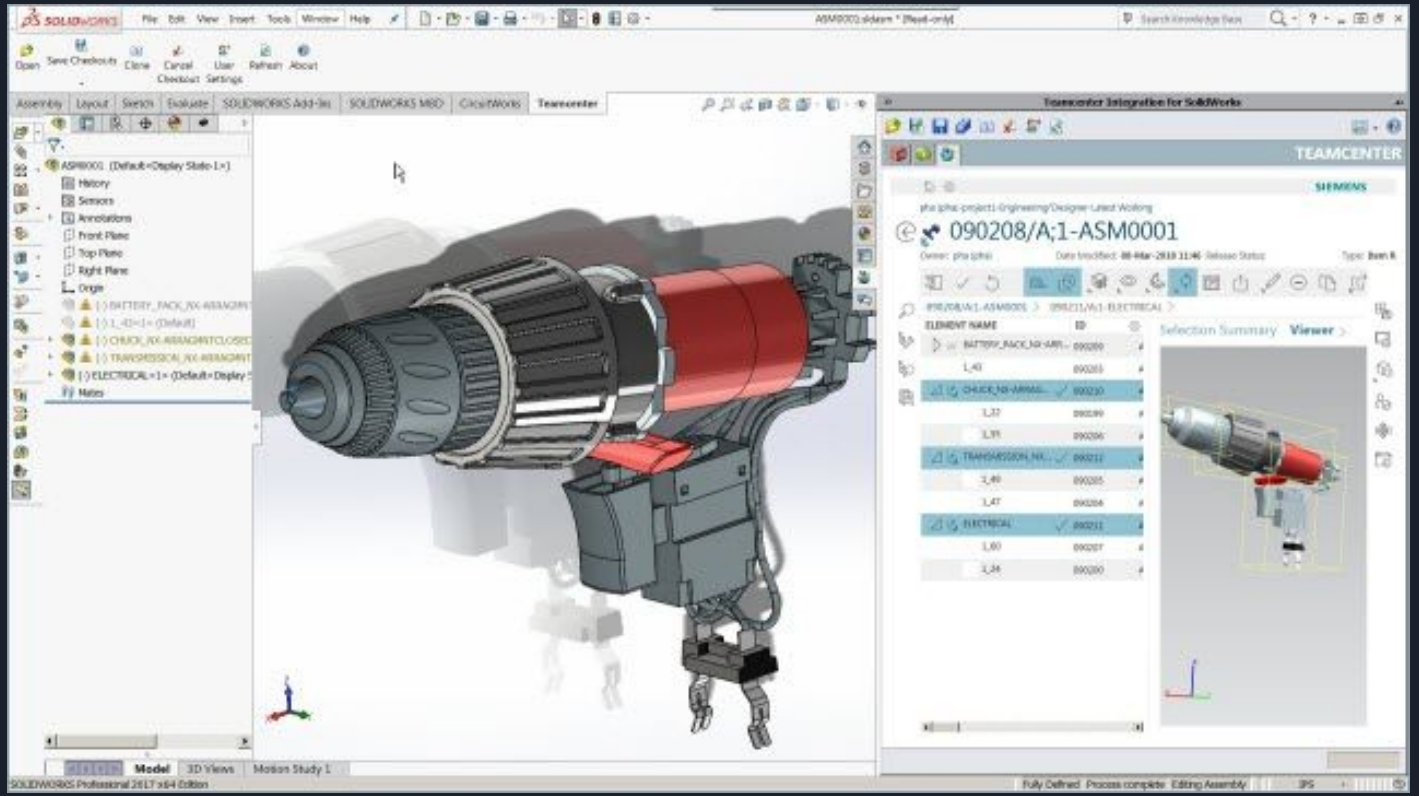
Qty 1
4.92in x 2.76in x 2.56in
more quantities
CNC, Aluminum 6061 T6 (Best Fit), Standard
Specifications
Material Features Finish Notes & Drawings
All Metal Plastic
Filter By All Processes
Material Aluminum (8)
Process CNC
Series 6061
Lead Time: Min. 9 Business Days
Aluminum 6061 is easily machined and lightweight, perfect for prototypes, military, and aerospace applications.
Spec Sheet (PDF)
Help | Support | Logout
Privacy Policy | Service Agreement
v2.1.1.0
SOLIDWORKS Premium 2017 x64 Edition
Diameter: .88in
Editing Part
IPS

SolidWorks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Selection Summary
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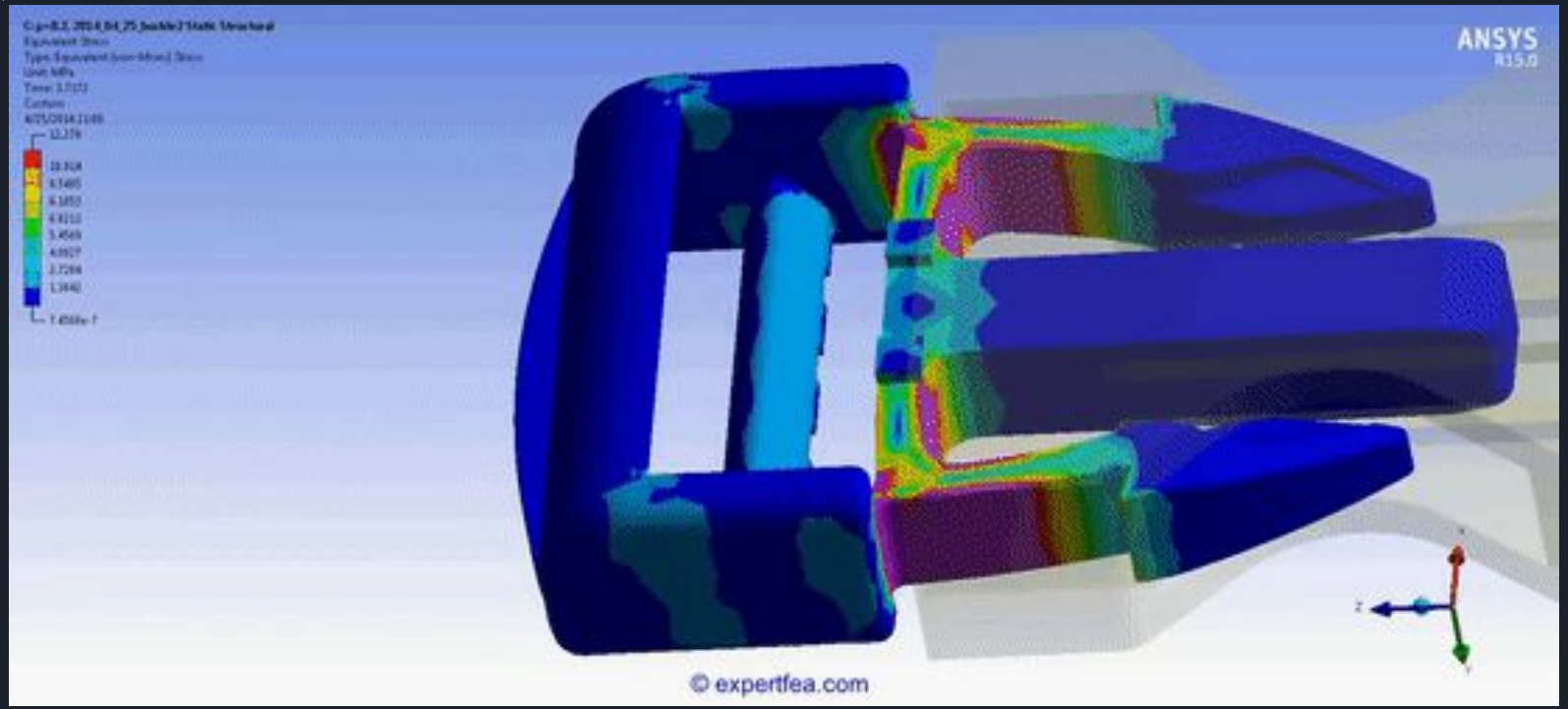
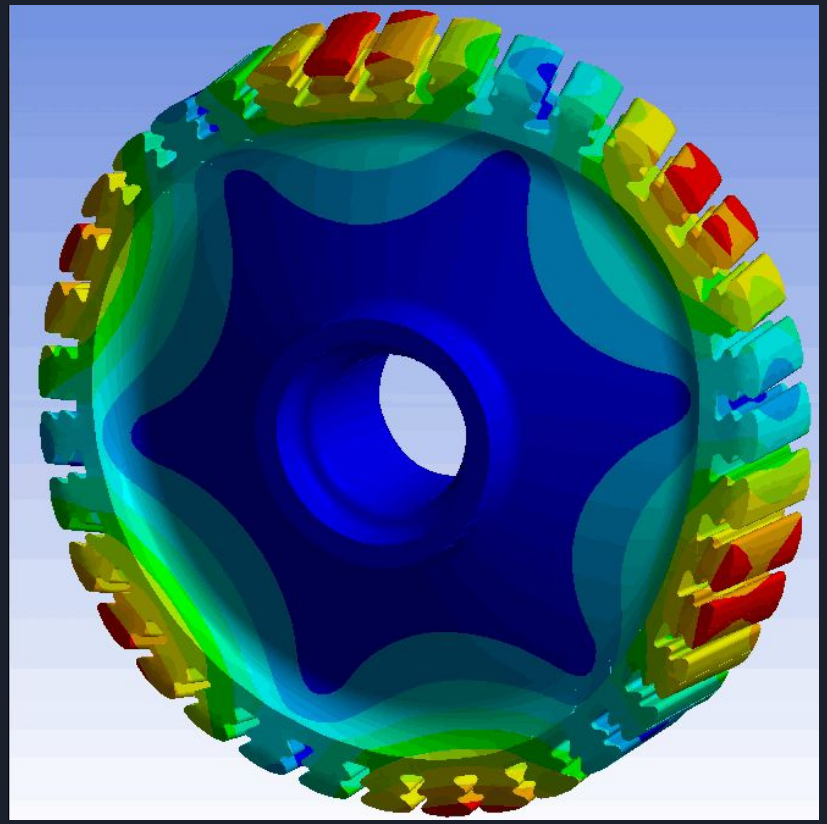
Model
3D Views
Motion Study 1

Analysis Softwares

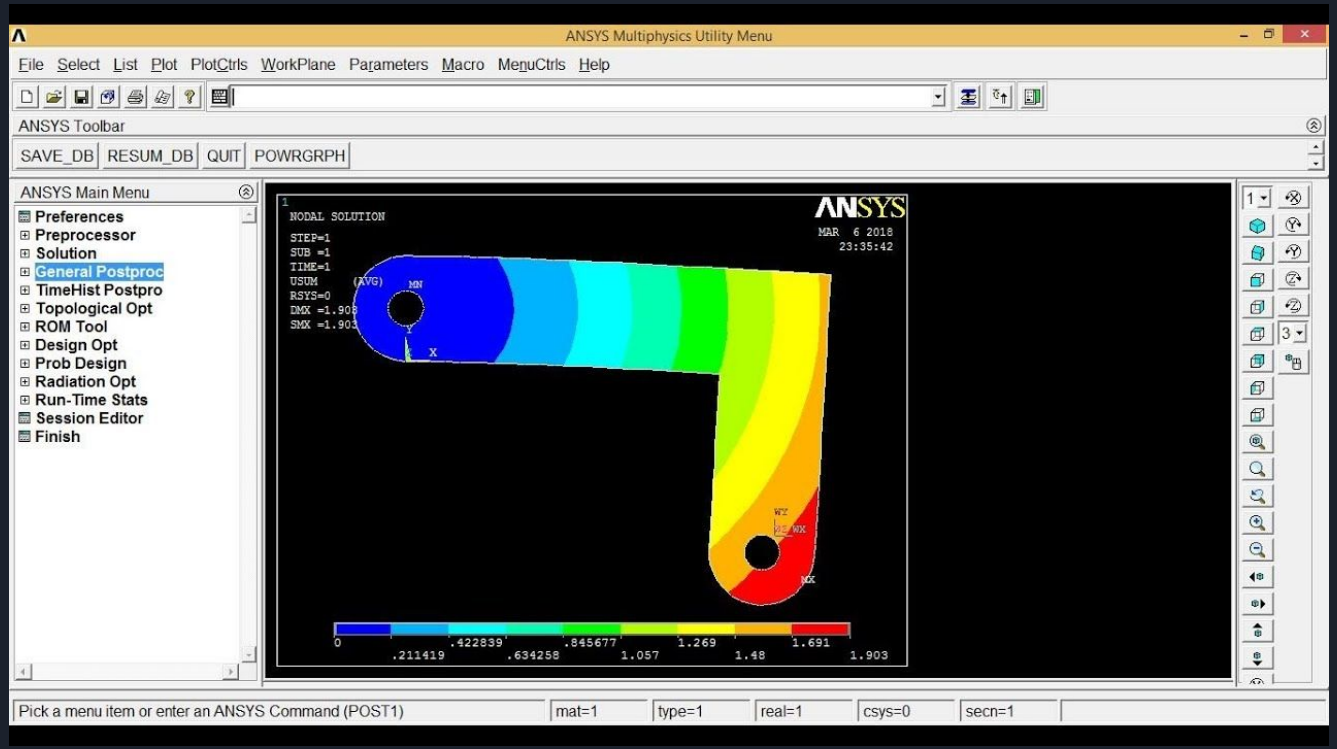
ANSYS



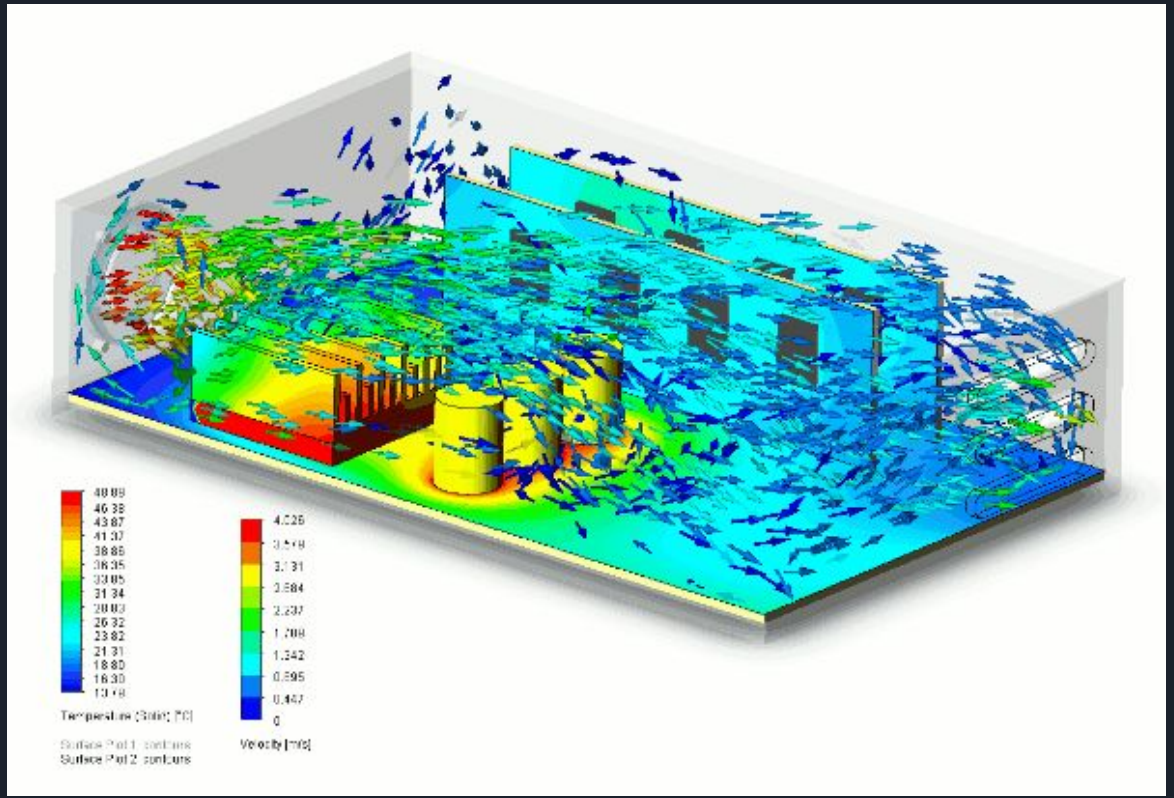
ANSYS



Mechanical APDL



Flow Design


46.38
43.87
41.37
38.86
36.35
33.85
31.34
28.83
26.32
23.82
21.31
18.80
16.30
4.026
3.131
2.684
2.237
1.789
1.342
0.895
0.447
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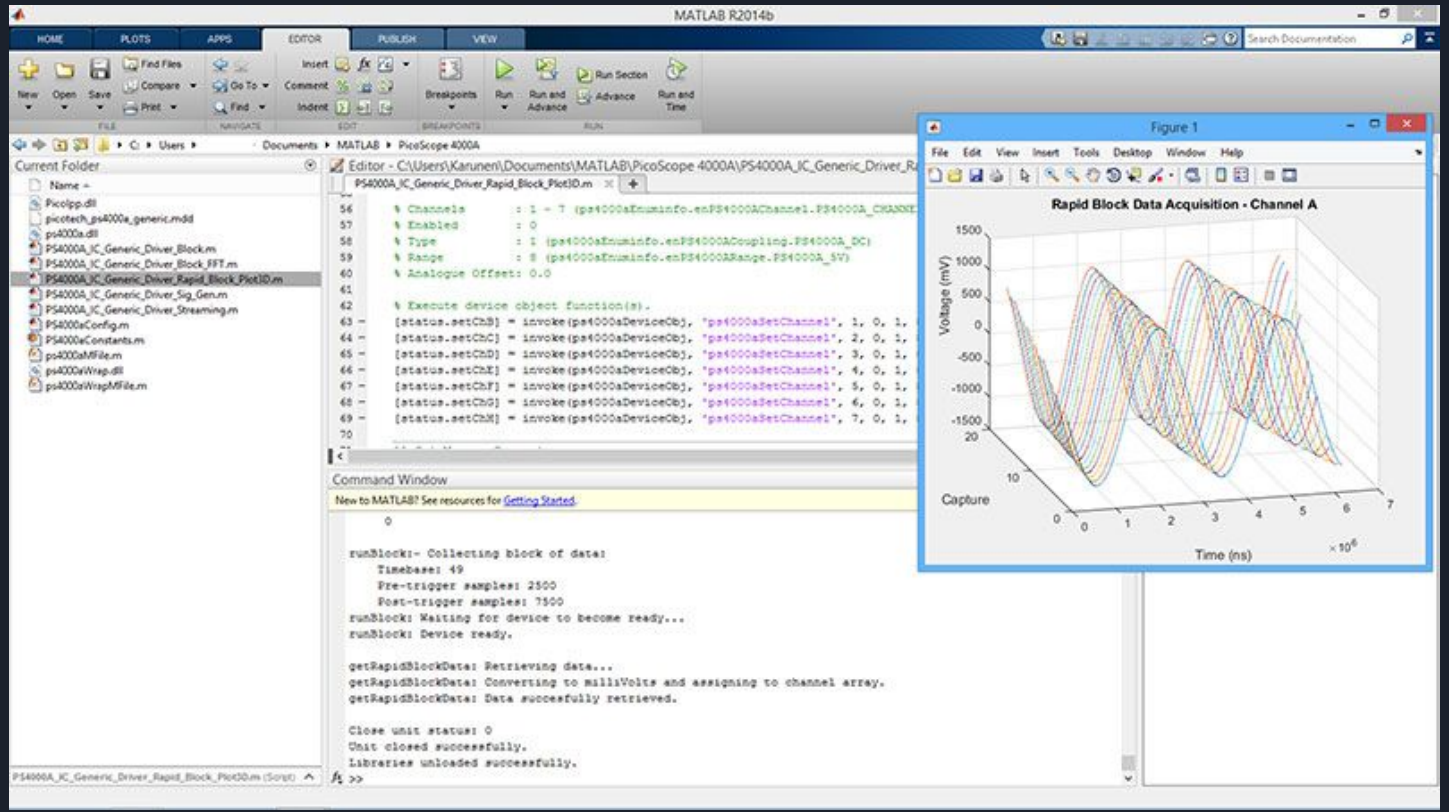
Velocity [m/s]
Surface Plot 2 contours

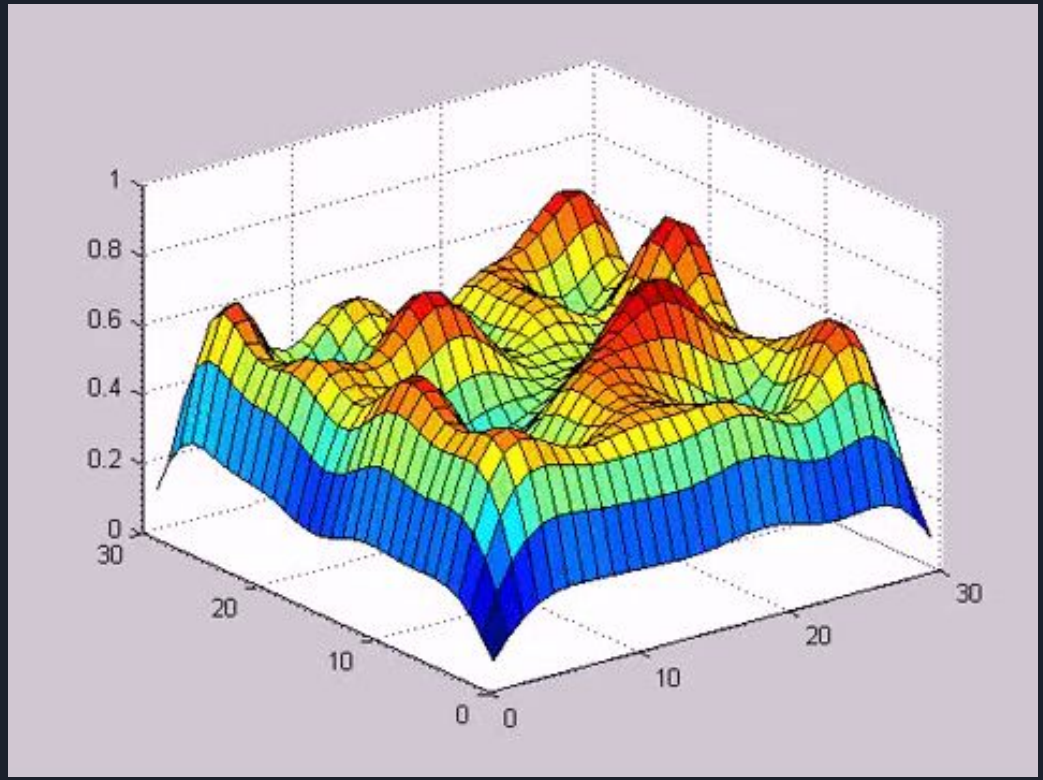
Mathematical Platforms


MATLAB®
&SIMULINK®

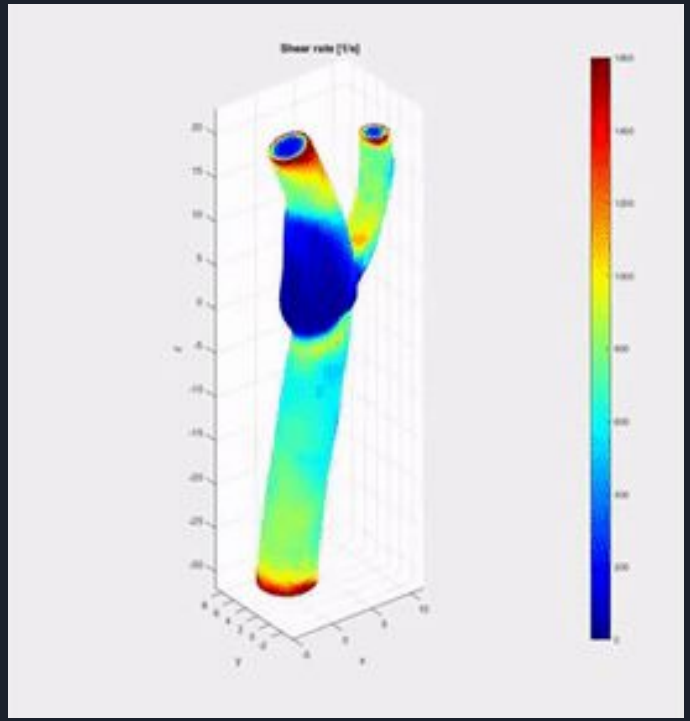
MATLAB


MATLAB R2014b
Figure 1
Rapid Block Data Acquisition - Channel A
Voltage (mV)
Capture
Time (ns)
Command Window
runBlock:- Collecting block of data:
Timebase: 49
Pre-trigger samples: 2500
Post-trigger samples: 7500
runBlock: Waiting for device to become ready...
runBlock: Device ready.
getRapidBlockData: Retrieving data...
getRapidBlockData: Converting to milliVolts and assigning to channel array.
getRapidBlockData: Data succesfully retrieved.
Close unit status: 0
Unit closed successfully.
Libraries unloaded successfully.

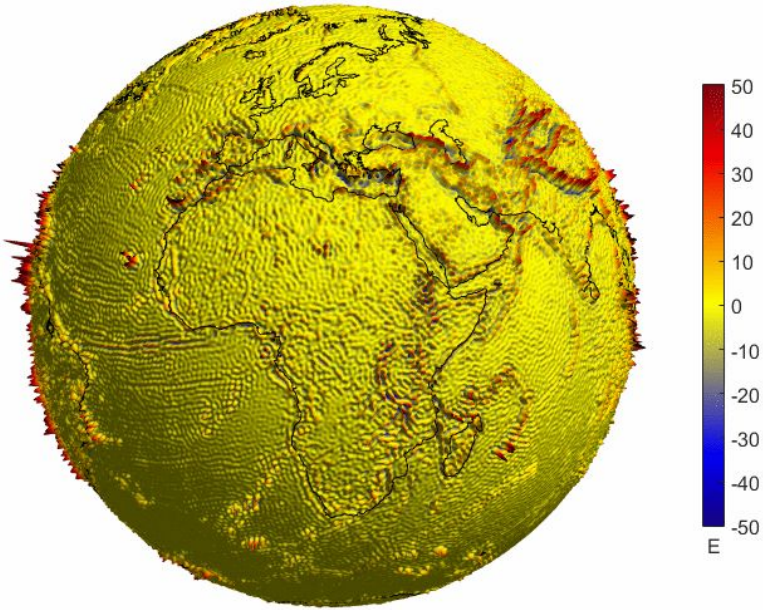
MATLAB



MATLAB

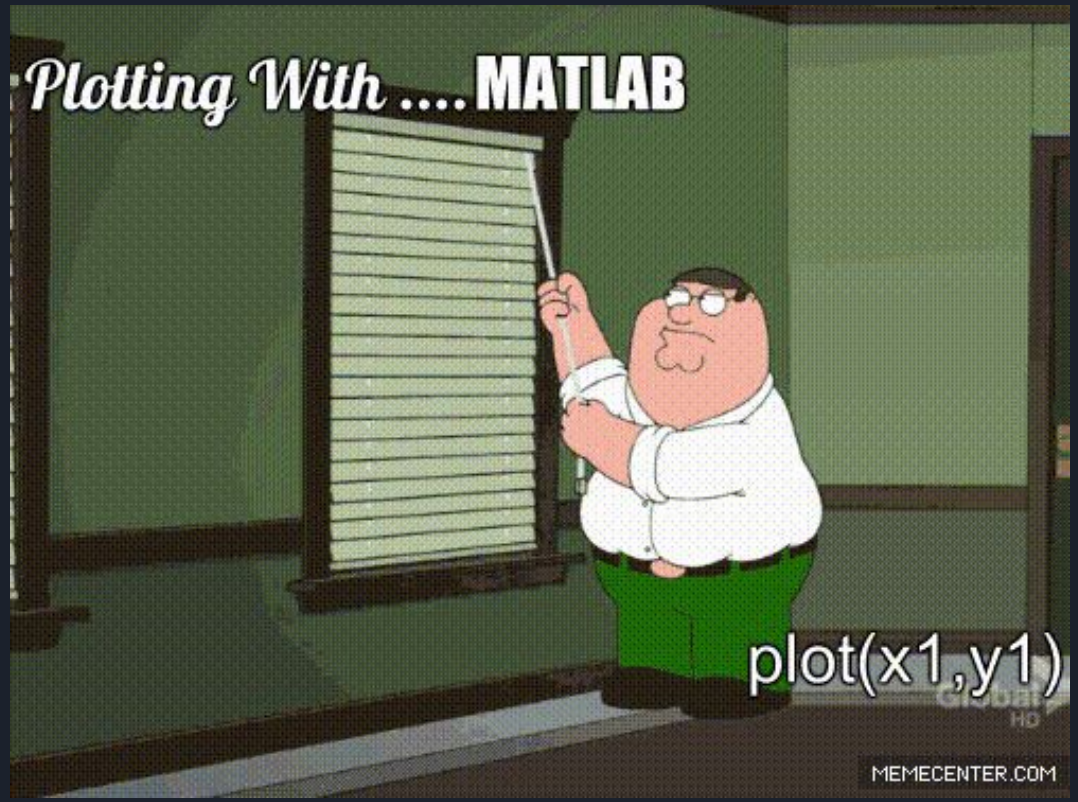


MATLAB

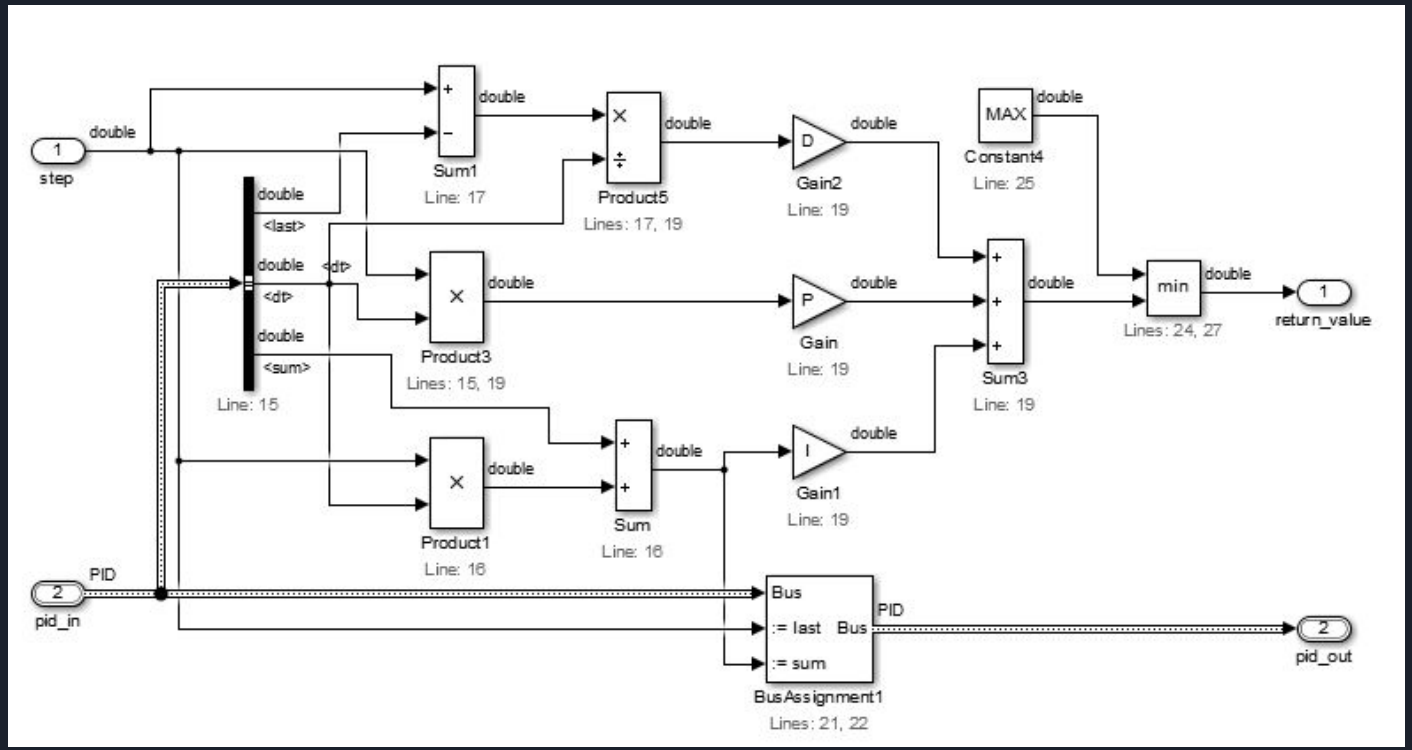


Gravity gradient (EGM2008, nmax=500)

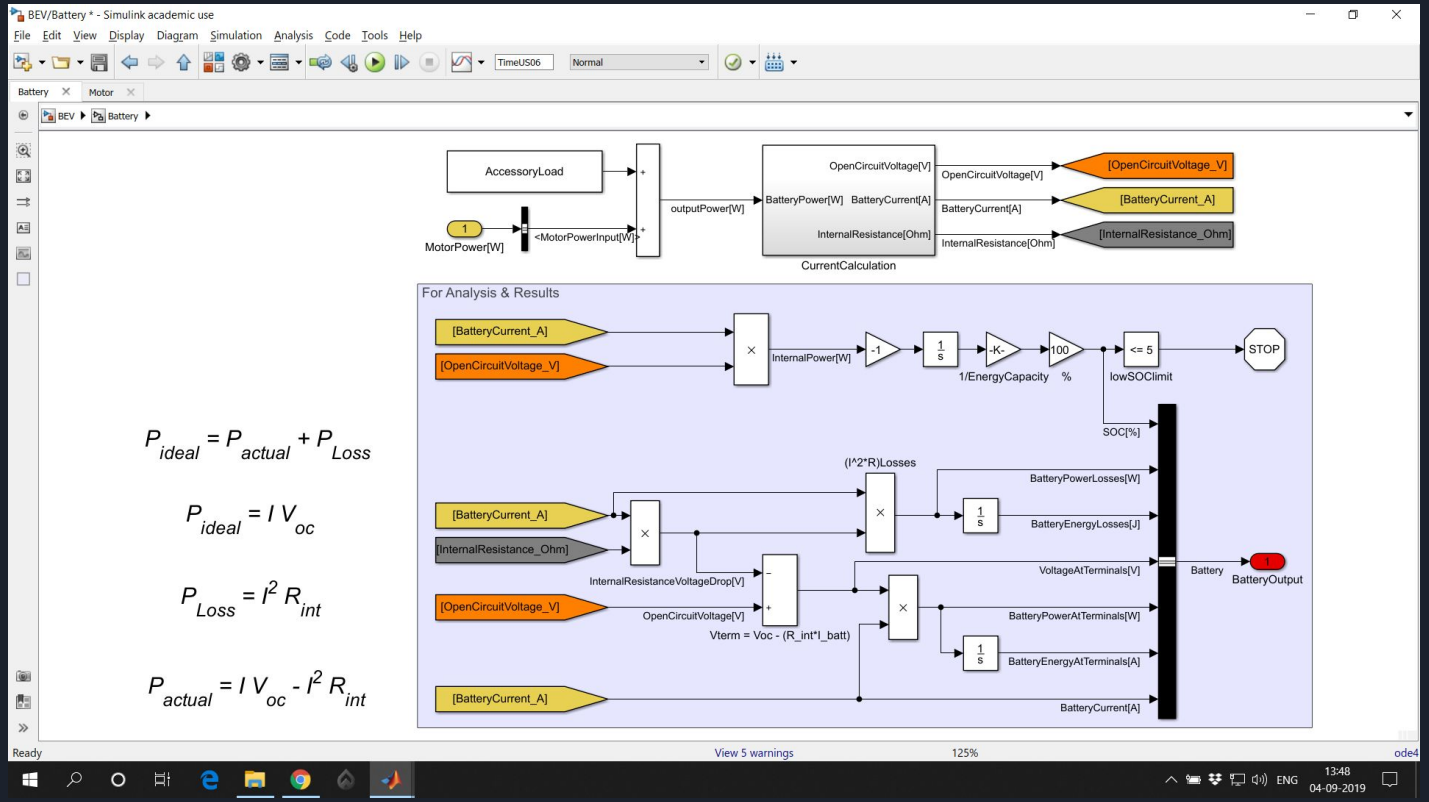
MATLAB



SimuLink


1
step
double
Sum1
Line: 17
Product5
Lines: 17, 19
D
Gain2
Line: 19
MAX
Constant4
Line: 25
<last>
<dt>
<sum>
Line: 15
Product3
Lines: 15, 19
P
Gain
Line: 19
Sum3
Line: 19
min
Lines: 24, 27
1
return_value
Product1
Line: 16
Sum
Line: 16
I
Gain1
Line: 19
2
pid_in
PID
Bus
:= last Bus
:= sum
BusAssignment1
Lines: 21, 22
2
pid_out

SimuLink



$$P_{ideal} = P_{actual} + P_{Loss}$$

$$P_{ideal} = I\,V_{oc}$$

$$P_{Loss} = I^2\,R_{int}$$

$$P_{actual} = I\,V_{oc} - I^2\,R_{int}$$

Advantages of using these softwares

- Efficient, Convenient Designing
- Flexible
- View complex assemblies
- CAM/CAE provides an extra edge
- Makes Mechanical Systems Designing cool

Thank you...

- Tejas Rane
  Chief Coordinator, ERC.
  (+91) 99208 90738

CODING: C-BASICS

Applications

→by coding various mathematical difficulties can be solved easily

→A large data can be sorted using coding with high accuracy which would take a lot of time to do manually.

→graphs of the data can be plotted easily from the analysis of data which can be analyzed later.

Applications(Robotics)

→used for programming various microcontrollers

→used in navigation systems

→once algorithm of a problem is made,we can test it with different inputs instead of solving each case manually

Basic format

```
#include <stdio.h>

int main() {

  /*first program in C */

  printf("Hello, World! \n");

  return 0;

}
```

Libraries

Syntax: **#include <library>**

- Char (ctype.h)
- File I/O (stdio.h)
- Math (math.h)
- Dynamic memory (stdlib.h)
- String (string.h)
- Time (time.h)

Data Types

2 Types:

- Integer
- Floating point

Integer type

Type	Storage size	Value range
char	1 byte	-128 to 127 or 0 to 255
unsigned char	1 byte	0 to 255
signed char	1 byte	-128 to 127
int	2 or 4 bytes	-32,768 to 32,767 or -2,147,483,648 to 2,147,483,647
unsigned int	2 or 4 bytes	0 to 65,535 or 0 to 4,294,967,295
short	2 bytes	-32,768 to 32,767
unsigned short	2 bytes	0 to 65,535
long	8 bytes	-9223372036854775808 to 9223372036854775807
unsigned long	8 bytes	0 to 18446744073709551615

Floating point type

Type	Storage size	Value range	Precision
float	4 byte	1.2E-38 to 3.4E+38	6 decimal places
double	8 byte	2.3E-308 to 1.7E+308	15 decimal places
long double	10 byte	3.4E-4932 to 1.1E+4932	19 decimal places

Variables

Syntax : type Variable_name;

Eg: int x;

int x,tp,cte_erc;

float m1;

char a,b,c;

How to assign values?

Syntax : type Variable_name=value;

Eg: int x=2;

int x=2,tp,cte_erc=6764;

float m1=7.22;

char a=’a’, b, c=’1’;

Arithmetic Operators

Operator	Description	Example
+	Adds two operands.	A + B = 30
−	Subtracts second operand from the first.	A − B = -10
*	Multiplies both operands.	A * B = 200
/	Divides numerator by de-numerator.	B / A = 2
%	Modulus Operator and remainder of after an integer division.	B % A = 0
++	Increment operator increases the integer value by one.	A++ = 11
--	Decrement operator decreases the integer value by one.	A-- = 9

Print and Input data

```
#include <stdio.h>
int main( ) {
  int i;

  printf( "Enter a value :");
  scanf(“%d", &i);

  printf( "\nYou entered: %d ",  i);
  return 0;
}
```

Example

```
#include <stdio.h>
int main( ) {
  int i,j;

  printf( "Enter numbers :");
  scanf(“%d %d", &i,&j);

  printf( "\nthe sum is : %d",  i+j);
  return 0;
}
```

Format specifiers

Format Specifier	Description
%d	Integer Format Specifier
%f	Float Format Specifier
%c	Character Format Specifier
%s	String Format Specifier
%u	Unsigned Integer Format Specifier
%ld	Long Int Format Specifier

Boolean Variable

Syntax : bool variable_name;
Eg: bool s = True
Bool var;

Relational Operators

Operator	Description	Example
==	Checks if the values of two operands are equal or not. If yes, then the condition becomes true.	(A == B) is not true.
!=	Checks if the values of two operands are equal or not. If the values are not equal, then the condition becomes true.	(A != B) is true.
>	Checks if the value of left operand is greater than the value of right operand. If yes, then the condition becomes true.	(A > B) is not true.
<	Checks if the value of left operand is less than the value of right operand. If yes, then the condition becomes true.	(A < B) is true.
>=	Checks if the value of left operand is greater than or equal to the value of right operand. If yes, then the condition becomes true.	(A >= B) is not true.
<=	Checks if the value of left operand is less than or equal to the value of right operand. If yes, then the condition becomes true.	(A <= B) is true.

If ,if else

```
#include <stdio.h>
int main () {

  /* local variable definition */
  int a = 10;

  /* check the boolean condition using if statement */

  if( a < 20 ) {
    /* if condition is true then print the following */
    printf("a is less than 20\n" );
  }

  printf("value of a is : %d\n", a);

  return 0;
}
```