

OpenSees Navigator & Hybrid Simulation

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The George E. Brown, Jr. Network for Earthquake Engineering Simulation



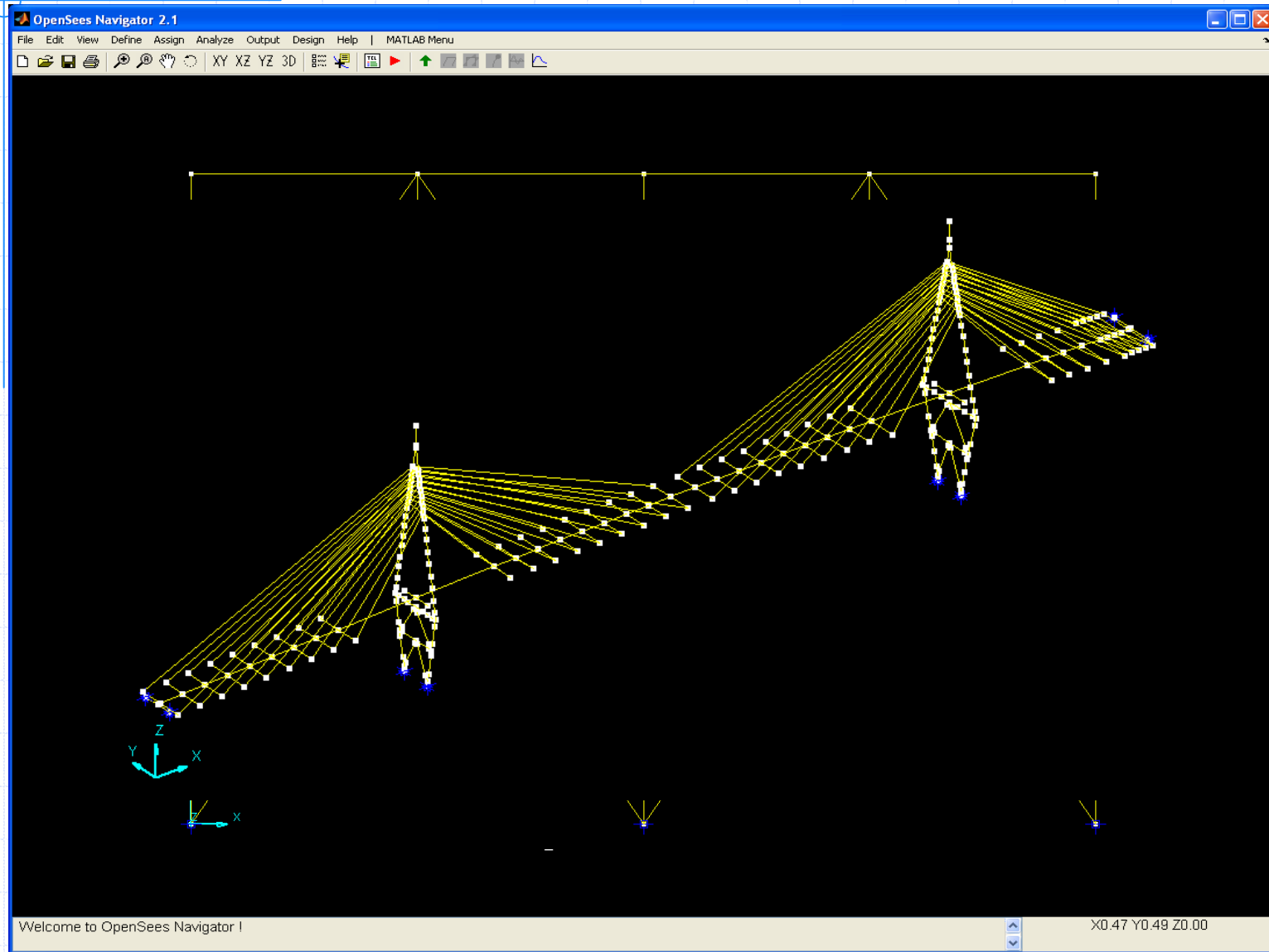
Introduction

- ◆ MATLAB based Graphical User Interface
- ◆ Pre- and post-processing for OpenSees
- ◆ Integration of Hybrid Simulation into the graphical user interface
- ◆ Response Spectra generation
- ◆ Integrated AISC data base
- ◆ Design toolboxes: NSP, AISC design checks, PBEE, ...
- ◆ Self-executable version available

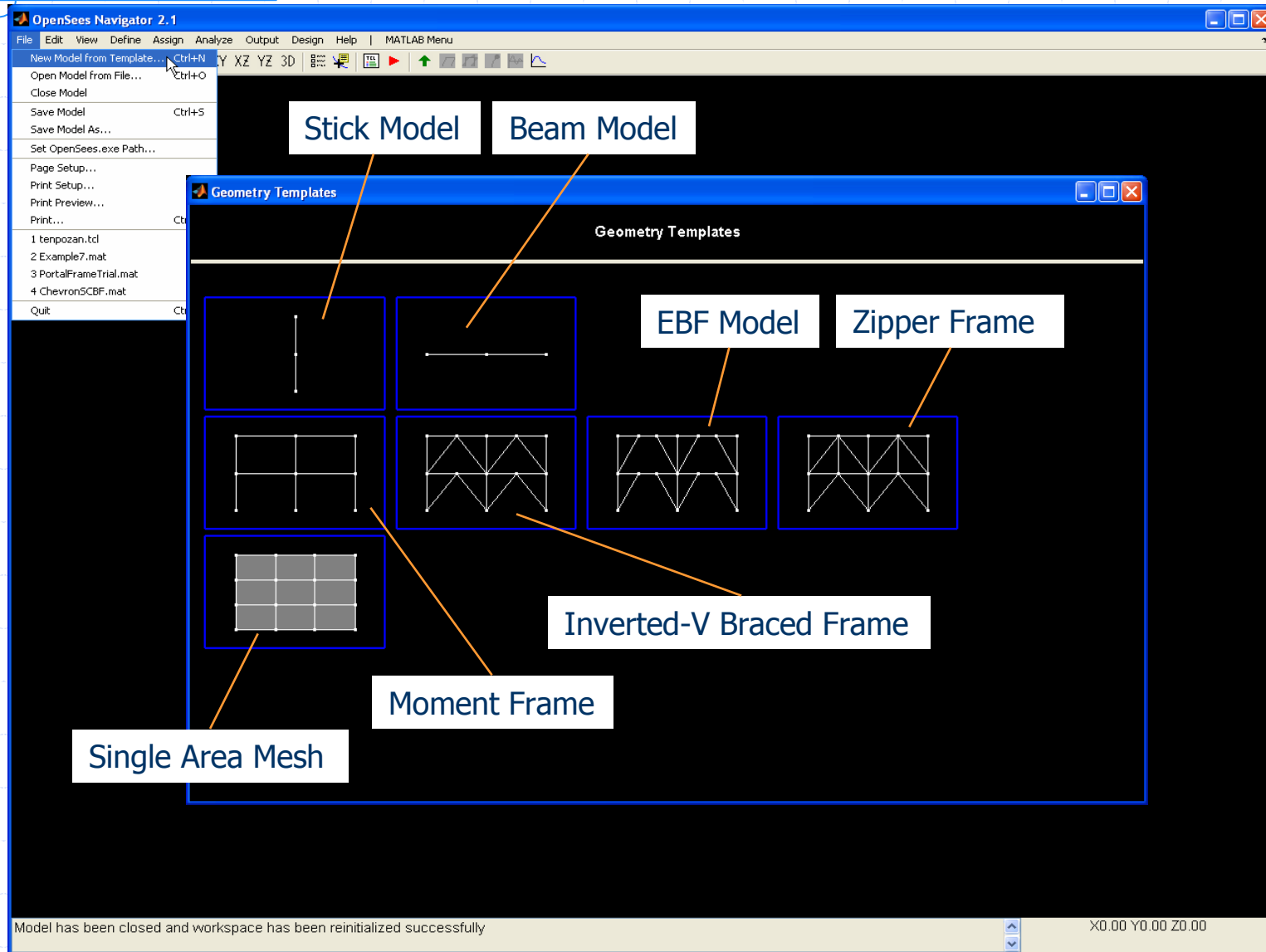
Motivation

- ◆ Graphical input is more user-friendly than TCL text input
- ◆ Most researchers use MATLAB to do the post-processing, and MATLAB/Simulink is the typical framework for implementing hybrid analyses
- ◆ OpenSees Navigator will create the OpenSees (hybrid) model and graphically display results before, during or after a test
- ◆ Flexible to use and requires no programming skills

OpenSees Navigator



Define Geometry



Define Geometry: Zipper Frame

Define Zipper Frame Geometry

Dimension (ndm) :	2d	<input type="button" value="Generate"/>
Number of Stories (NOS) :	3	
Number of Bays (NOB) :	1	
Story Height (SH) :	52	
Bay Width (BW) :	80	
Boundary Condition (BC) :	pinned	
Brace Bay Config (BraceBay) :	BraceBay	
Num Segments in Col (NSC) :	1	
Num Segments in Beam (NSB) :	1	
Num Segments in Brace (NSBR) :	2	
Num Segments in Z-Col (NSZC) :	1	
Brace Offset (BraceOffset) :	None	

View Geometry: Set Display Options

OpenSees Navigator 2.1

File Edit View Define Assign Analyze Output Design Help | MATLAB Menu

Set Display Options... (Ctrl+E) Z YZ 3D

Clear all

Set Grid Lines...

2D XY-Plane

2D XZ-Plane

2D YZ-Plane

3D SW-View

3D SE-View

3D NE-View

3D NW-View

Set 3D View...

Set Display Options... (Ctrl+E)

Set Display Options

Node	Element	General
<input checked="" type="checkbox"/> Tags	<input checked="" type="checkbox"/> Tags	<input checked="" type="checkbox"/> Model
<input checked="" type="checkbox"/> SP Constraints	<input type="checkbox"/> Types	<input checked="" type="checkbox"/> Global Axes
<input type="checkbox"/> MP Constraints	<input type="checkbox"/> Geo Trans	<input type="checkbox"/> Grid Lines
<input type="checkbox"/> Masses	<input type="checkbox"/> Local Axes	
<input type="checkbox"/> Loads/Displacements	<input type="checkbox"/> Zero Length	
	<input type="checkbox"/> Loads/Deformations	

Select all Clear all OK

zipper frame geometry has been generated successfully X-26.61 Y173.55 Z0.00

Node:

- Tags
- SP Constraints
- MP Constraints
- Masses
- Loads/Displ.

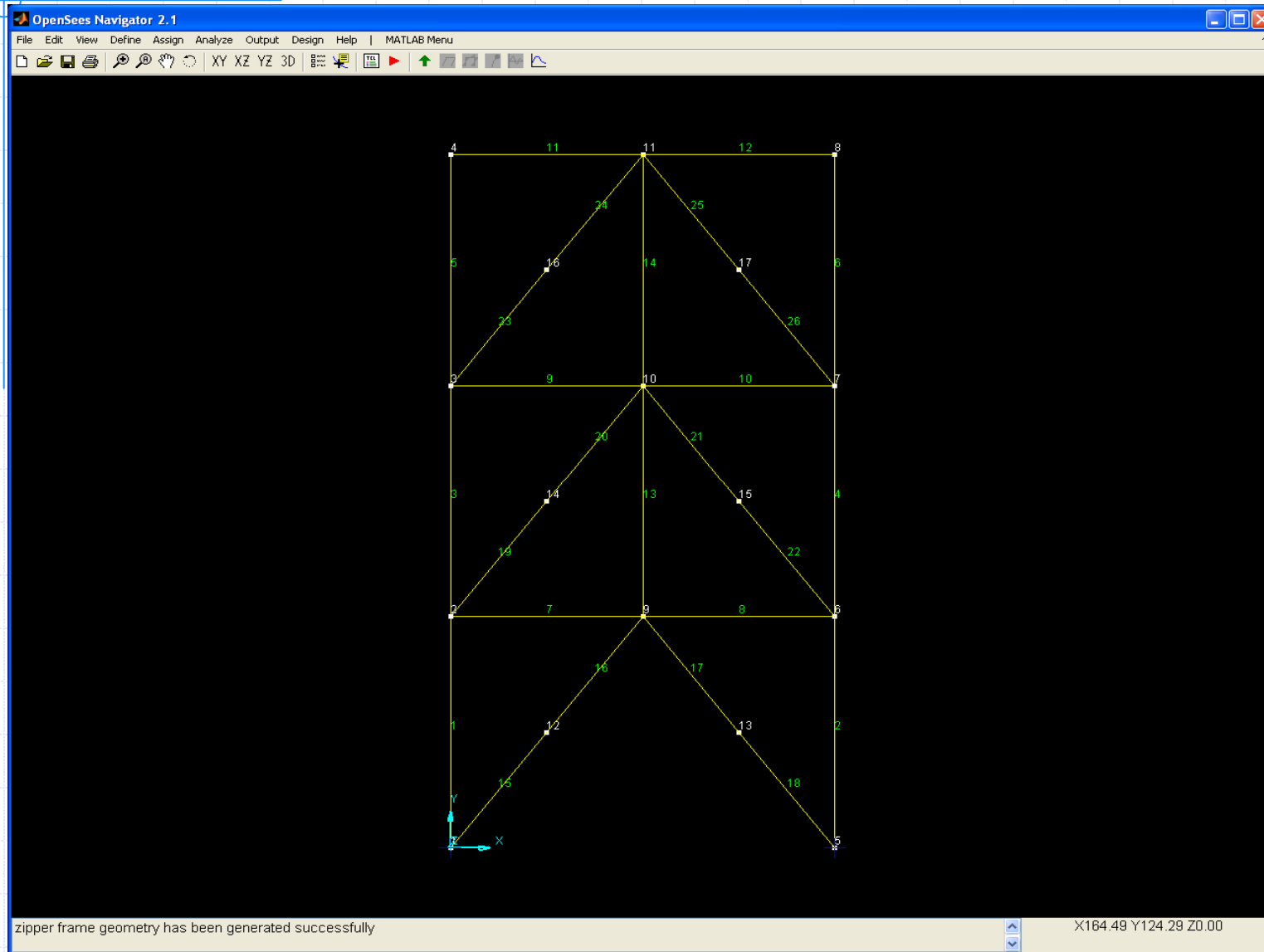
Element:

- Tags
- Types
- GeoTrans
- Local Axes
- Zero Length

General:

- Model
- Global Axes
- Grid Lines

View Geometry: Display



Edit Geometry

The screenshot displays the OpenSees Navigator 2.1 interface. The main window shows a zipper frame geometry with nodes numbered 1 through 18 and elements numbered 1 through 26. A context menu is open over element 10, showing options: Add..., Delete..., Divide/Join Frames..., and Add/Delete ZeroLength... The status bar at the bottom indicates "zipper frame geometry has been generated successfully" and "X:73.20 Y:172.73 Z:0.00".

- Node:**
 - Add
 - Delete
 - Move
- Element:**
 - Add
 - Delete
 - Divide/Join
 - Add/Delete ZeroLength

Define Material: Uniaxial Materials

The screenshot displays the OpenSees Navigator 2.1 software interface. The main window shows a mesh diagram with nodes numbered 4, 11, 12, 8, 5, 16, 14, 17, and 6. A 'Define Uniaxial Material' dialog box is open in the foreground, containing the following fields:

Define Uniaxial Material	
Add Material :	BoucWen
Modify/Show Material :	ElasticDefault
Delete Material :	ElasticDefault

The status bar at the bottom of the window displays the message: "zipper frame geometry has been generated successfully" and the coordinates "X=56.17 Y=172.73 Z=0.00".

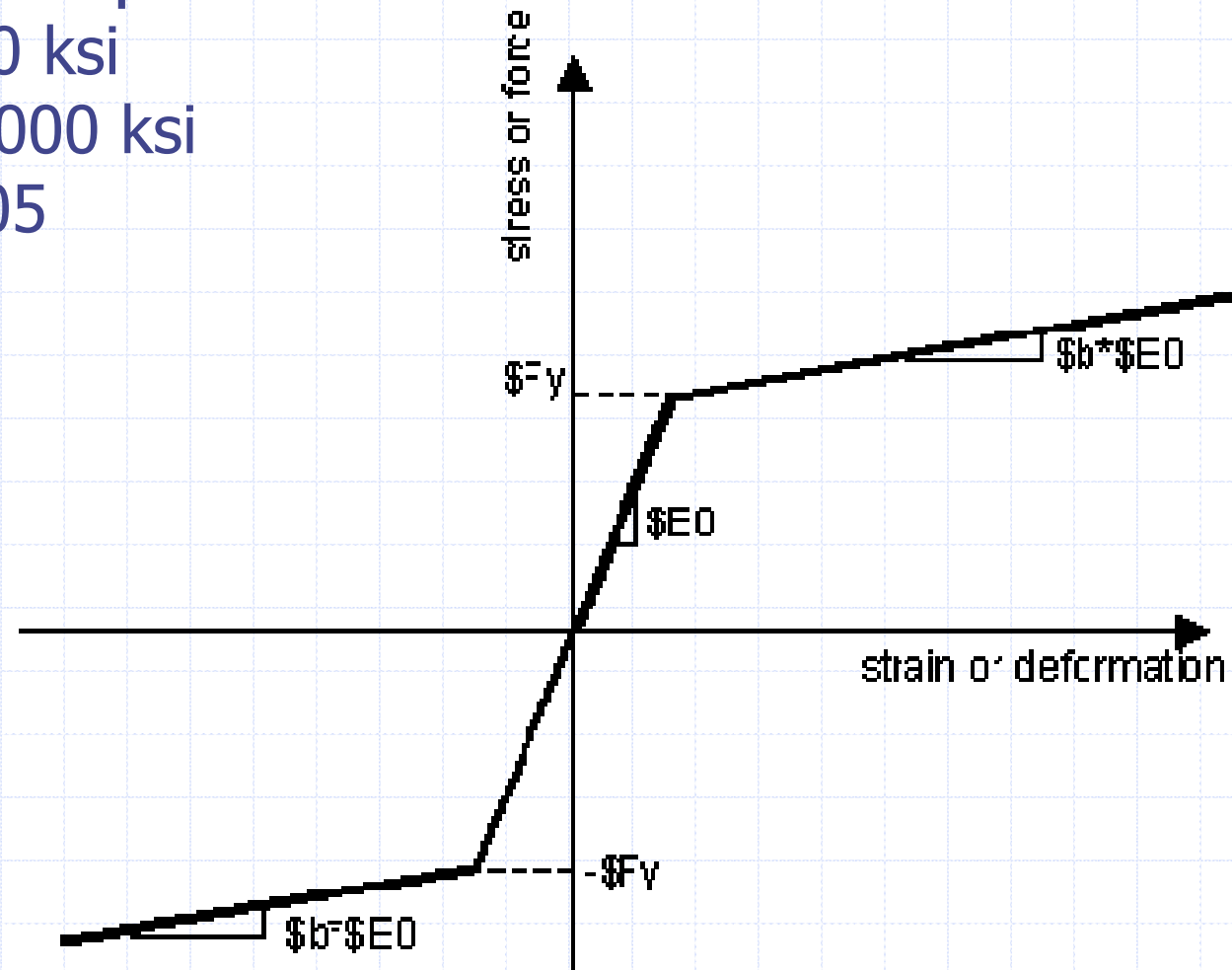
Templates:

- BoucWen
- Concrete01
- Concrete02
- Concrete03
- Elastic
- ElasticNoTension
- ElasticPP
- ElasticPPGap
- Fatigue
- Hardening
- Hysteretic
- MinMax
- Parallel
- Series
- Steel01
- Steel02
- Viscous

Define Steel01 Material: A50

◆ Material Properties

- $F_y = 50$ ksi
- $E = 29000$ ksi
- $b = 0.05$



Define Steel01 Material: A50

Define Steel01 Material

Material Name : A50

Yield Stress (Fy) : 50

Modulus of Elasticity (E) : 29000

Hardening Ratio (b) : 0.05

Optional Parameters :

Iso Hardening Parameter (a1) : 0.0

Iso Hardening Parameter (a2) : 1.0

Iso Hardening Parameter (a3) : 0.0

Iso Hardening Parameter (a4) : 1.0

Define Material: nD Materials

The screenshot displays the OpenSees Navigator 2.1 software interface. The main window shows a zipper frame geometry with nodes numbered 1 through 18. A menu is open, highlighting 'nD Materials...'. A dialog box titled 'Define nD Material' is overlaid on the main window. The dialog box contains three input fields: 'Add Material : ElasticIsotropic', 'Modify/Show Material :', and 'Delete Material :'. The status bar at the bottom of the main window reads 'zipper frame geometry has been generated successfully' and 'X-61.09 Y173.14 Z0.00'.

Templates:

- ElasticIsotropic
- J2Plasticity
- PlaneStress
- PlateFiber

Define Section: Line Sections

The screenshot displays the OpenSees Navigator 2.1 software interface. The main window shows a zipper frame geometry with nodes numbered 1 through 18. A menu is open, highlighting 'Line Sections...' under the 'Sections' option. A dialog box titled 'Define Line Section' is overlaid on the main window, showing the following configuration:

Define Line Section	
Add Section :	Aggregator
Modify/Show Section :	ElasticDefault
Delete Section :	ElasticDefault

The status bar at the bottom of the main window displays the message: "zipper frame geometry has been generated successfully" and the coordinates "X-50.42 Y171.91 Z0.00".

Templates:

- Aggregator
- Elastic
- Fiber
- Uniaxial

Define Fiber Section: 1stFloorBeam

Define Fiber Section

Section Name : 1stFloorBeam

Add Fiber : Fiber

Modify Fiber :

Delete Fiber :

Add Patch : AISC

Modify Patch :

Delete Patch :

Add Layer : Straight

Modify Layer :

Delete Layer :

Define Fiber Section: AISC Patch

Define AISC Patch

Patch Name : Patch01

Material Type : A50

AISC Section Name : W24 X68

Number of Fibers along dw (nfdw) : 10

Number of Fibers along tw (nftw) : 1

Number of Fibers along bf (nfbf) : 10

Number of Fibers along tf (nftf) : 1

Optional Arguments :

Counter-Clockwise Rot (Theta) : 0.

Define Section: Area Sections

The screenshot displays the OpenSees Navigator 2.1 software interface. The main window shows a structural model with nodes and elements. A menu is open, highlighting 'Area Sections...'. A dialog box titled 'Define Area Section' is overlaid on the model. The dialog box contains three dropdown menus: 'Add Section :', 'Modify/Show Section :', and 'Delete Section :'. The 'Add Section :' dropdown is currently set to 'Bidirectional'. The status bar at the bottom of the dialog box indicates 'section(2) with name "1stFloorBeam" has been defined/modified successfully' and shows coordinates 'X-47.75 Y173.55 Z0.00'.

Define Area Section

Add Section :

Modify/Show Section :

Delete Section :

section(2) with name "1stFloorBeam" has been defined/modified successfully

X-47.75 Y173.55 Z0.00

Templates:

- Bidirectional
- ElasticMembranePlate
- PlateFiber

Define Experimental Control

OpenSees Navigator 2.1

File Edit View Define Assign Analyze Output Design Help | MATLAB Menu

Materials
Sections
Experimental
Elements
Time Series...
Load Pattern...
Recorders...
Analyses Options...
Response Functions...
Response Spectra...

YZ 3D

Define Experimental Control

Define Experimental Control

Add Exp Control : SCRAMNET

Modify/Show Exp Control :

Delete Exp Control :

element [15] has been added successfully

X-74.02 Y173.55 Z0.00

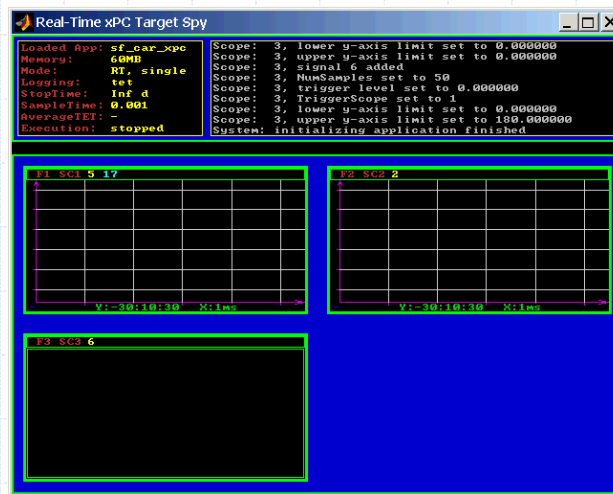
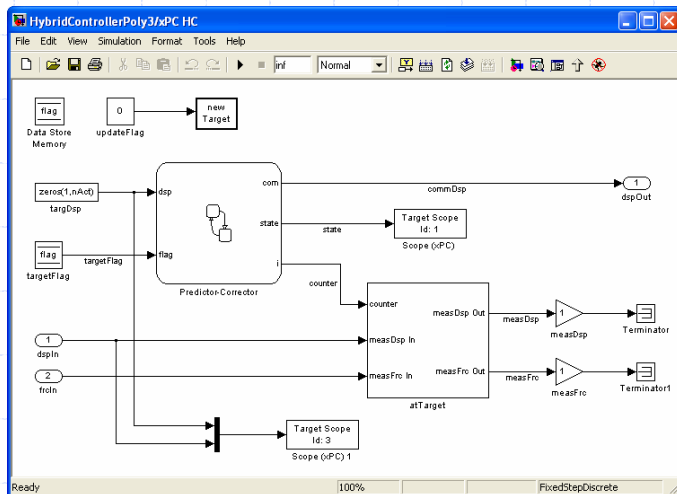
- Templates:**
- (-SCRAMNET)
 - SimChevronBrace
 - Simulation
 - dSpace
 - xPC Target

Define ExpControl: xPC Target

Define xPC Target Control

Define xPC Target Control

Control Name :	BraceExpCtrlXPC	Add
Number of Setups (numSetups) :	1	
Predictor-Corrector Type (type) :	Dsp	
xPC Target IP Address (ipAddr) :	192.168.2.20	
xPC Target IP Port (ipPort) :	22222	
Application Name (appName) :	HybridControllerPoly3	Browse
Application Path (appPath) :	TestModels\c&mCode-xPCTarget-STS\	



Define Experimental Setup

OpenSees Navigator 2.1

File Edit View Define Assign Analyze Output Design Help | MATLAB Menu

Materials
Sections
Experimental
Elements
Time Series...
Load Pattern...
Recorders...
Analyses Options...
Response Functions...
Response Spectra...

YZ 3D

Define Experimental Setup

Define Experimental Setup

Add Exp Setup : ChevronBrace

Modify/Show Exp Setup :

Delete Exp Setup :

element [15] has been added successfully

X-50.21 Y173.55 Z0.00

Templates:

- ChevronBrace
- ChevronBraceJntOff
- NoTransformation
- OneActuator
- ThreeActuators
- TwoActuators

Define ExpSetup: ChevronBrace

Define ChevronBraceJntOff Setup

Setup Name :

Experimental Control Type :

Geometry Type (nlGeomFlag) :

Actuator Length 1 (La1) :

Actuator Length 2 (La2) :

Actuator Length 3 (La3) :

Rigid Link Length 1 (L1) :

Rigid Link Length 2 (L2) :

Rigid Link Length 3 (L3) :

Rigid Link Length 4 (L4) :

Rigid Link Length 5 (L5) :

Rigid Link Length 6 (L6) :

Optional Parameters :

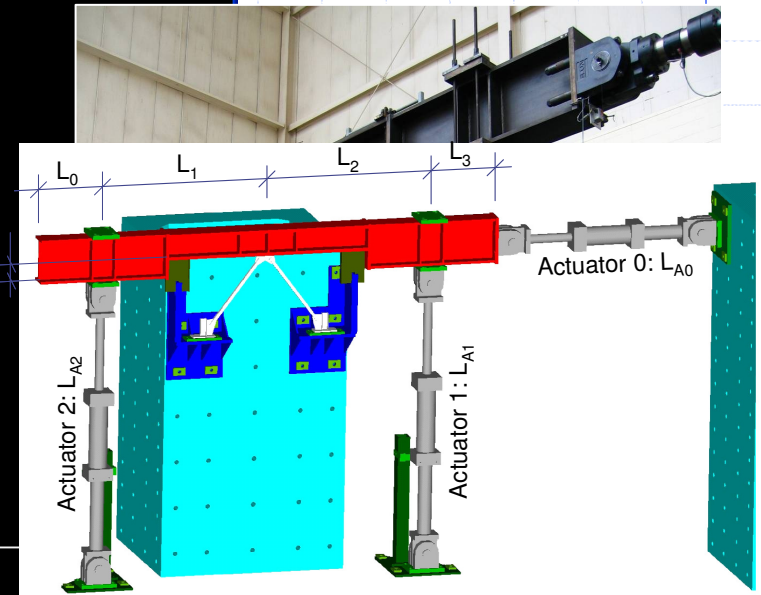
Dsp Control Factor (dspCtrlFact) :

Vel Control Factor (velCtrlFact) :

Acc Control Factor (accCtrlFact) :

Dsp Daq Factor (dspDaqFact) :

Force Daq Factor (frcDaqFact) :



Define Experimental Site

The screenshot shows the OpenSees Navigator 2.1 software interface. The 'Define' menu is open, and the 'Sites...' option is selected. A dialog box titled 'Define Experimental Site' is displayed in the foreground. The dialog box contains three rows of controls:

Control	Value
Add Exp Site :	LocalSite
Modify/Show Exp Site :	RFS
Delete Exp Site :	RFS

The background shows a 3D model of a truss structure with nodes numbered 4, 11, 8, 5, 16, 14, 17, 6, 7, 24, 25, 26. A red triangle representing element 15 is highlighted in the foreground. The status bar at the bottom indicates 'element [15] has been added successfully' and 'X-72.79 Y173.14 Z0.00'.

Templates:

- LocalSite
- RemoteSite

Define ExpSite: RFS

Define Local Site

Define Local Site

Site Name :

Experimental Setup Type :



Define Element: Line Element

The screenshot shows the OpenSees Navigator 2.1 software interface. The 'Define' menu is open, and 'Line Elements...' is selected. A dialog box titled 'Define Line Element' is displayed in the foreground. The dialog box contains three dropdown menus: 'Add Element' set to 'CorotationalTruss', 'Modify/Show Element' set to 'ElasticDefault', and 'Delete Element' set to 'ElasticDefault'. In the background, a truss structure is visible with nodes 4, 11, 8, 5, 16, 14, 17, and 6. A red triangle element labeled '15' is highlighted in the foreground. The status bar at the bottom indicates 'element [15] has been added successfully' and 'X-17.78 Y166.16 Z0.00'.

Templates:

- CorotationalTruss
- DispBeamColumn
- ElasticBeamColumn
- ExpBeamColumn
- ExpChevronBrace
- ExpTruss
- ExpZeroLength
- ForceBeamColumn
- HingeBeamColumn
- Truss
- ZeroLength

Define ElasticBeamColumn Element

Define ElasticBeamColumn Element

Define ElasticBeamColumn Element

Element Name :	<input type="text" value="EColumn"/>	<input type="button" value="Add"/>
Modulus of Elasticity (E) :	<input type="text" value="29000"/>	<input type="button" value="Database"/>
Cross-Sectional Area (A) :	<input type="text" value="13.3"/>	
Moment of Inertia (Iz) :	<input type="text" value="248"/>	

Select Section from Database

Select Section from Database

Database :	<input type="text" value="AISC"/>	<input type="button" value="Select"/>
Section Name :	<input type="text" value="W10X45"/>	
Direction :	<input type="text" value="strong"/>	

Define ForceBeamColumn Element

Define ForceBeamColumn Element

Element Name : 1stStoryColumn

Number Intergration Points (NIP) : 5

Section Type : 1stStoryColumn

Optional Arguments :

Mass Density (massDens) : 0.

Maximum Iterations (maxlters) : 10

Tolerance (tol) : 1E-8

Define ExpElement: ChevronBrace

Define ExpChevronBrace Element

Element Name :

Experimental Site Type :

Initial Stiffness (initStif) :

<input type="text" value=""/>	<input type="text" value="0"/>	<input type="text" value="0"/>
<input type="text" value="0"/>	<input type="text" value=""/>	<input type="text" value="0"/>
<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>

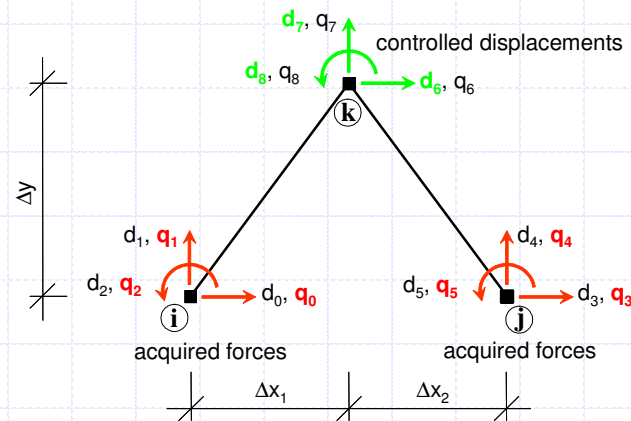
Optional Arguments :

I-Modification (iMod) :

Is Copy (isCopy) :

Mass Density 1 (massDens1) :

Mass Density 2 (massDens2) :



Define ExpElement: ChevronBrace

OpenSees Navigator 2.1 - ZipperExpHS.mat

File Edit View Define Assign Analyze Output Design Help | MATLAB Menu

OpenSees result files loaded successfully

X-11.45 Y170.18 Z0.00

Experimental ChevronBrace Element

ExpBrace1

Define TimeSeries

The screenshot shows the OpenSees Navigator 2.1 software interface. The 'Define' menu is open, and the 'Time Series...' option is selected. A 'Define TimeSeries' dialog box is displayed in the foreground, showing the following options:

Operation	Selected Template
Add TimeSeries :	Constant
Modify/Show TimeSeries :	LinearDefault
Delete TimeSeries :	LinearDefault

The background shows a 3D model of a structure with a red triangular element highlighted. The status bar at the bottom indicates 'element [15] has been added successfully' and 'X-65.20 Y173.55 Z0.00'.

Templates:

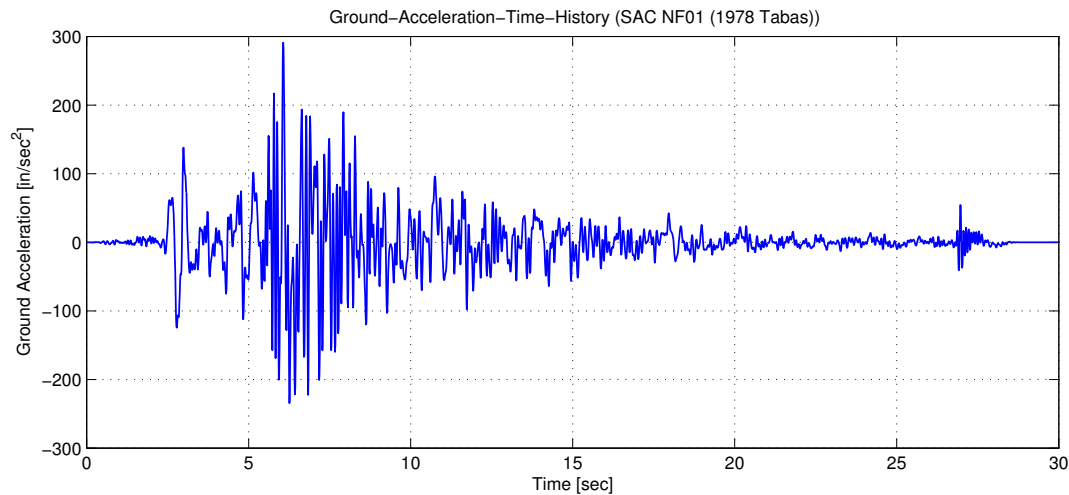
- Constant
- Interpolated GroundMotion
- Linear
- PathFile
- PathFileFiltered
- PathValue
- PlainGroundMotion
- Pulse
- Rectangular
- Sine
- Triangle

Define PathFile TimeSeries: SACNF01

Define PathFile Time Series

Define PathFile Time Series

TimeSeries Name :	SACNF01	Add
Time Interval (dt) :	0.01	
Time File Name (fileTime) :	<input type="checkbox"/>	Browse
Value File Name (filePath) :	D:\NEES\GroundMotions\SACNF01.txt	Browse
Load Factor (cFactor) :	386.1	



Define LoadPattern

OpenSees Navigator 2.0 - Test.mat

File Edit View Define Assign Analyze Output Design Help | MATLAB Menu

Materials
Sections
Experimental
Elements
Time Series...
Load Pattern...
Recorders...
Analyses Options...
Response Functions...
Response Spectra...

Define LoadPattern

Define LoadPattern

Add LoadPattern : MultipleSupport

Modify/Show LoadPattern : PlainDefault

Delete LoadPattern : PlainDefault

time-series(2) with name "SACNF01" has been defined/modified successfully

X-41.59 Y157.54 Z0.00

Templates:

- MultipleSupport
- Plain
- UniformExcitation

Define UniformExcitation LoadPattern

Define UniformExcitation Load Pattern

Define UniformExcitation Load Pattern

LoadPattern Name : SACNF01

TimeSeries Type : SACNF01

Direction of Excitation (dir) : 1

Define Recorder

The screenshot shows the OpenSees Navigator 2.0 software interface. The main window displays a 3D model of a truss structure. A menu is open, showing options like Materials, Sections, Experimental, Elements, Time Series..., Load Pattern..., Recorders..., Analyses Options..., Response Functions..., and Response Spectra... The 'Define Recorder' dialog box is open, showing the following settings:

Define Recorder	
Add Recorder :	BeamColumn Element
Modify/Show Recorder :	DefoShape
Delete Recorder :	DefoShape

The status bar at the bottom of the window displays the message: "load-pattern(2) with name 'SACNF01' has been defined/modified successfully" and the coordinates "X:69.51 Y:173.55 Z:0.00".

Templates:

- BeamColumn Element
- Display
- Experimental Element
- Node
- Truss Element
- ZeroLength Element

Defaults:

- DefoShape
- EigenVector

Define Node Recorder

Define Node Recorder

Recorder Name : DefoShape

Node Number(s) : all Envelope

Deformations :

- Displacements
- Velocities
- Accelerations
- Incremental Displacements
- Incremental Delta Displacements
- Eigenvectors

Forces :

- Reaction Forces Without Inertia
- Reaction Forces Including Inertia
- Unbalanced Loads Without Inertia
- Unbalanced Loads Including Inertia

Define BeamColumn Recorder

Define BeamColumn Element Recorder

Recorder Name : ElemForces

Element Number(s) : all Envelope

Arguments : Global Resisting Forces
 Local Resisting Forces

Section Response : Section

Section Number(s) : 15

Arguments : Forces Deformations
 Stiffness

Fiber Response : Fiber

Arguments : Stress/Strain 0. Y-Coor 0. Z-Coor

Define Analysis Options

OpenSees Navigator 2.0 - Test.mat

File Edit View Define Assign Analyze Output Design Help | MATLAB Menu

Materials
Sections
Experimental
Elements
Time Series...
Load Pattern...
Recorders...
Analyses Options...
Response Functions...
Response Spectra...

Define Analysis Options

Define Analysis Options

Add Analysis Options :

Modify/Show Analysis Options : StaticDefault

Delete Analysis Options : StaticDefault

load-pattern(2) with name "SACNF01" has been defined/modified successfully

X-79.16 Y173.55 Z0.00

Defaults:

- StaticDefault
- TransientDefault
- EigenDefault

Define New Analysis Options

Define New Analysis Options

Analysis Optn Name : AnalysisOptn01

Analysis Type : Transient

Constraint Handler Type : Plain Constraints

Integrator Type : AlphaOS

Solution Algorithm Type : Linear

Convergence Test Type : Energy Increment

DOF Numberer Type : Plain

System of Equations Type : BandGeneral

Integrator Type:

For example use AlphaOS Method for Hybrid Simulation

Solution Algorithm:

The AlphaOS Method requires a Linear solution algorithm

Define Response Spectra

OpenSees Navigator 2.0 - Test.mat

File Edit View Define Assign Analyze Output Design Help | MATLAB Menu

Materials
Sections
Experimental
Elements
Time Series...
Load Pattern...
Recorders...
Analyses Options...
Response Functions...
Response Spectra...

Define Response Spectra

Define Response Spectra

Add Response Spectra : From Acceleration File

Modify/Show Response Spectra :

Delete Response Spectra :

analysis(4) with name "AnalysisOptn01" has been defined/modified successfully X-49.39 Y173.55 Z0.00

Templates:

- From Acceleration File
- From Output
- IBC2000
- NEHRP
- Newmark & Hall
- UBC1997

Define From Acceleration File Spectra

Define Response Spectra from Acceleration File

Response Spectra Name :	LA22YY	Add
Time Interval (dt) :	0.008164	
Acceleration File Name (filePath) :	ZipperExpHS\GroundMotions\la22yy.thf	Browse
Load Factor (cFactor) :	386.1	
First Period Value :	0.01	
Last Period Value :	3.0	
Number of Period Values :	1000	
Damping Ratio(s) :	0.02 0.05 0.1	

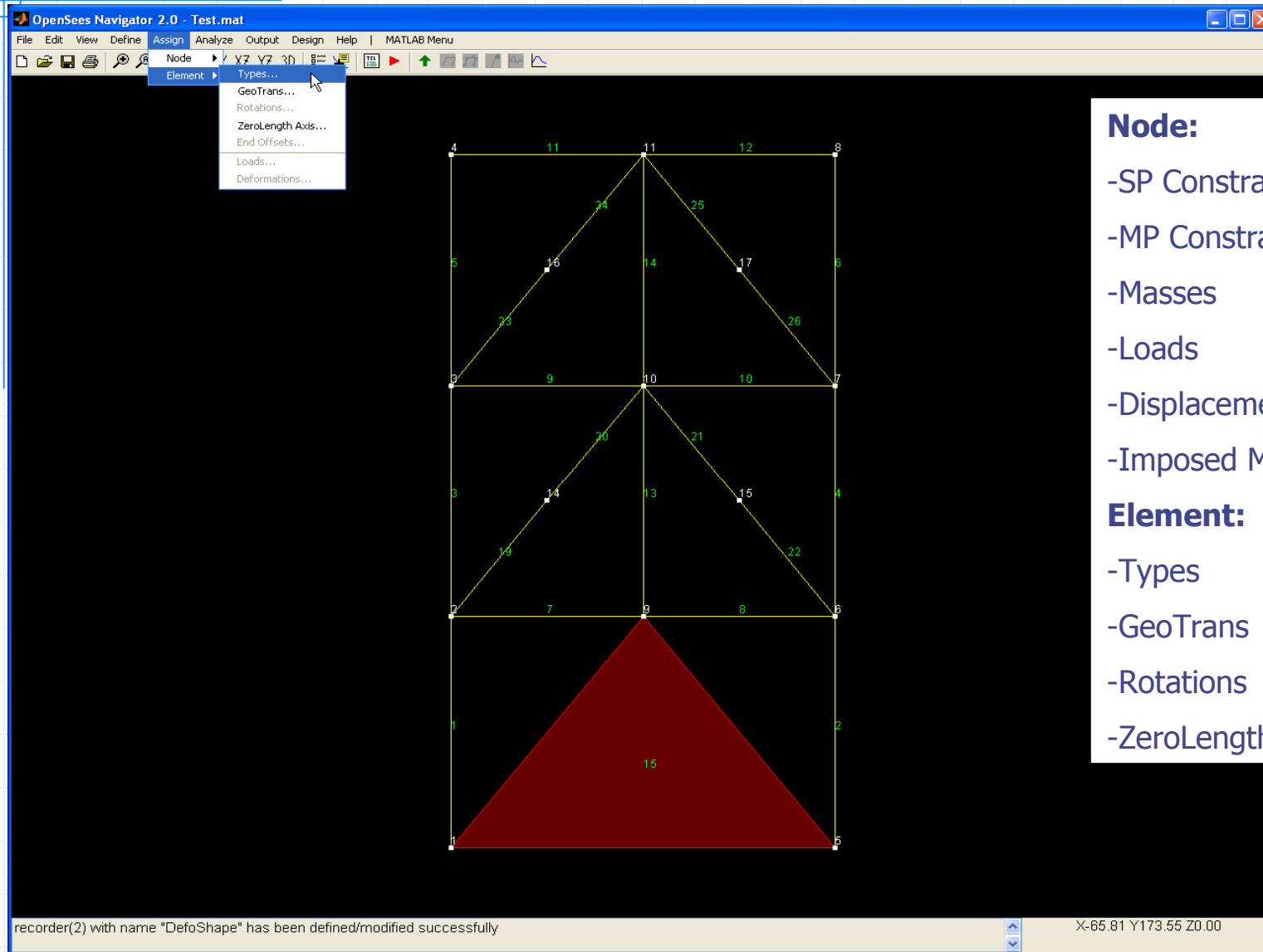
Define From Output Spectra

Define Response Spectra from Output

Define Response Spectra from Output

Response Spectra Name :	FirstFloorSpectra	Add
Analysis Case :	LA22YY	
Recorder :	DefoShape	
Node Number :	10	
Degree of Freedom :	1	
First Period Value :	0.01	
Last Period Value :	3.0	
Number of Period Values :	1000	
Damping Ratio(s) :	0.02 0.05 0.1	

Assign Menu



Node:

- SP Constraints
- MP Constraints
- Masses
- Loads
- Displacements
- Imposed Motions

Element:

- Types
- GeoTrans
- Rotations
- ZeroLength Axis

Assign Menu

Assign Nodal Masses

Replace/Add/Delete Masses :

Node Number(s) :

Mass X-dir :

Mass Y-dir :

Mass Moment of Inertia Z-dir :

Select Nodes

X-Coordinate :

Y-Coordinate :

Assign Element Types

Assign Element Types :

Element Number(s) :

Element Type :

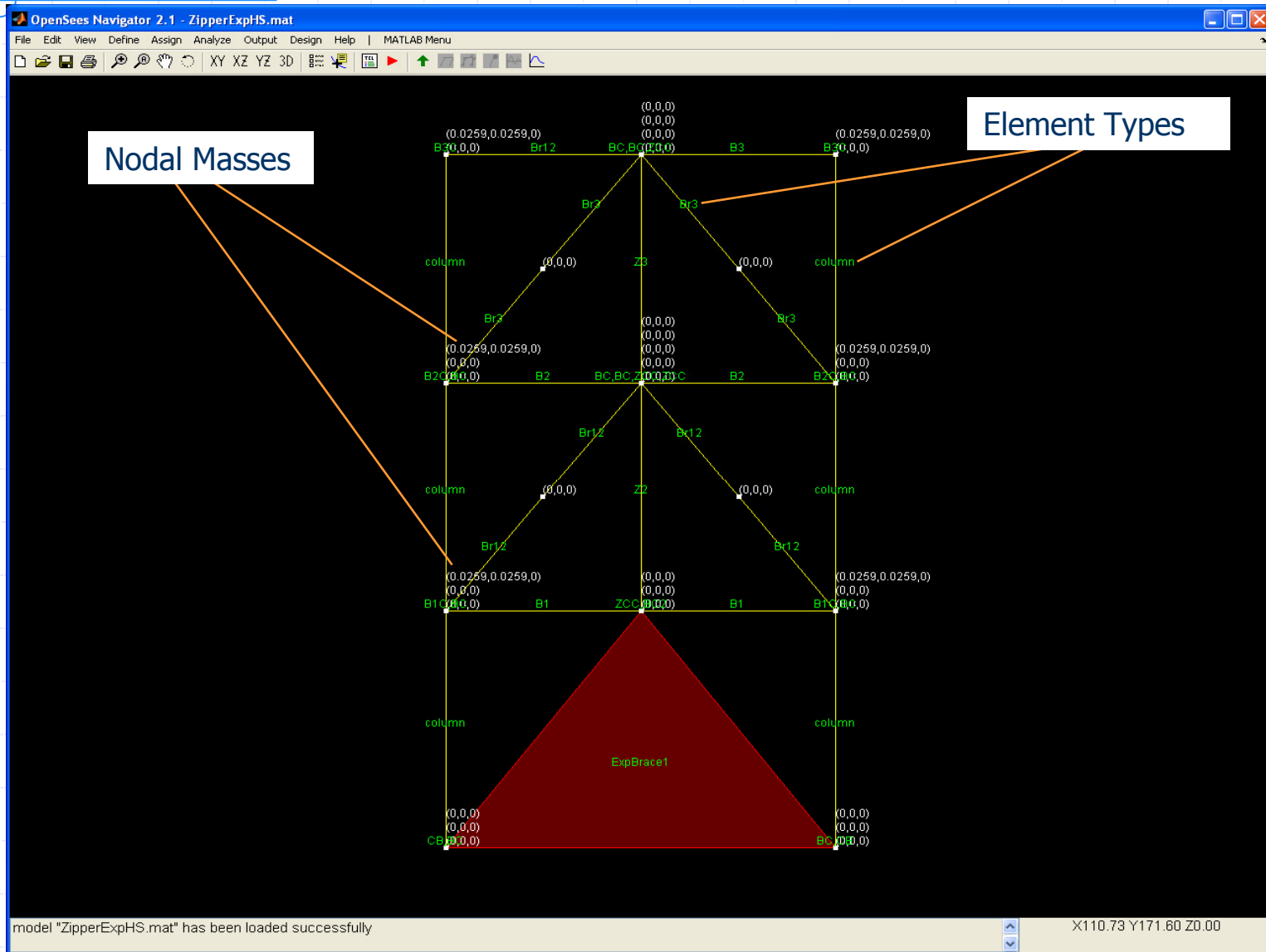
Assign Element Geometric Transformations

Assign Geometric Transformations :

Element Number(s) :

Geometric Transformation :

Assigned Properties



Define Analysis Cases

The screenshot shows the OpenSees Navigator 2.1 interface with the 'Define Analysis Case' dialog box open. The dialog box contains the following fields:

Define Analysis Case	
Add Analysis Case :	<input type="button" value="New Analysis Case"/>
Modify/Show Analysis Case :	StaticDefaultCase
Delete Analysis Case :	StaticDefaultCase

The background shows a structural model with a red triangle at the bottom and a yellow wireframe structure above it. The status bar at the bottom of the window displays the message: "model 'ZipperExpHS.mat' has been loaded successfully" and the coordinates "X-46.36 Y171.60 Z0.00".

Defaults:
-StaticDefaultCase
-EigenDefaultCase

Define New Analysis Case

Define New Analysis Case

Analysis Case Name :

Load Pattern Name(s) :

Recorder Name(s) :

Analysis Options Name :

User Defined Analysis Script :

Start from Previous Analysis Case :

Num of Eigenvalues (numEigVal) :

Analysis Type (typeEig) :

For Example:

Periods and Mode Shapes after Time-History Analysis

To Run OpenSees

The screenshot shows the OpenSees Navigator 2.1 software interface. The title bar reads "OpenSees Navigator 2.1 - ZipperExpHS.mat". The menu bar includes File, Edit, View, Define, Assign, Analyze, Output, Design, Help, and MATLAB Menu. The File menu is open, showing options such as "New Model from Template...", "Open Model from File...", "Close Model", "Save Model", "Save Model As...", "Set OpenSees.exe Path...", "Page Setup...", "Print Setup...", "Print Preview...", "Print...", "Quit", and a list of recent files. A callout box titled "Steps:" contains the instruction: "1. Set OpenSees.exe Path (needs to be done only once)". The main workspace displays a structural model with a red triangular base and a yellow wireframe structure above it. The status bar at the bottom shows "recorder(5) with name 'EigenVector' has been defined/modified successfully" and coordinates "X-49.00 Y170.79 Z0.00".

Steps:

1. Set OpenSees.exe Path (needs to be done only once)

To Run OpenSees

The screenshot displays the OpenSees Navigator 2.1 software interface. The main window title is "OpenSees Navigator 2.1 - ZipperExpHS.mat". The menu bar includes "File", "Edit", "View", "Define", "Assign", "Analyze", "Output", "Design", "Help", and "MATLAB Menu". The toolbar contains various icons for file operations and analysis. A white dialog box titled "Running OpenSees" is overlaid on the main window, containing the text "running OpenSees analysis, please wait" and an "OK" button. A red trapezoidal shape is positioned below the dialog box. At the bottom of the main window, a status bar shows the text "recorder(5) with name 'Eigenvector' has been defined/modified successfully" on the left and "X-45.55 Y171.60 Z0.00" on the right.

Steps:

2. Write OpenSees Input Files (writes TCL files)
3. Run OpenSees

Post-Processing: Output

First:
Load OpenSees Results into Matlab

OpenSees Navigator 2.1 - ZipperExpHS.mat

File Edit View Define Assign Analyze Output Design Help | MATLAB Menu

Load OpenSees Results

Load OpenSees Results

Select Analysis Case(s) :

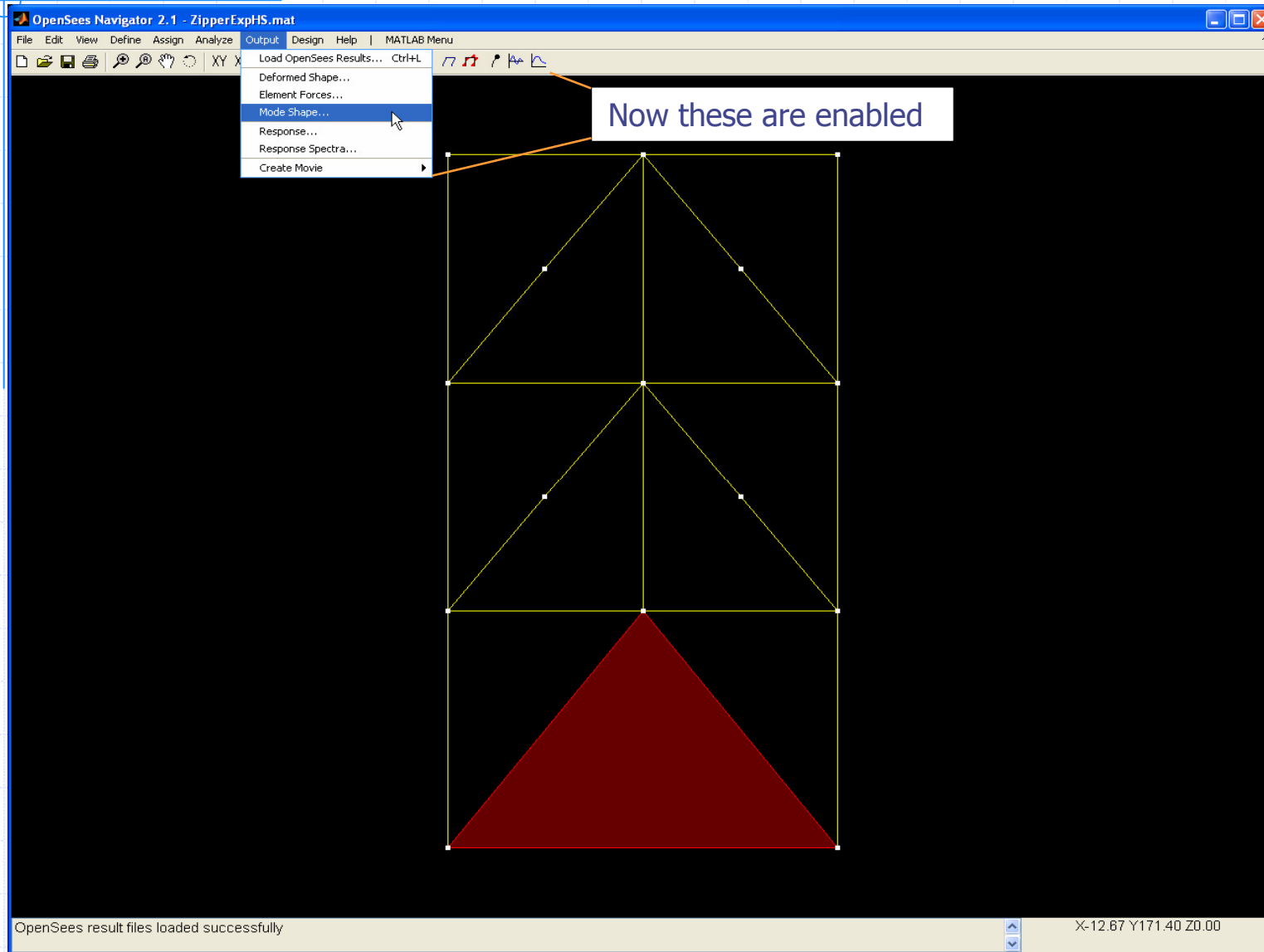
- EigenDefaultCase
- SACNF01Case01

Load

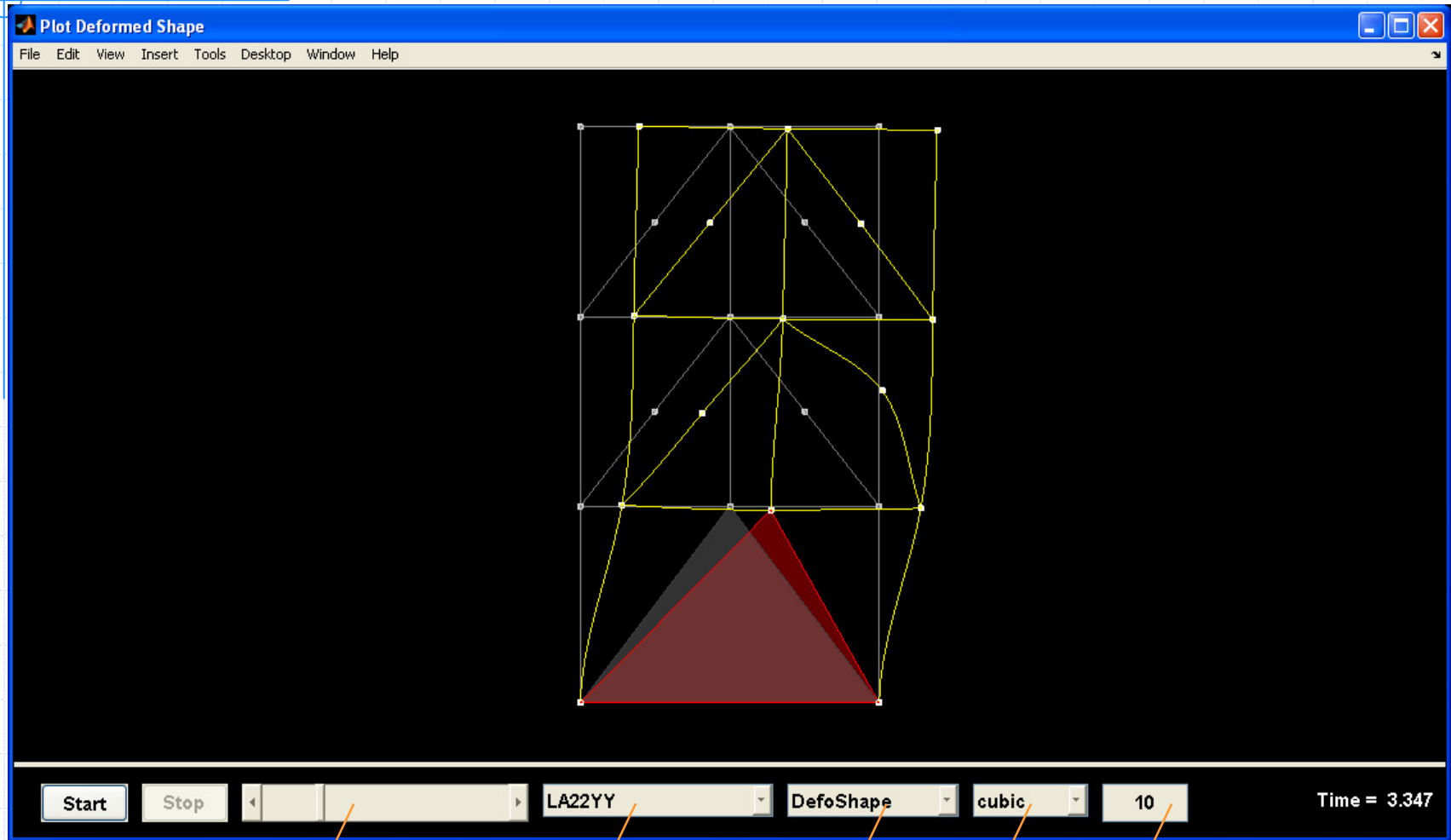
recorder(5) with name "EigenVector" has been defined/modified successfully

X-45.55 Y171.60 Z0.00

Post-Processing: Output



Plot Deformed Shape



Time Step

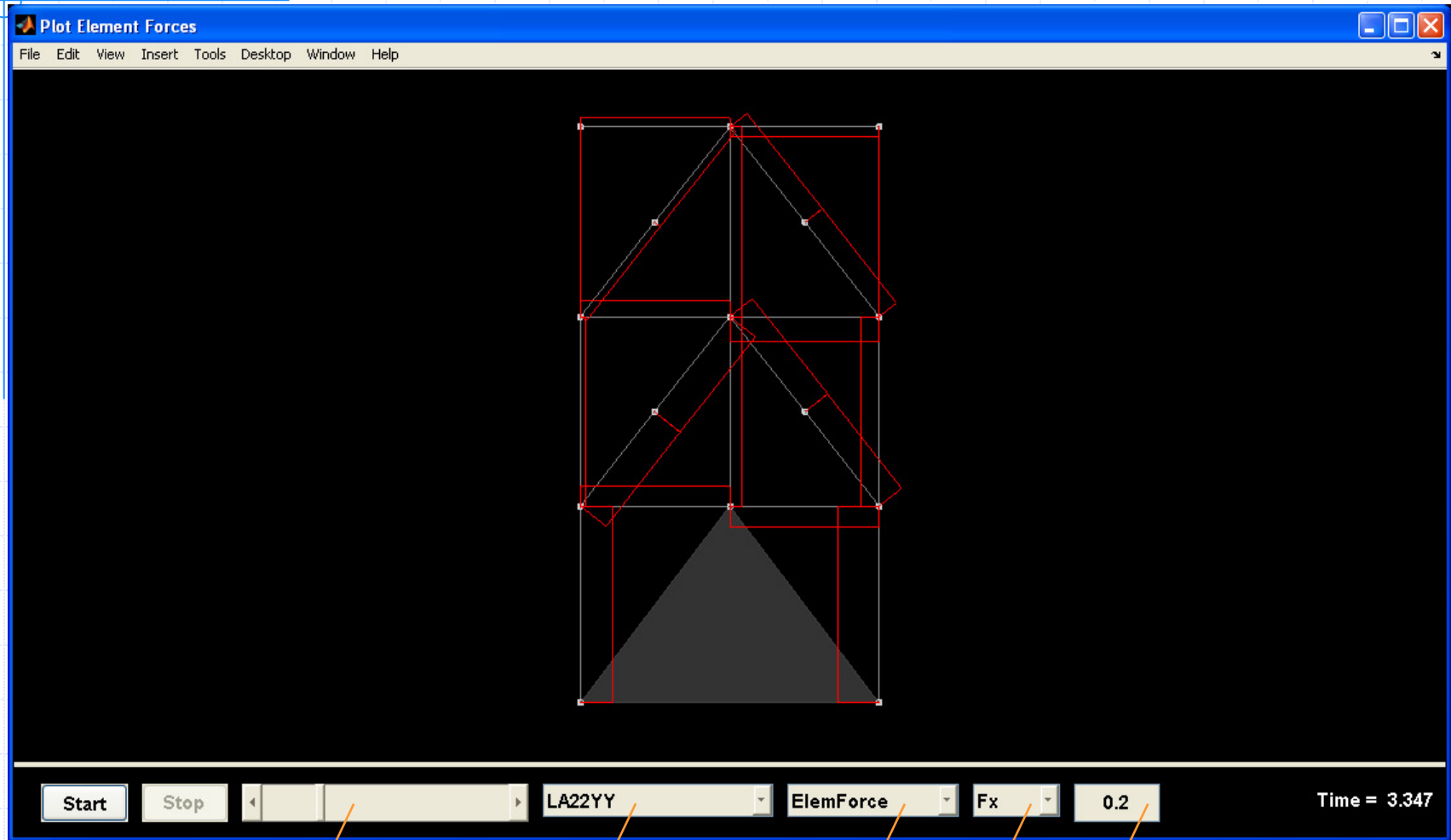
AnalysisCase

Recorder

Order

Magnification

Plot Element Forces: Axial Forces



Time Step

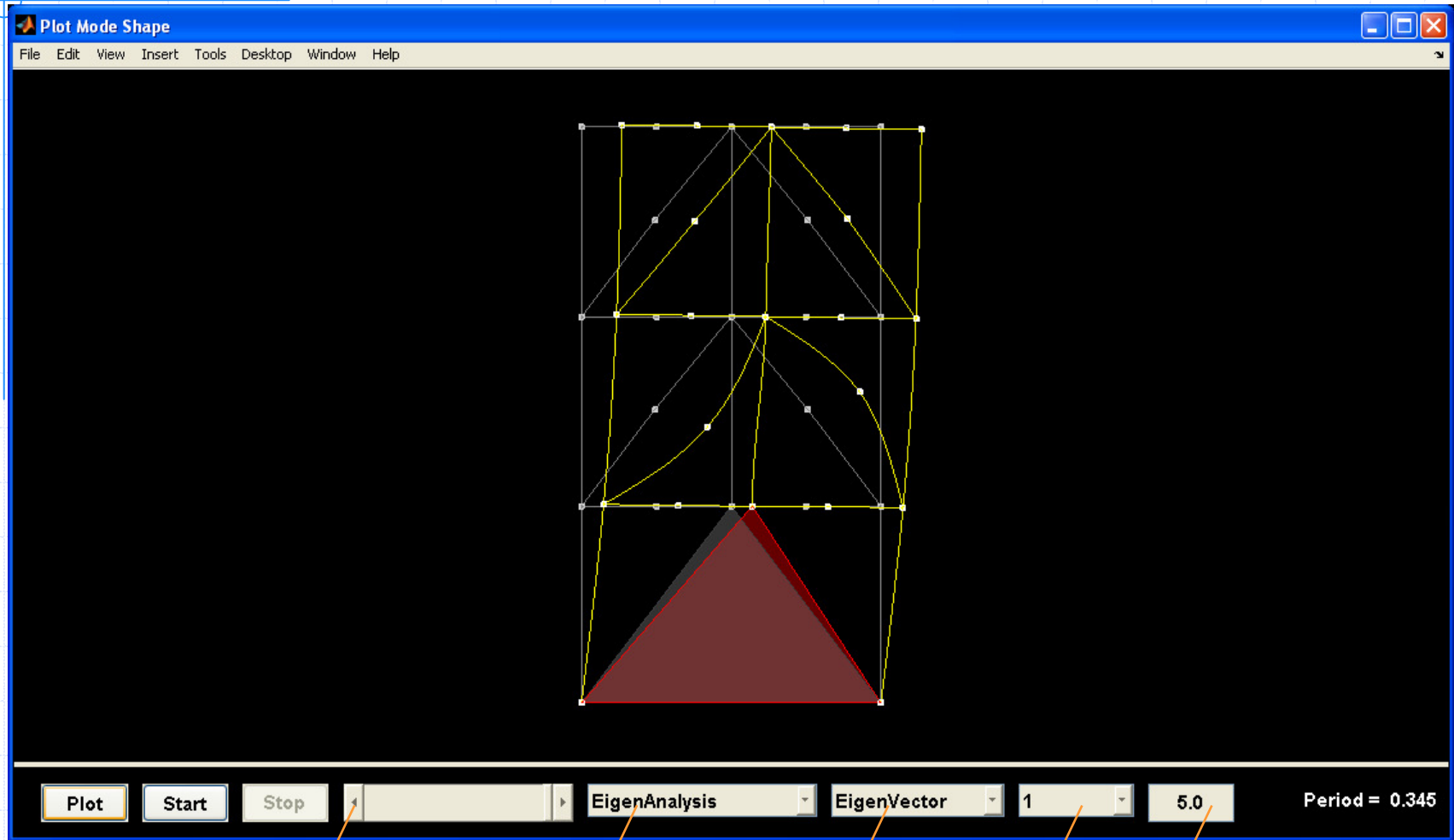
AnalysisCase

Recorder

Response

Magnification

Plot Mode Shape: 1st Mode



Animation Speed

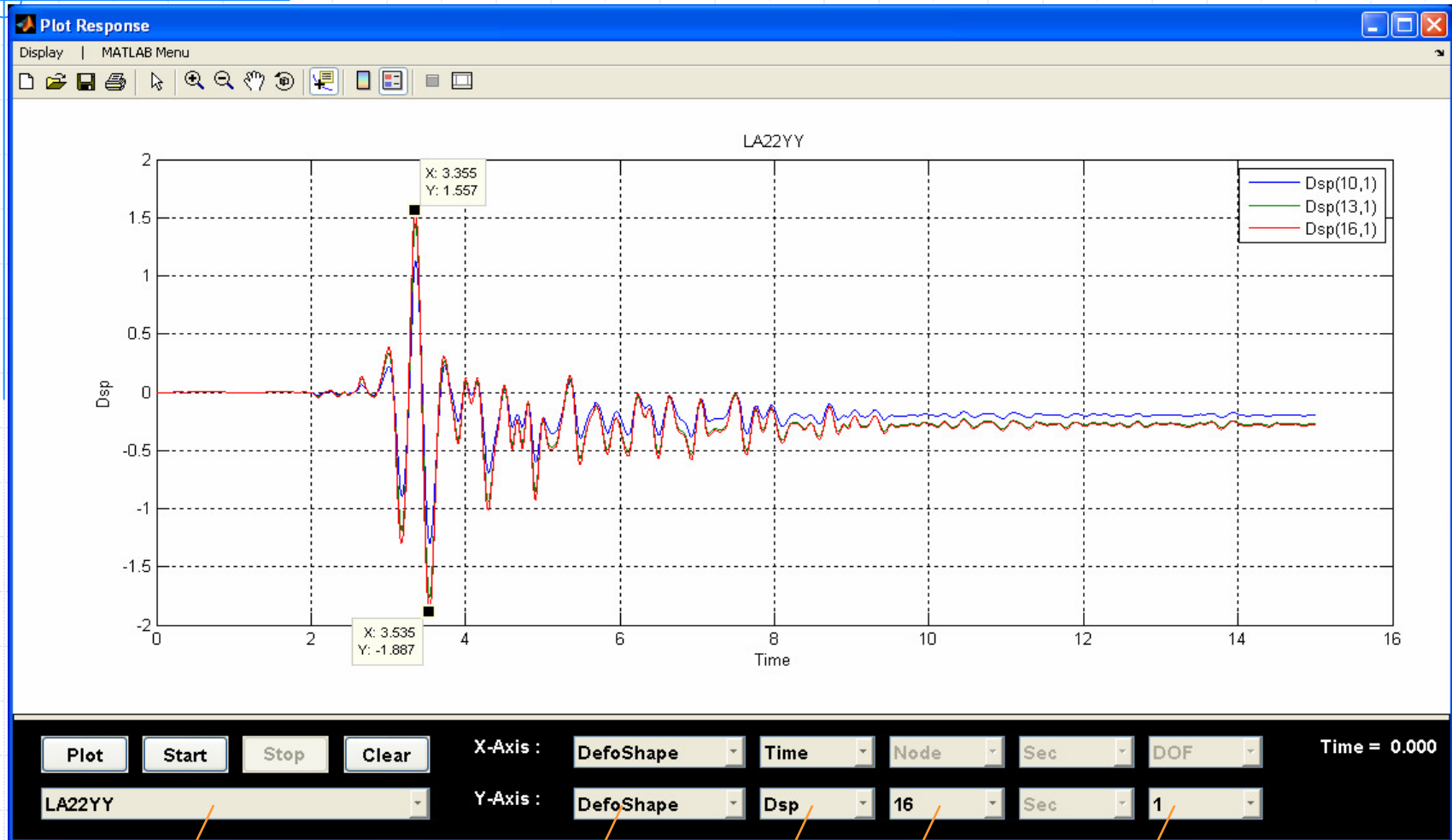
AnalysisCase

Recorder

Mode

Magnification

Plot Response



AnalysisCase

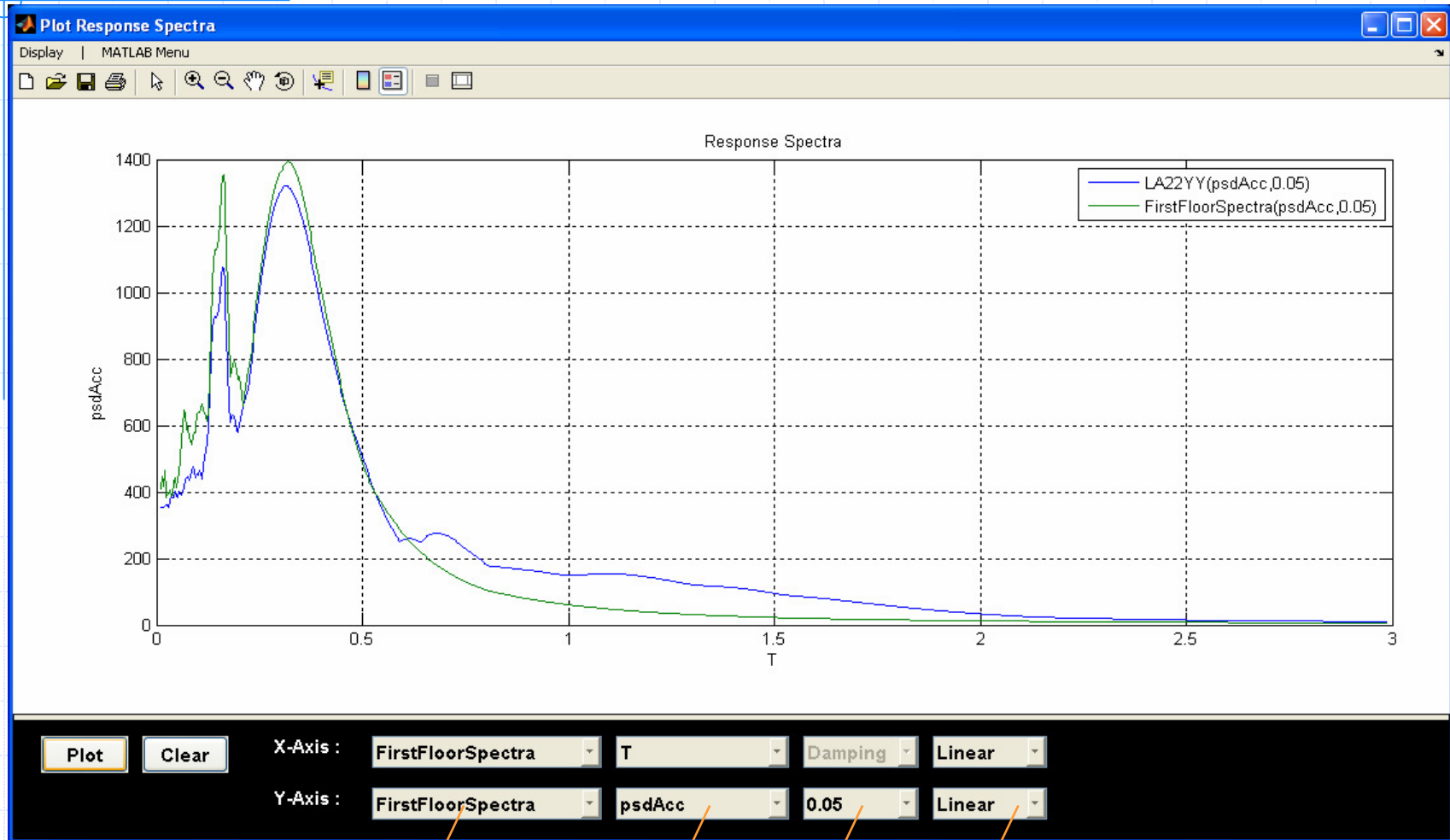
Recorder

Parameter

Node/Element

DOF

Plot Response Spectra



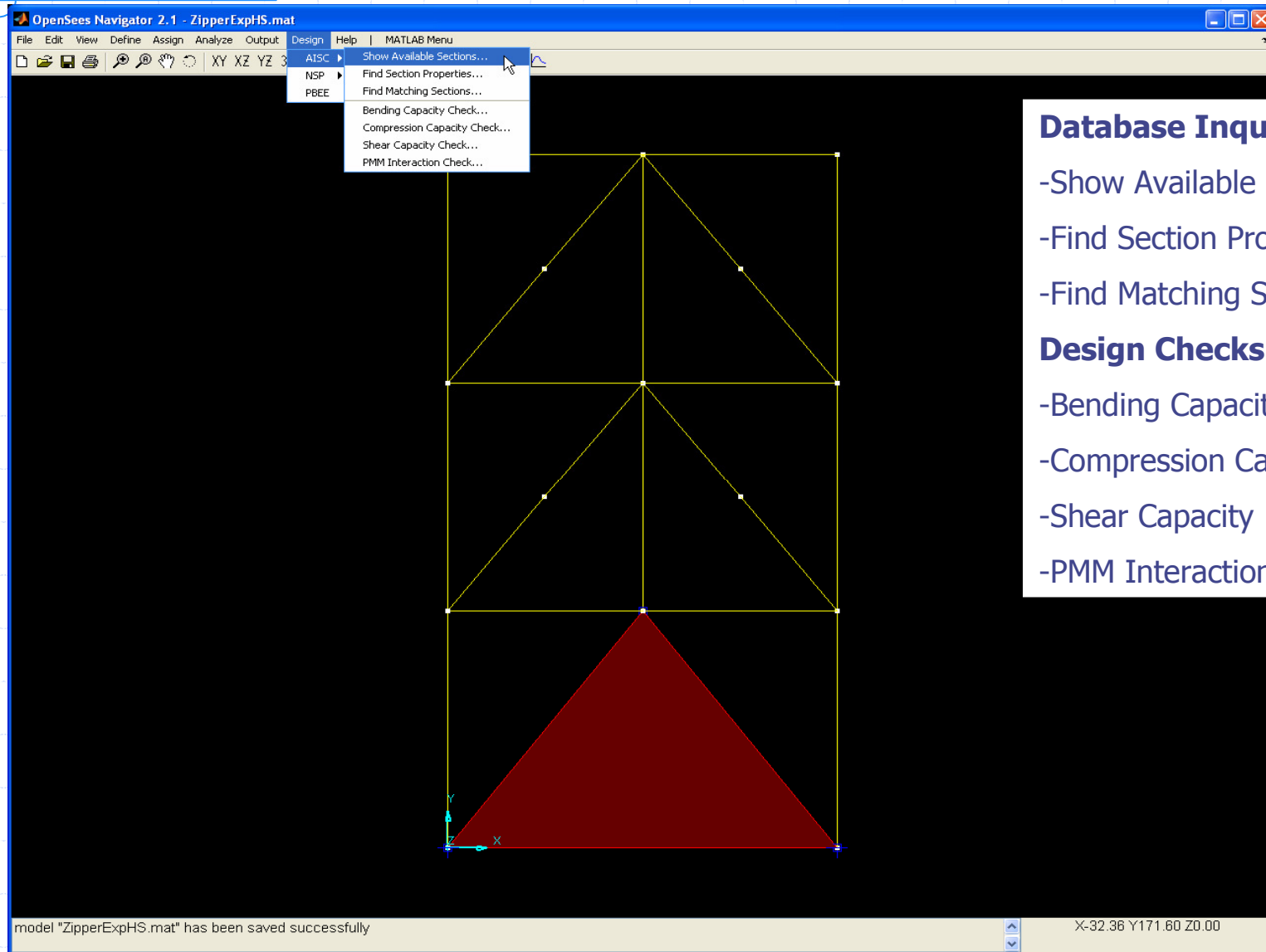
Spectra Name

Response

Damping

Axis Scale

AISC Design Toolbox



Database Inquiries:

- Show Available Sections
- Find Section Properties
- Find Matching Sections

Design Checks:

- Bending Capacity
- Compression Capacity
- Shear Capacity
- PMM Interaction

AISC Toolbox: Find Section Prop.

Find AISC Section Properties

Section Shape :

Section Parameters :

- Area - A
- Depth - d
- Width - bf
- Tickness of the web (W,M,S only) - tw
- Tickness of the flange (W,M,S only) - tf
- Moment of inertia - Ix

Output

AISC Section Properties

The requested parameters are :

```
name = W24x68
shape = W
A = 20.1
d = 23.7
Ix = 1830
Iy = 70.4
```


AISC Toolbox: Find Matching Sec.

Find Matching AISC Sections

Select Section Shape :

Add Parameter : Min : Max :

Modify Parameter : Min : Max :

Delete Parameter :

Sort by Parameter :

Output

Matching AISC Sections

There are a total of "19" sections available:

- S3X7.5
- S4X7.7
- W6X8.5
- W6X9
- S4X9.5
- S5X10
- W8X10
- W6X12
- S6X12.5
- W4X13
- W8X13
- W6X15
- W5X16
- W6X16
- S6X17.25
- S8X18.4
- M5X18.9
- W5X19
- W6X20

AISC Toolbox: Bending Capacity

AISC Bending Capacity

Bending Capacity of AISC Section

Section Shape :	W24x68	Calculate
Unbraced Length (Lb) :	40	[in]
Bending Coefficient (Cb) :	1	[-]
Yield Stress (Fy) :	50	[ksi]
Modulus of Elasticity (E) :	29000	[ksi]
Direction :	strong	

Note: The AISC Bending Capacity check is only applied to AISC rolled W/S/M/HSS sections.

Output

AISC Bending Capacity

```
Bending capacity for section W24x68 :  
With Lb = 120 in  
  Cb = 1  
  Fy = 50 ksi  
  E = 29000 ksi  
  
phi = 0.9  
Mp = 8850  
Mr = 6160  
Lp = 79.2626  
Lr = 208.7244  
Flange_Compactness = Compact  
Web_Compactness = Compact  
Capacity = 7203.19  
FailureMode = Lateral torsional buckling
```

OK

AISC Toolbox: Compression Capacity

AISC Compression Capacity

Compression Capacity of AISC Section

Section Shape :	W14x68	Calculate
Effective Length (kLx) :	144	[in]
Effective Length (kLy) :	144	[in]
Yield Stress (Fy) :	50	[ksi]
Modulus of Elasticity (E) :	29000	[ksi]

Note: The AISC Compression Capacity check only applied to AISC rolled W/S/M/HSS sections.

Output

AISC Compression Capacity

```
Compression capacity for section W14x68 :  
With kLx = 144 in  
    kLy = 144 in  
    Fy = 50 ksi  
    E = 29000 ksi  
  
Section_Slenderness = None Slender  
phi = 0.85  
FailureMode = Inelastic buckling (Qs(flange) = 1, Qa(web) = 1)  
Capacity = 661.6242
```

OK

AISC Toolbox: Shear Capacity

AISC Shear Capacity

Shear Capacity of AISC Section

Section Shape :	W24x68	Calculate
Distance between Stiffeners (a) :	24	[in]
Yield Stress (Fy) :	50	[ksi]
Modulus of Elasticity (E) :	29000	[ksi]

Note: The AISC Shear Capacity check is only applied to AISC rolled W/S/M sections.

Output

AISC Shear Capacity

```
The Shear Capacity parameters are :  
T_tw_p = 78.2264  
T_tw_r = 97.4274  
T_tw = 49.8795  
phi = 0.9  
Capacity = 265.5585  
FailureMode = Reaching yielding capacity 0.6*Fy
```

OK

AISC Toolbox: PMM Interaction

AISC PMM Interaction Check

PMM Interaction Check of AISC Section

Section Shape :	W24x68	Calculate
Yield Stress (Fy) :	50	[ksi]
Modulus of Elasticity (E) :	29000	[ksi]
Demand :		
Applied Axial Force (Pu) :		[kips]
Applied Moment about X axis (Mux) :		[kips - in]
Applied Moment about Y axis (Muy) :		[kips - in]
Compression :		
Effective Length (kLx) :		[in]
Effective Length (kLy) :		[in]
Bending :		
Unbraced Length (Lb) :		[in]
Bending Coefficient (Cb) :	1	[-]

Note: The AISC P-M interaction check is only applied to AISC rolled W/S/M/HSS sections.

Summary

◆ OpenSees Navigator provides

- Flexible and user friendly graphical user-interface
- Easy way to study material, section, element or system behavior
- Hybrid Simulation interface
- Many built in post processing toolboxes
- Great tool to visualize structural behavior
- Response Spectra generation
- Graphical user interface for AISC steel manual
- Design toolboxes

Website: Home

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Introduction	<p>Dear OpenSees Navigator users,</p> <p>Thanks for your interest in OpenSees Navigator. This program is intended to be self-explanatory, nevertheless a basic user manual will be added to the website shortly. We are very happy to have the opportunity to distribute this software for OpenSees Navigator users. We encourage everyone to try out all of the functions of the program and send us criticism, corrections or suggestions to improve future versions. We also encourage users to e-mail us at either andreas.schellenberg@gmail.com or yangtony2004@gmail.com so that we can add the e-mail addresses to the OpenSees Navigator user list. We will use such list to contact everyone about new releases or major updates. We will try our best to improve the next release.</p> <p>Thank you.</p> <p>Please feel free to visit our websites to discover in what other fun research we are involved:</p> <p>Andreas Schellenberg & Tony Yang</p>
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MCRInstaller.exe	Installation Instructions: <ol style="list-style-type: none">1. Download the two files on the left.2. Install the Matlab component runtime libraries by executing MCRInstaller.exe and following the on screen instructions (this has only to be done once).3. Extract OpenSeesNavigator.zip in any folder of your choice and then execute OpenSeesNavigator.exe.4. If you like you can create a shortcut to OpenSeesNavigator.exe on your Desktop.
OpenSeesNavigator.zip	

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Thank you!

OpenSees Navigator 2.0 is available at
<http://peer.berkeley.edu/OpenSeesNavigator>

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