

DESIGN DOCUMENT

Node Class

Properties

node_coord: 1x3 vector
node_dof: 6x1 vector
node_number: double

Public Methods

Constructor
GetNodeCoord()
GetNodeDOF()

Private Methods

AssignDOF()

Node Class Constructor

Arguments

node_coord: 1x3 vector
node_number: double

Computes/Stores

node_coord: 1x3 vector
node_number: double

Calls

AssignDOF()

Returns

N/A

GetNodeCoord()

Arguments

N/A

Computes/Stores

N/A

Returns

node_coord: 1x3 vector

GetNodeDOF()

Arguments

N/A

Computes/Stores

N/A

Returns

node_dof: 6x1 vector

AssignDOF()

Arguments

node_number: double

Computes/Stores

node_dof: 6x1 vector

Returns

N/A

Element Class

Properties

elementNodes:	1x2 vector
A:	double
Izz:	double
Iyy:	double
J:	double
Zzz:	double
Zyy:	double
E:	double
v:	double
webdir:	1x3 vector
distribLoad:	1x3 vector
length:	double
gamma:	12x12 matrix
localStiffness:	12x12 matrix
globalStiffness:	12x12 matrix
element_dof:	12x1 vector
fixedEndForcesLocal:	12x1 vector
fixedEndForcesGlobal:	12x1 vector

Public Methods

Constructor
GetGlobalStiffness
GetElementDOF
GetFixedEndForcesGlobal
ComputeForces

Private Methods

ComputeLength
ComputeTransformationMatrix
ComputeElasticStiffnessMatrix
RetrieveDOF
ComputeFixedEndForces

Element Class Constructor

Arguments

elementNodes:	1x2 vector
A:	double
Izz:	double
Iyy:	double
J:	double
Zzz:	double
Zyy:	double
E:	double
v:	double
webdir:	1x3 vector
w:	1x3 vector

Computes/Stores

elementNodes:	1x2 vector
A:	double
Izz:	double
Iyy:	double
J:	double
Zzz:	double
Zyy:	double
E:	double
v:	double
webdir:	1x3 vector
distribLoad:	1x3 vector
length:	double
gamma:	12x12 matrix
localStiffness:	12x12 matrix
globalStiffness:	12x12 matrix
element_dof:	12x1 vector
fixedEndForcesLocal:	12x1 vector
fixedEndForcesGlobal:	12x1 vector

Calls

ComputeLength
ComputeTransformationMatrix
ComputeElasticStiffnessMatrix
RetrieveDOF
ComputeFixedEndForces

Returns

N/A

GetGlobalStiffness ()

Arguments

N/A

Computes/Stores

N/A

Returns

globalStiffness: 12x12 matrix

GetElementDOF()

Arguments

N/A

Computes/Stores

N/A

Returns

element_dof: 12x1 vector

GetFixedEndForcesGlobal()

Arguments

N/A

Computes/Stores

N/A

Returns

fixedEndForcesGlobal: 12x1 vector

ComputeForces()

Arguments

eleDelta: 1x12 vector

Computes/Stores

elementForces: 12x1 vector

Returns

elementForces: 12x1 vector

ComputeLength()

Arguments

N/A

Computes/Stores

Local-

firstNode: 1x3 vector

secondNode: 1x3 vector

Global-

length: double

Calls

GetNodeCoord

Returns

length: double

RetrieveDOF()

Arguments

N/A

Computes/Stores

elementDOF: 12x1 vector

Calls

GetNodeDOF

Returns

elementDOF: 12x1 vector

ComputeTransformationMatrix()

Arguments

N/A

Computes/Stores

Local-

firstNode: 1x3 vector

secondNode: 1x3 vector

xprime: 1x3 vector

zprime: 1x3 vector

Global-

transformationMatrixGamma: 12x12 matrix

(Stored as- gamma: 12x12 matrix

Calls

GetNodeCoord

Returns

transformationMatrixGamma: 12x12 matrix

ComputeFixedEndForces()

Arguments

N/A

Computes/Stores

fixedEndForcesLocal: 12x1 vector

fixedEndForcesGlobal: 12x1 vector

Calls

N/A

Returns

fixedEndForcesLocal: 12x1 vector

fixedEndForcesGlobal: 12x1 vector

ComputeElasticStiffnessMatrix()

Arguments

N/A

Computes/Stores

Local-

etay: double

etaz: double

twoy: double

twoz: double

foury: double

fourz: double

sixy: double

sixz: double

twelvey: double

torsion: double

Global-

globalStiffness: 12x12 matrix

localStiffness: 12x12 matrix

Calls

N/A

Returns

globalStiffness: 12x12 matrix

localStiffness: 12x12 matrix

Analysis Class

Properties

nnodes:	double
coordinates:	nnodesx3 matrix
concen:	nnodesx6 matrix
fixity:	nnodesx6 matrix
nele:	double
ends:	nnodesx2 matrix
A:	double
Izz:	double
Iyy:	double
J:	double
Zzz:	double
Zyy:	double
Azz:	double
Ayy:	double
E:	double
v:	double
webdir:	1x3 vector
distribLoad:	1x3 vector
Nodes:	nnodesx1 vector
Elements:	nelex1 vector
Kff:	freeDOFxfreeDOF matrix
Kfn:	freeDOFxknownDOF matrix
Knf:	knownDOFxfreeDOF matrix
Knn:	knownDOFxknownDOF matrix
Ksf:	fixedDOFxfreeDOF matrix
Ksn:	fixedDOFxknownDOF matrix
AFLAG:	double
DEFL:	nnodesx6 matrix
REACT:	nnodesx6 matrix
ELE_FOR:	nelex12 matrix
error:	double

Public Methods

Constructor
RunAnalysis
GetMastan2Returns

Analysis Class (Contd.)

Private Methods

CreateNodes
CreateElements
ComputeStiffnessSubMatrices
ClassifyDOF
ComputeError
CheckKff
ComputeDisplacementReactions
CreateLoadVectors
RecoverElementForces

Analysis Class Constructor

Arguments

nnodes:	double
coordinates:	nnodesx3 matrix
concen:	nnodesx6 matrix
fixity:	nnodesx6 matrix
nele:	double
ends:	nnodesx2 matrix
A:	double
Izz:	double
Iyy:	double
J:	double
Zzz:	double
Zyy:	double
Azz:	double
Ayy:	double
E:	double
v:	double
webdir:	1x3 vector
distribLoad:	1x3 vector

Analysis Class Constructor (Contd.)

Computes/Stores

nnodes:	double
coordinates:	nnodesx3 matrix
concen:	nnodesx6 matrix
fixity:	nnodesx6 matrix
nele:	double
ends:	nnodesx2 matrix
A:	double
Izz:	double
Iyy:	double
J:	double
Zzz:	double
Zyy:	double
Azz:	double
Ayy:	double
E:	double
v:	double
webdir:	1x3 vector
distribLoad:	1x3 vector
Nodes:	nnodesx1 vector
Elements:	nelex1 vector
Kff:	freeDOFxfreeDOF matrix
Kfn:	freeDOFxknownDOF matrix
Knf:	knownDOFxfreeDOF matrix
Knn:	knownDOFxknownDOF matrix
Ksf:	fixedDOFxfreeDOF matrix
Ksn:	fixedDOFxknownDOF matrix

Calls

CreateNodes
CreateElements
ComputeStiffnessSubMatrices

Returns

N/A

RunAnalysis()

Arguments

N/A

Computes/Stores

AFLAG: double
DEFL: nnodesx6 matrix
REACT: nnodesx6 matrix
ELE_FOR: nelex12 matrix
error: freeDOFx1 vector

Calls

CheckKffMatrix
ComputeDisplacementReactions
RecoverElementForces
ComputeError

Returns

AFLAG: double
DEFL: nnodesx6 matrix
REACT: nnodesx6 matrix
ELE_FOR: nelex12 matrix
error: freeDOFx1 vector

GetMastan2Returns()

Arguments

N/A

Computes/Stores

N/A

Returns

AFLAG: double
DEFL: nnodesx6 matrix
REACT: nnodesx6 matrix
ELE_FOR: nelex12 matrix
error: double

CreateNodes()

Arguments

N/A

Computes/Stores

Nodes: nnodesx1 vector

Calls

Node Class Constructor

Returns

Nodes: nnodesx1 vector

CreateElements()

Arguments

N/A

Computes/Stores

Elements: nelex1 vector

Calls

Element Class Constructor

Returns

Elements: nelex1 vector

RecoverElementForces()

Arguments

N/A

Computes/Stores

ELE_FOR: nelex12 matrix

Calls

ComputeForces

Returns

ELE_FOR: nelex12 matrix

ClassifyDOF()

Arguments

N/A

Computes/Stores

Local-
fixityTrans: 6xnnodes matrix
Global-
freeDOF: freeDOFx1 vector
fixedDOF: fixedDOFx1 vector
knownDOF: knownDOFx1 vector

Calls

N/A

Returns

freeDOF: freeDOFx1 vector
fixedDOF: fixedDOFx1 vector
knownDOF: knownDOFx1 vector

ComputeError()

Arguments

N/A

Computes/Stores

Local-
deltaF: freeDOFx1 vector
deltaN: knownDOFx1 vector
backPf: freeDOFx1 vector
realLoads: freeDOFx1 vector
Global-
error: freeDOFx1 vector

Calls

ClassifyDOF
CreateLoadVectors

Returns

error: freeDOFx1 vector

CheckKffMatrix()

Arguments

N/A

Computes/Stores

Local-
kappa: double
lostDigits: double
Global-
AFLAG: double

Calls

N/A

Returns

AFLAG: double

ComputeStiffnessSubMatrices()

Arguments

N/A

Computes/Stores

Local-

K: nnodes*6nnodes*6 matrix

Global-

Kff: freeDOFxfreeDOF matrix

Kfn: freeDOFxknownDOF matrix

Knf: knownDOFxfreeDOF matrix

Knn: knownDOFxknownDOF matrix

Ksf: fixedDOFxfreeDOF matrix

Ksn: fixedDOFxknownDOF matrix

Calls

GetElementDOF

GetGlobalStiffness

ClassifyDOF

Returns

Kff: freeDOFxfreeDOF matrix

Kfn: freeDOFxknownDOF matrix

Knf: knownDOFxfreeDOF matrix

Knn: knownDOFxknownDOF matrix

Ksf: fixedDOFxfreeDOF matrix

Ksn: fixedDOFxknownDOF matrix

ComputeDisplacementReactions()

Arguments

N/A

Computes/Stores

Local-

deltaF: freeDOFx1 vector

Rs: fixedDOFx1 vector

Rn: knownDOFx1 vector

Global-

DEFL: nnodesx6 matrix

REACT: nnodesx6 matrix

Calls

ClassifyDOF

CreateLoadVectors

Returns

DEFL: nnodesx6 matrix

REACT: nnodesx6 matrix

CreateLoadVectors()

Arguments

freeDOF: freeDOFx1 vector

fixedDOF: fixedDOFx1 vector

knownDOF: knownDOFx1 vector

Computes/Stores

Local-

concen_t: 6nnodes matrix

fixityTrans: 6nnodes matrix

Global-

Pf: freeDOFx1 vector

Pn: knownDOFx1 vector

Ps: fixedDOFx1 vector

FeFf: freeDOFx1 vector

FeFn: knownDOFx1 vector

FeFs: fixedDOFx1 vector

deltaN: knownDOFx1 vector

Calls

GetElementDOF

GetFixedEndForcesGlobal

Returns

Pf: freeDOFx1 vector

Pn: knownDOFx1 vector

Ps: fixedDOFx1 vector

FeFf: freeDOFx1 vector

FeFn: knownDOFx1 vector

FeFs: fixedDOFx1 vector

deltaN: knownDOFx1 vector



