pdeplot

Plot solution or mesh for 2-D problem

Syntax

```
pdeplot(model,'XYData',results.NodalSolution)
pdeplot(model,'XYData',results.Temperature,'ColorMap','hot')
pdeplot(model,'XYData',results.VonMisesStress,'Deformation',results.Displacement)
pdeplot(model,'XYData',results.ModeShapes.ux)
pdeplot(model,'XYData',results.ElectricPotential)

pdeplot(model)
pdeplot(mesh)
pdeplot(nodes,elements)

pdeplot(p,e,t)

pdeplot( ___ ,Name,Value)
h = pdeplot( ___ )
```

Description

`pdeplot(model,'XYData',results.NodalSolution)` plots the solution of a `model` at nodal locations as a colored surface plot using the default `'jet'` colormap. example

`pdeplot(model,'XYData',results.Temperature,'ColorMap','hot')` plots the temperature at nodal locations for a 2-D thermal analysis model. This syntax creates a colored surface plot using the `'hot'` colormap. example

`pdeplot(model,'XYData',results.VonMisesStress,'Deformation',results.Displacement)` plots the von Mises stress and shows the deformed shape for a 2-D structural analysis model. example

`pdeplot(model,'XYData',results.ModeShapes.ux)` plots the `x`-component of the modal displacement for a 2-D structural modal analysis model. example

`pdeplot(model,'XYData',results.ElectricPotential)` plots the electric potential at nodal locations for a 2-D electrostatic analysis model. example

`pdeplot(model)` plots the mesh specified in `model`. example

`pdeplot(mesh)` plots the mesh defined as a `Mesh` property of a 2-D `model` object of type `PDEModel`. example

`pdeplot(nodes,elements)` plots the mesh defined by its `nodes` and `elements`. example

`pdeplot(p,e,t)` plots the mesh described by `p`,`e`, and `t`. example

`pdeplot( ___ ,Name,Value)` plots the mesh, the data at the nodal locations, or both the mesh and the data, depending on the `Name,Value` pair arguments. Use any arguments from the previous syntaxes. example

Specify at least one of the `FlowData` (vector field plot), `XYData` (colored surface plot), or `ZData` (3-D height plot) name-value pairs. Otherwise, `pdeplot` plots the mesh with no data. You can combine any number of plot types.

- For a thermal model, you can plot temperature or gradient of temperature.
- For a structural model, you can plot displacement, stress, strain, and von Mises stress. In addition, you can show the deformed shape and specify the scaling factor for the deformation plot.

`h = pdeplot( ___ )` returns a handle to a plot, using any of the previous syntaxes. example

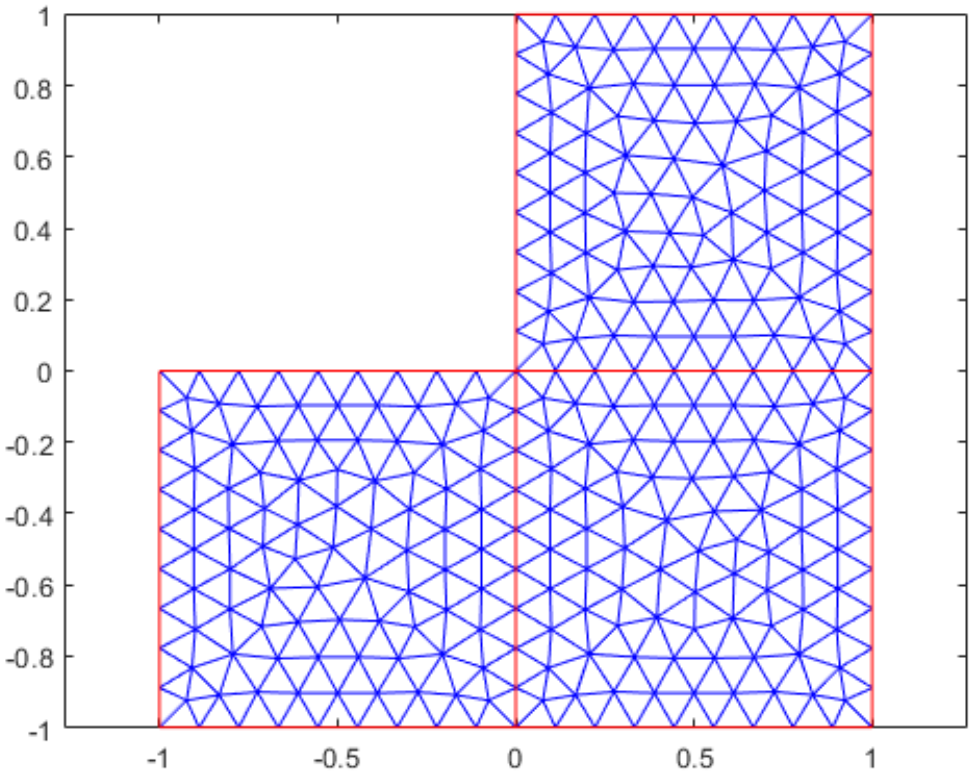
Examples

collapse all

2-D Mesh Plot

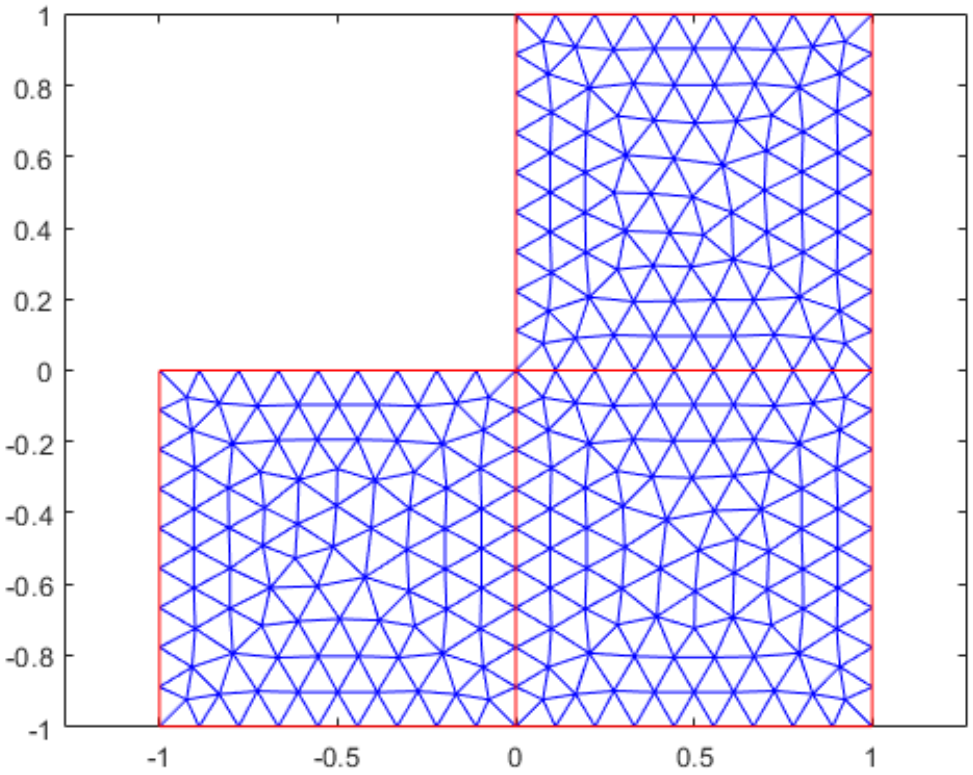
Create a PDE model. Include the geometry of the built-in function `lshapeg`. Mesh the geometry and plot it. Open Live Script

```
model = createpde;
geometryFromEdges(model,@lshapeg);
mesh = generateMesh(model);
pdeplot(model)
```



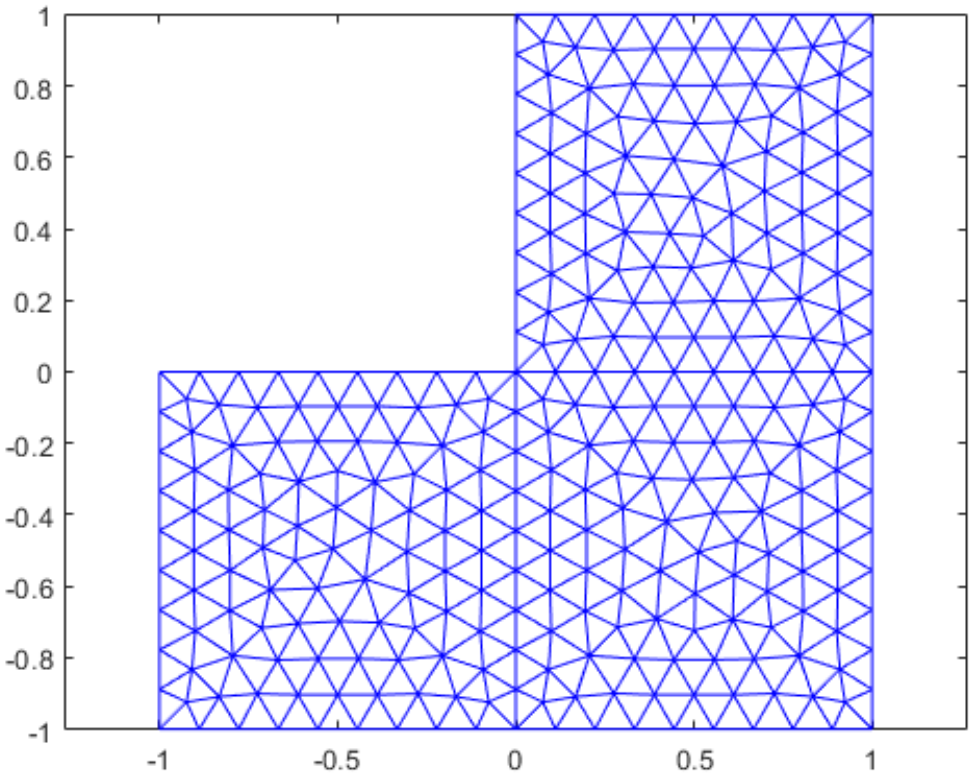
Alternatively, you can plot a mesh by using `mesh` as an input argument.

```
pdeplot(mesh)
```



Another approach is to use the nodes and elements of the mesh as input arguments for `pdeplot`.

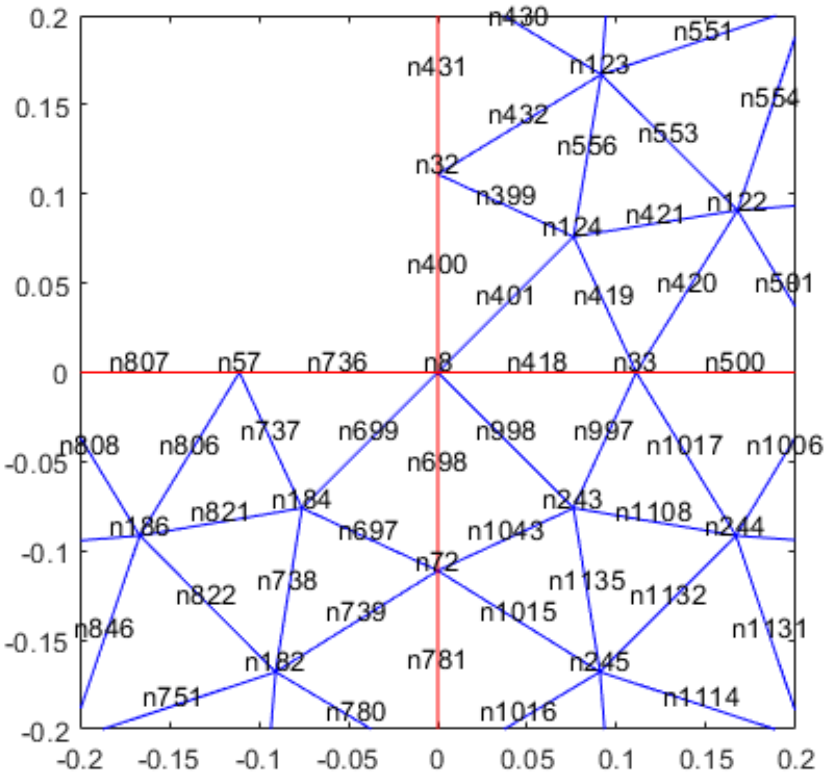
```
pdeplot(mesh.Nodes,mesh.Elements)
```



Display the node labels. Use `xlim` and `ylim` to zoom in on particular nodes.

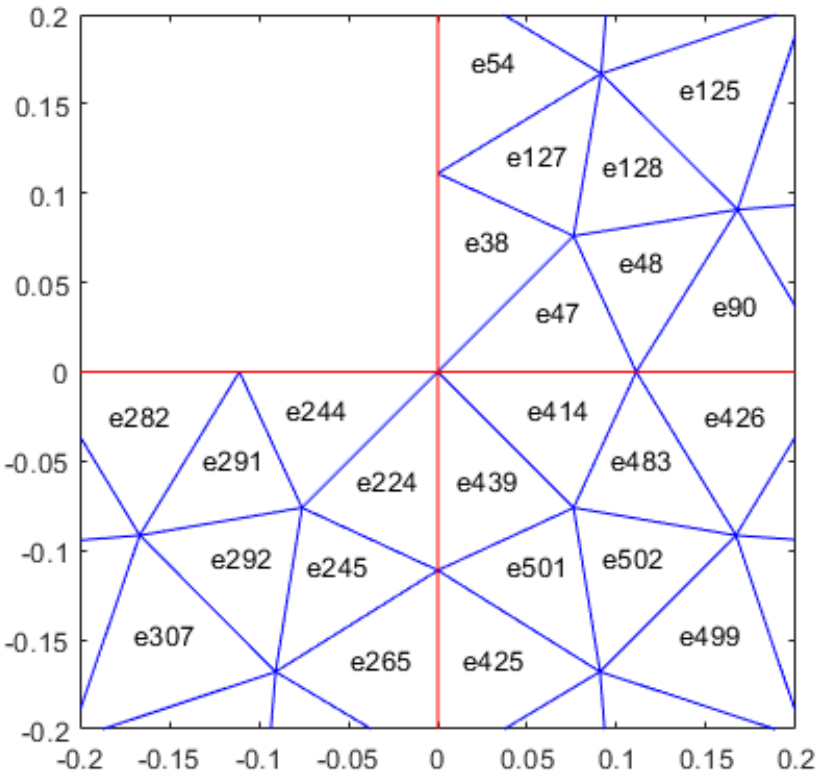
```
pdeplot(model,'NodeLabels','on')
xlim([-0.2,0.2])
```

```
ylim([-0.2,0.2])
```



Display the element labels.

```
pdeplot(model,'ElementLabels','on')
xlim([-0.2,0.2])
ylim([-0.2,0.2])
```



Solution Plots

Create colored 2-D and 3-D plots of a solution to a PDE model.

Open Live Script

Create a PDE model. Include the geometry of the built-in function `lshapeg`. Mesh the geometry.

```
model = createpde;
geometryFromEdges(model,@lshapeg);
generateMesh(model);
```

Set the zero Dirichlet boundary conditions on all edges.

```
applyBoundaryCondition(model,'dirichlet', ...
                            'Edge',1:model.Geometry.NumEdges, ...
                            'u',0);
```

Specify the coefficients and solve the PDE.

```
specifyCoefficients(model,'m',0, ...
                          'd',0, ...
                          'c',1, ...
                          'a',0, ...
                          'f',1);
results = solvepde(model)
```

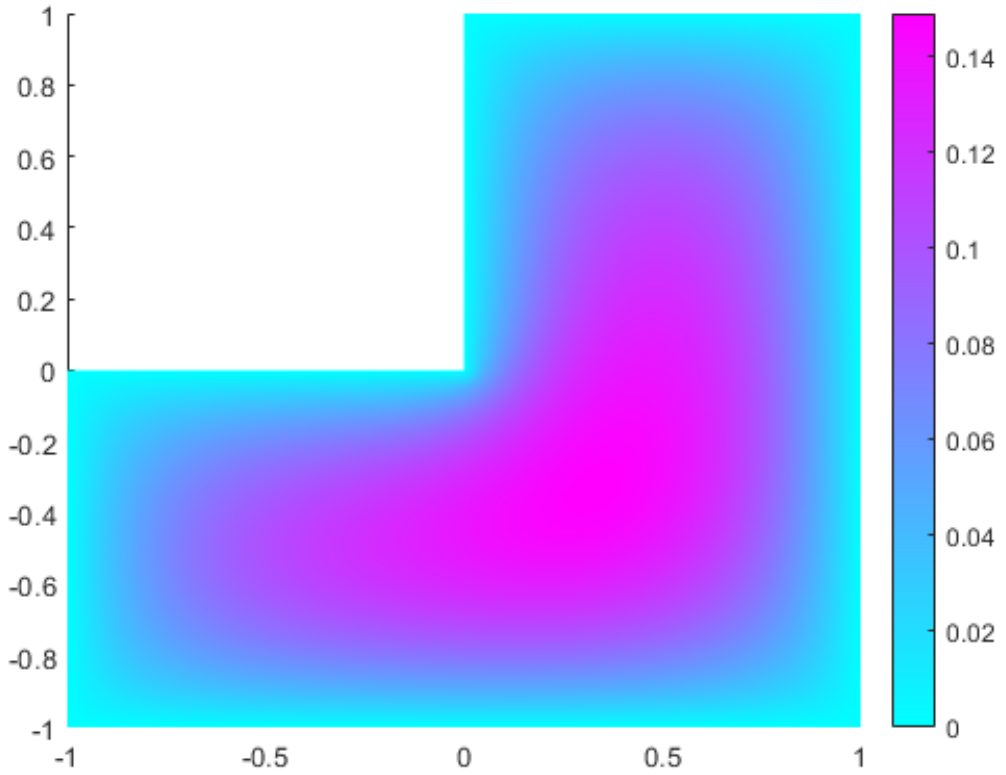
```
results =
  StationaryResults with properties:

    NodalSolution: [1177x1 double]
       XGradients: [1177x1 double]
       YGradients: [1177x1 double]
       ZGradients: []
             Mesh: [1x1 FEMesh]
```

Access the solution at the nodal locations.

```
u = results.NodalSolution;
```

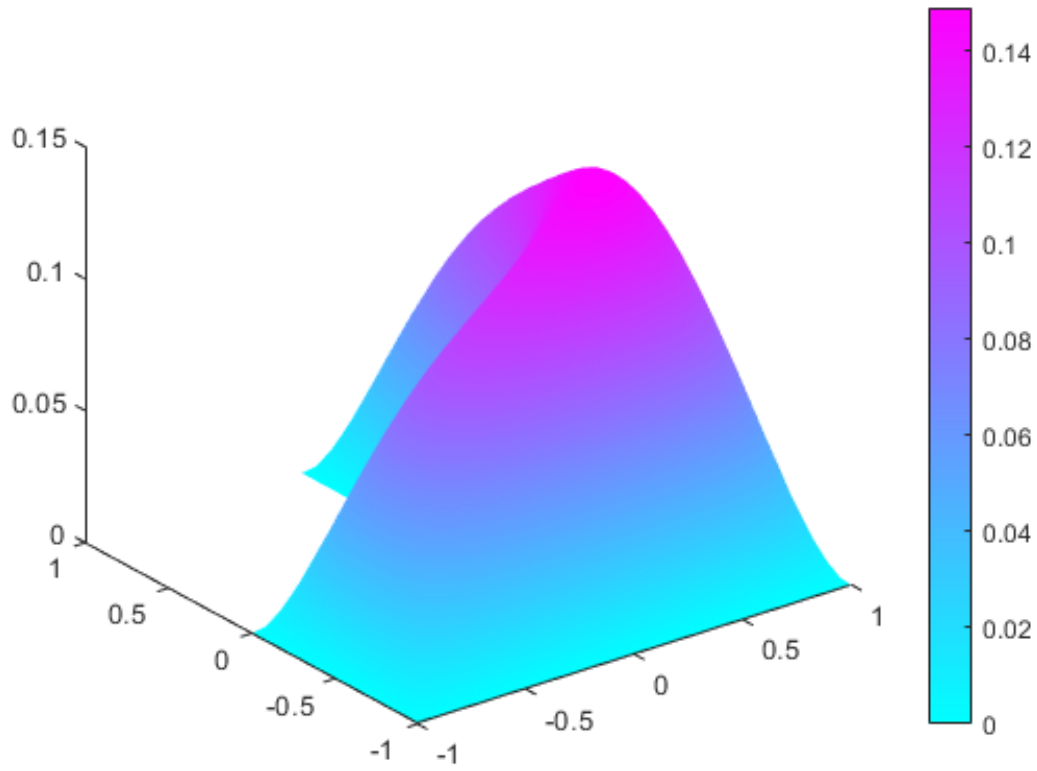
Plot the 2-D solution.

```
pdeplot(model,'XYData',u)
```



Plot the 3-D solution.

```
pdeplot(model,'XYData',u,'ZData',u)
```



Solution Quiver Plot

Plot the gradient of a PDE solution as a quiver plot.

Open Live Script

Create a PDE model. Include the geometry of the built-in function `lshapeg`. Mesh the geometry.

```
model = createpde;
geometryFromEdges(model,@lshapeg);
generateMesh(model);
```

Set the zero Dirichlet boundary conditions on all edges.

```
applyBoundaryCondition(model,'dirichlet', ...
                            'Edge',1:model.Geometry.NumEdges, ...
                            'u',0);
```

Specify coefficients and solve the PDE.

```
specifyCoefficients(model,'m',0, ...
                          'd',0, ...
                          'c',1, ...
                          'a',0, ...
                          'f',1);
results = solvepde(model)
```

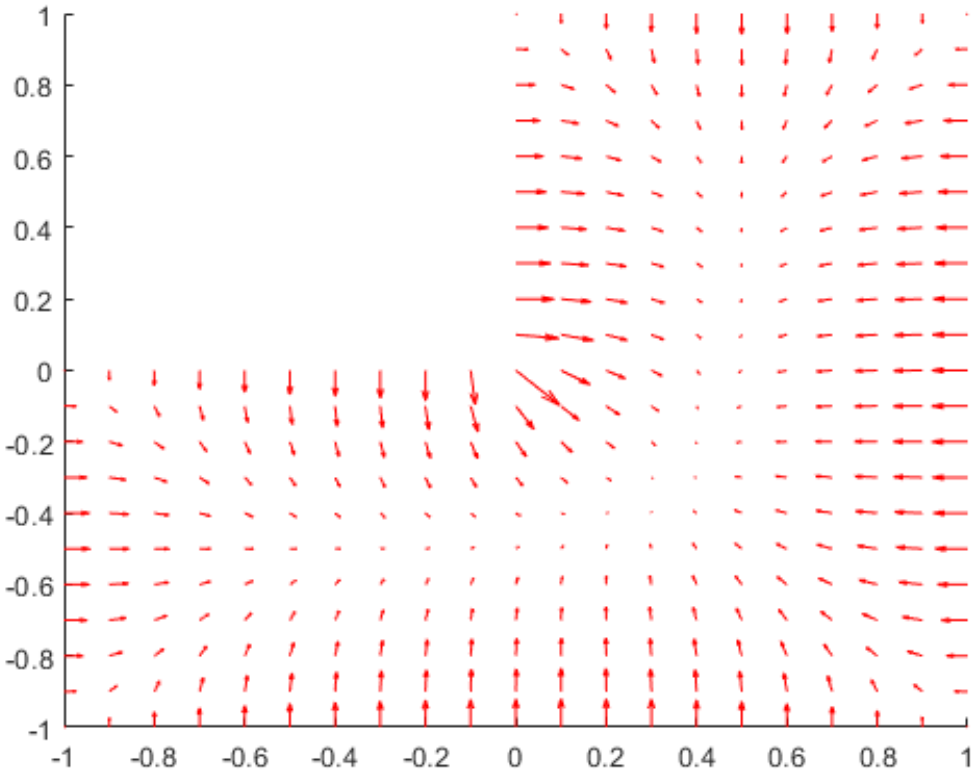
```
results =
  StationaryResults with properties:

    NodalSolution: [1177x1 double]
       XGradients: [1177x1 double]
       YGradients: [1177x1 double]
       ZGradients: []
             Mesh: [1x1 FEMesh]
```

Access the gradient of the solution at the nodal locations.

```
ux = results.XGradients;
uy = results.YGradients;
```

Plot the gradient as a quiver plot.

```
pdeplot(model,'FlowData',[ux,uy])
```



Composite Plot

Plot the solution of a 2-D PDE in 3-D with the `'jet'` coloring and a mesh, and include a quiver plot. Get handles to the axes objects.

Open Live Script

Create a PDE model. Include the geometry of the built-in function `lshapeg`. Mesh the geometry.

```
model = createpde;
geometryFromEdges(model,@lshapeg);
generateMesh(model);
```

Set zero Dirichlet boundary conditions on all edges.

```
applyBoundaryCondition(model,'dirichlet', ...
                            'Edge',1:model.Geometry.NumEdges, ...
                            'u',0);
```

Specify coefficients and solve the PDE.

```
specifyCoefficients(model,'m',0, ...
                          'd',0, ...
                          'c',1, ...
                          'a',0, ...
                          'f',1);
results = solvepde(model)
```

```
results =
  StationaryResults with properties:
```

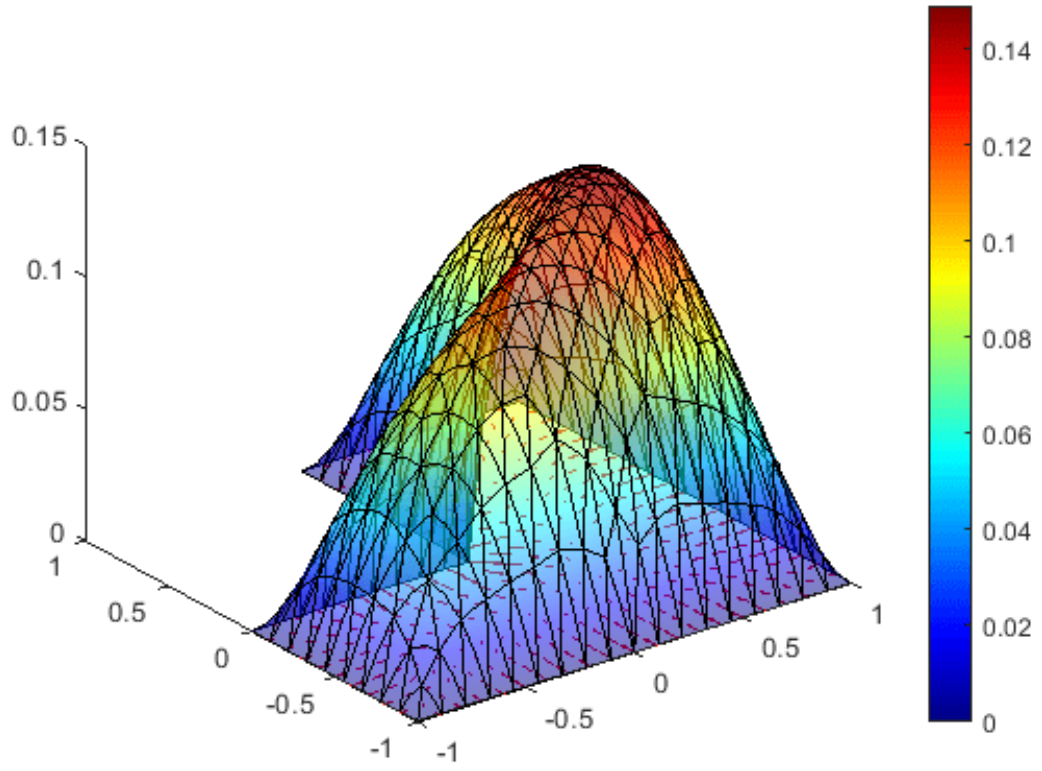
```
    NodalSolution: [1177x1 double]
       XGradients: [1177x1 double]
       YGradients: [1177x1 double]
       ZGradients: []
             Mesh: [1x1 FEMesh]
```

Access the solution and its gradient at the nodal locations.

```
u = results.NodalSolution;
ux = results.XGradients;
uy = results.YGradients;
```

Plot the solution in 3-D with the `'jet'` coloring and a mesh, and include the gradient as a quiver plot.

```
h = pdeplot(model,'XYData',u,'ZData',u, ...
                  'FaceAlpha',0.5, ...
                  'FlowData',[ux,uy], ...
                  'ColorMap','jet', ...
                  'Mesh','on')
```




```
h =
  3x1 graphics array:

  Patch
  Quiver
  ColorBar
```

Solution to Transient Thermal Model

Solve a 2-D transient thermal problem.

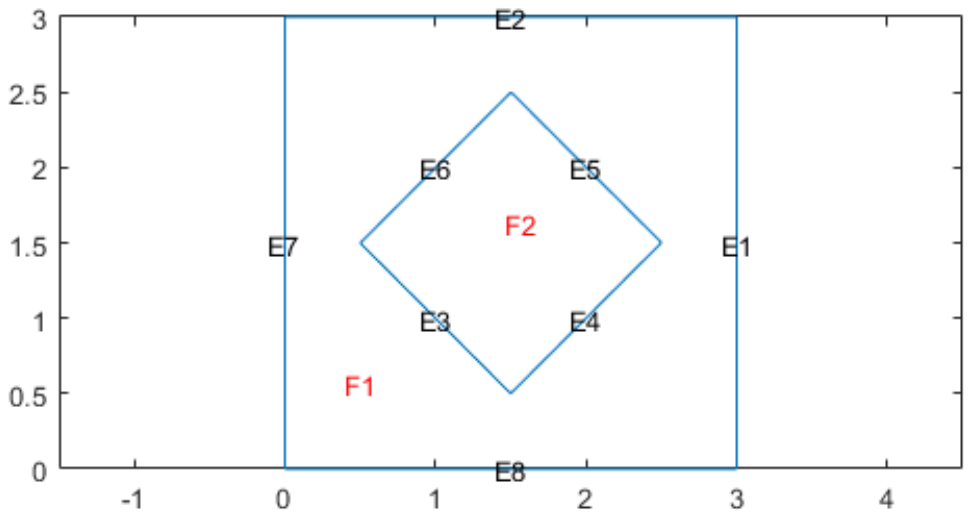
Open Live Script

Create a transient thermal model for this problem.

```
thermalmodel = createpde('thermal','transient');
```

Create the geometry and include it in the model.

```
SQ1 = [3; 4; 0; 3; 3; 0; 0; 0; 3; 3];
D1 = [2; 4; 0.5; 1.5; 2.5; 1.5; 1.5; 0.5; 1.5; 2.5];
gd = [SQ1 D1];
sf = 'SQ1+D1';
ns = char('SQ1','D1');
ns = ns';
dl = decsg(gd,sf,ns);
geometryFromEdges(thermalmodel,dl);
pdegplot(thermalmodel,'EdgeLabels','on','FaceLabels','on')
xlim([-1.5 4.5])
ylim([-0.5 3.5])
axis equal
```



For the square region, assign these thermal properties:

- Thermal conductivity is $10\,\mathrm{W/(m\cdot^{\circ}C)}$
- Mass density is $2\,\mathrm{kg/m^3}$
- Specific heat is $0.1\,\mathrm{J/(kg\cdot^{\circ}C)}$

```
thermalProperties(thermalmodel,'ThermalConductivity',10, ...
                               'MassDensity',2, ...
                               'SpecificHeat',0.1, ...
                               'Face',1);
```

For the diamond region, assign these thermal properties:

- Thermal conductivity is $2\,\mathrm{W/(m\cdot°C)}$
- Mass density is $1\,\mathrm{kg/m^3}$
- Specific heat is $0.1\,\mathrm{J/(kg\cdot°C)}$

```
thermalProperties(thermalmodel,'ThermalConductivity',2, ...
                               'MassDensity',1, ...
                               'SpecificHeat',0.1, ...
                               'Face',2);
```

Assume that the diamond-shaped region is a heat source with a density of $4\,\mathrm{W/m^2}$.

```
internalHeatSource(thermalmodel,4,'Face',2);
```

Apply a constant temperature of $0°C$ to the sides of the square plate.

```
thermalBC(thermalmodel,'Temperature',0,'Edge',[1 2 7 8]);
```

Set the initial temperature to 0 °C.

```
thermalIC(thermalmodel,0);
```

Generate the mesh.

```
generateMesh(thermalmodel);
```

The dynamics for this problem are very fast. The temperature reaches a steady state in about 0.1 seconds. To capture the interesting part of the dynamics, set the solution time to `logspace(-2,-1,10)`. This command returns 10 logarithmically spaced solution times between 0.01 and 0.1.

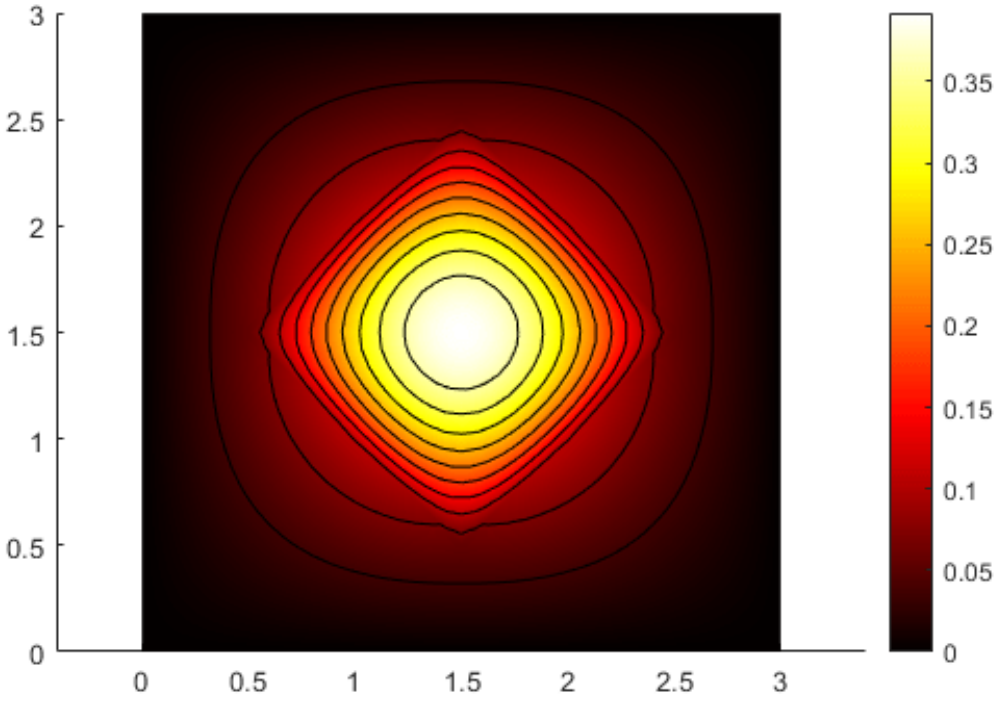
```
tlist = logspace(-2,-1,10);
```

Solve the equation.

```
thermalresults = solve(thermalmodel,tlist);
```

Plot the solution with isothermal lines by using a contour plot.

```
T = thermalresults.Temperature;
pdeplot(thermalmodel,'XYData',T(:,10),'Contour','on','ColorMap','hot')
```



Plot Deformed Shape for Static Plane-Strain Problem

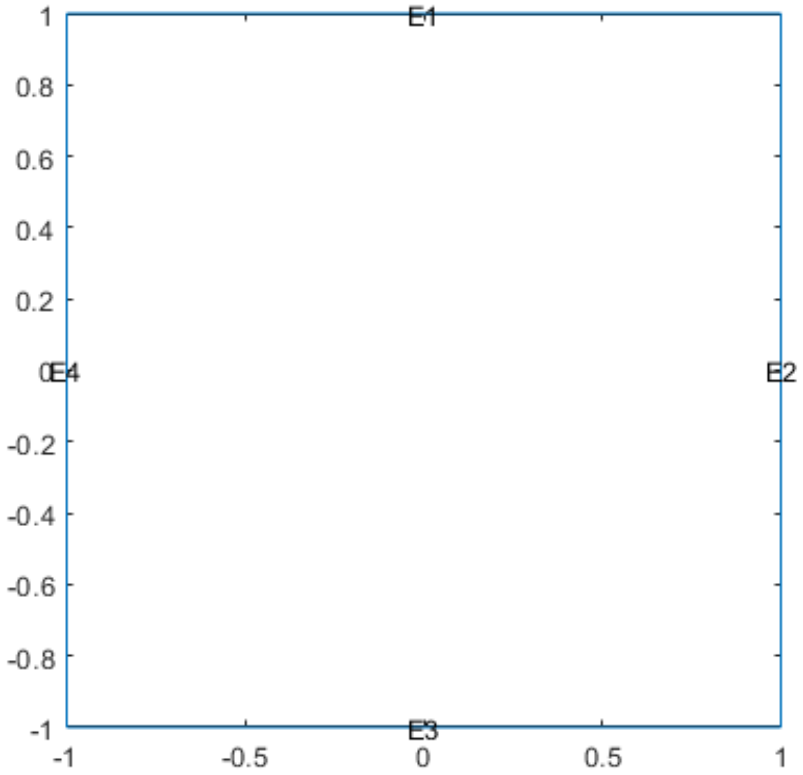
Create a structural analysis model for a static plane-strain problem.

Open Live Script

```
structuralmodel = createpde('structural','static-planestrain');
```

Create the geometry and include it in the model. Plot the geometry.

```
geometryFromEdges(structuralmodel,@squareg);
pdegplot(structuralmodel,'EdgeLabels','on')
axis equal
```



Specify the Young's modulus and Poisson's ratio.

```
structuralProperties(structuralmodel,'PoissonsRatio',0.3, ...
                                     'YoungsModulus',210E3);
```

Specify the *x*-component of the enforced displacement for edge 1.

```
structuralBC(structuralmodel,'XDisplacement',0.001,'Edge',1);
```

Specify that edge 3 is a fixed boundary.

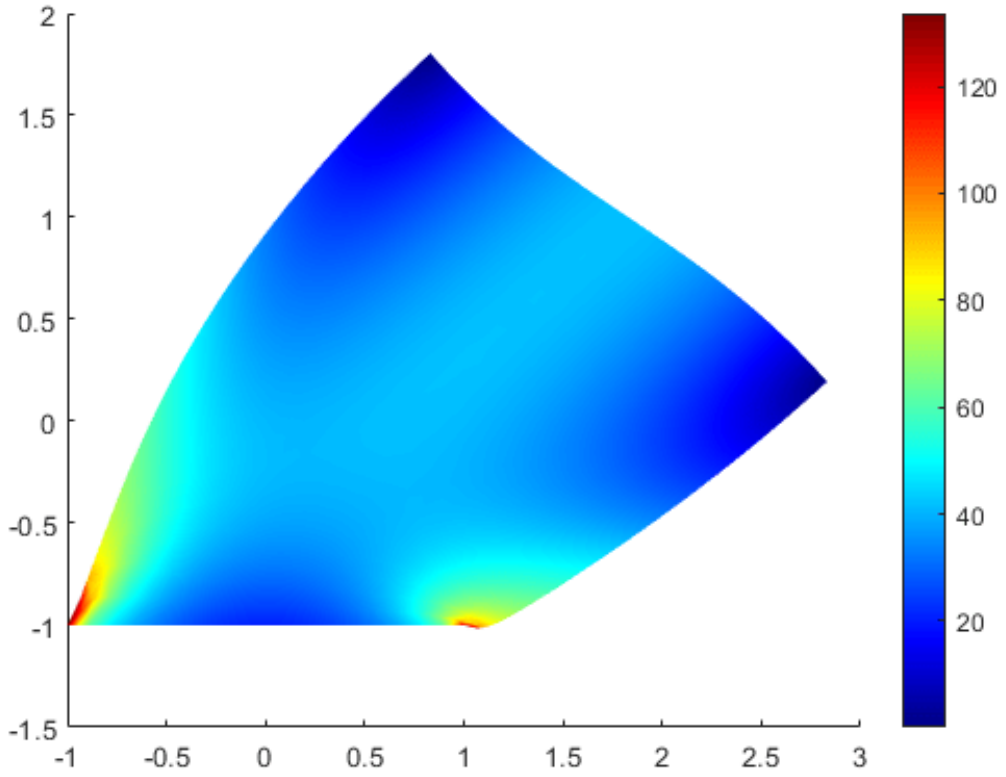
```
structuralBC(structuralmodel,'Constraint','fixed','Edge',3);
```

Generate a mesh and solve the problem.

```
generateMesh(structuralmodel);
structuralresults = solve(structuralmodel);
```

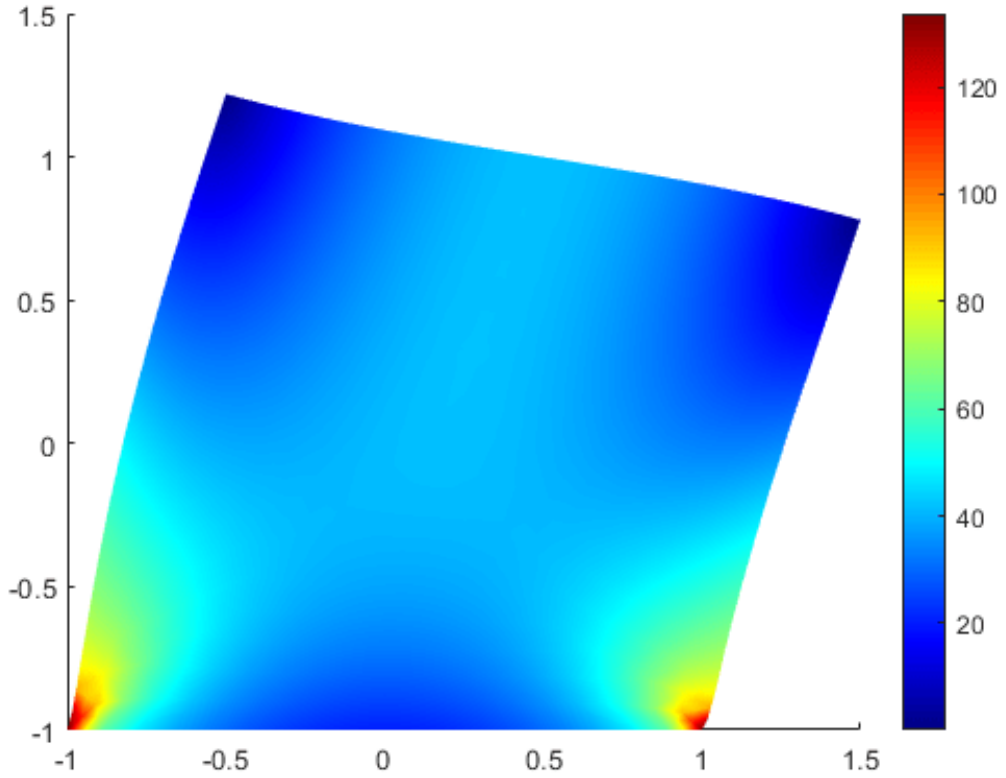
Plot the deformed shape using the default scale factor. By default, `pdeplot` internally determines the scale factor based on the dimensions of the geometry and the magnitude of deformation.

```
pdeplot(structuralmodel, ...
        'XYData',structuralresults.VonMisesStress, ...
        'Deformation',structuralresults.Displacement, ...
        'ColorMap','jet')
```



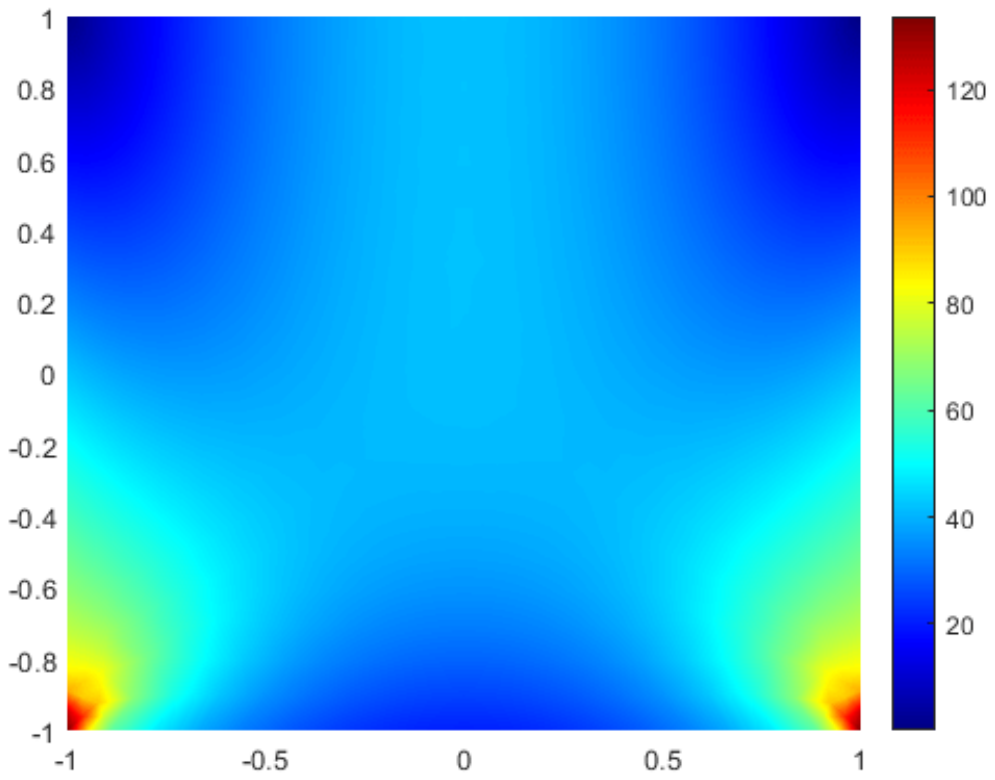
Plot the deformed shape with the scale factor 500.

```
pdeplot(structuralmodel, ...
        'XYData',structuralresults.VonMisesStress, ...
        'Deformation',structuralresults.Displacement, ...
        'DeformationScaleFactor',500,...
        'ColorMap','jet')
```



Plot the deformed shape without scaling.

```
pdeplot(structuralmodel,'XYData',structuralresults.VonMisesStress, ...
                        'ColorMap','jet')
```



Solution to Modal Analysis Structural Model

Find the fundamental (lowest) mode of a 2-D cantilevered beam, assuming prevalence of the plane-stress condition.

Open Live Script

Specify the following geometric and structural properties of the beam, along with a unit plane-stress thickness.

```
length = 5;
height = 0.1;
E = 3E7;
nu = 0.3;
rho = 0.3/386;
```

Create a model plane-stress model, assign a geometry, and generate a mesh.

```
structuralmodel = createpde('structural','modal-planestress');
gdm = [3;4;0;length;length;0;0;0;height;height];
g = decsg(gdm,'S1',('S1')');
geometryFromEdges(structuralmodel,g);
```

Define a maximum element size (five elements through the beam thickness).

```
hmax = height/5;
msh=generateMesh(structuralmodel,'Hmax',hmax);
```

Specify the structural properties and boundary constraints.

```
structuralProperties(structuralmodel,'YoungsModulus',E, ...
                                     'MassDensity',rho, ...
                                     'PoissonsRatio',nu);
structuralBC(structuralmodel,'Edge',4,'Constraint','fixed');
```

Compute the analytical fundamental frequency (Hz) using the beam theory.

```
I = height^3/12;
analyticalOmega1 = 3.516*sqrt(E*I/(length^4*(rho*height)))/(2*pi)
```

```
analyticalOmega1 = 126.9498
```

Specify a frequency range that includes an analytically computed frequency and solve the model.

```
modalresults = solve(structuralmodel,'FrequencyRange',[0,1e6])
```

```
modalresults =
  ModalStructuralResults with properties:

    NaturalFrequencies: [32x1 double]
            ModeShapes: [1x1 FEStruct]
                  Mesh: [1x1 FEMesh]
```

The solver finds natural frequencies and modal displacement values at nodal locations. To access these values, use `modalresults.NaturalFrequencies` and `modalresults.ModeShapes`.

```
modalresults.NaturalFrequencies/(2*pi)
```

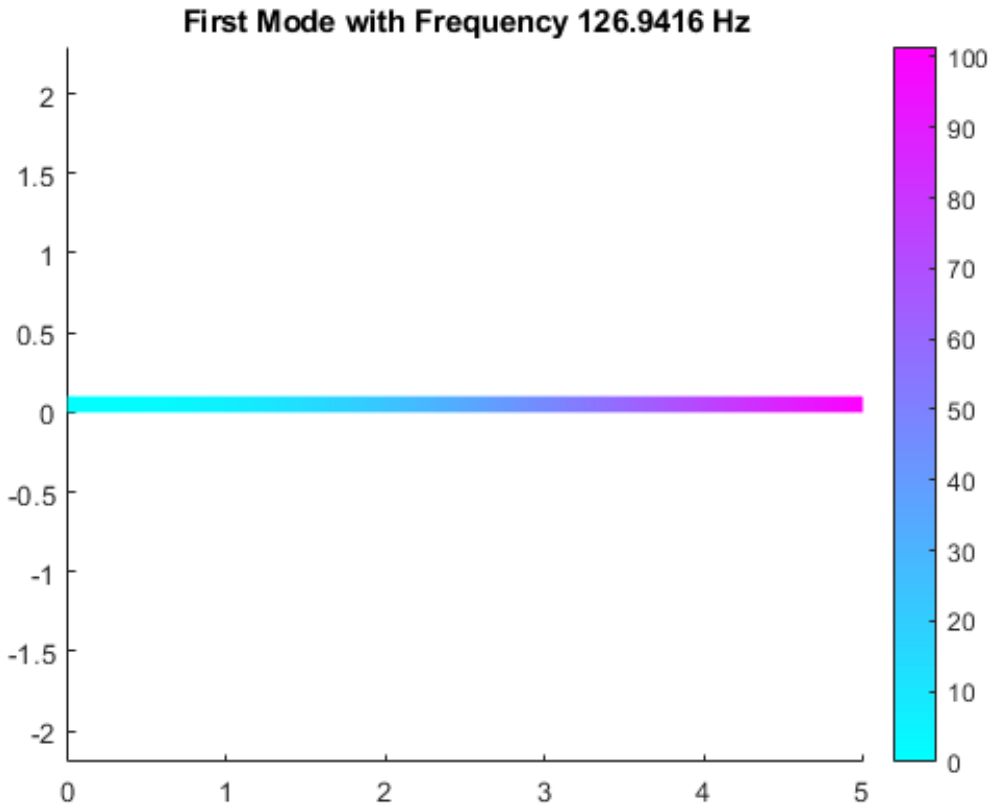
```
ans = 32×1
10^5 ×

    0.0013
    0.0079
    0.0222
    0.0433
    0.0711
    0.0983
    0.1055
    0.1462
    0.1930
    0.2455
      ⋮
```

```
modalresults.ModeShapes
```

```
ans =
  FEStruct with properties:

           ux: [6511x32 double]
           uy: [6511x32 double]
    Magnitude: [6511x32 double]
```

Plot the *y*-component of the solution for the fundamental frequency.

```
pdeplot(structuralmodel,'XYData',modalresults.ModeShapes.uy(:,1))
title(['First Mode with Frequency ', ...
        num2str(modalresults.NaturalFrequencies(1)/(2*pi)),' Hz'])
axis equal
```



Solution to 2-D Electrostatic Analysis Model

Solve an electromagnetic problem and find the electric potential and field distribution for a 2-D geometry representing a plate with a hole.

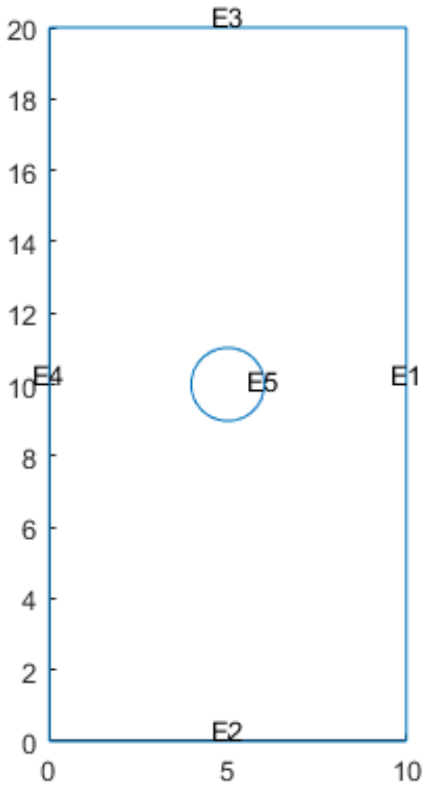
Open Live Script

Create an electromagnetic model for electrostatic analysis.

```
emagmodel = createpde('electromagnetic','electrostatic');
```

Import and plot the geometry representing a plate with a hole.

```
importGeometry(emagmodel,'PlateHolePlanar.stl');
pdegplot(emagmodel,'EdgeLabels','on')
```



Specify the vacuum permittivity in the SI system of units.

```
emagmodel.VacuumPermittivity = 8.8541878128E-12;
```

Specify the relative permittivity of the material.

```
electromagneticProperties(emagmodel,'RelativePermittivity',1);
```

Apply the voltage boundary conditions on the edges framing the rectangle and the circle.

```
electromagneticBC(emagmodel,'Voltage',0,'Edge',1:4);
electromagneticBC(emagmodel,'Voltage',1000,'Edge',5);
```

Specify the charge density for the entire geometry.

```
electromagneticSource(emagmodel,'ChargeDensity',5E-9);
```

Generate the mesh.

```
generateMesh(emagmodel);
```

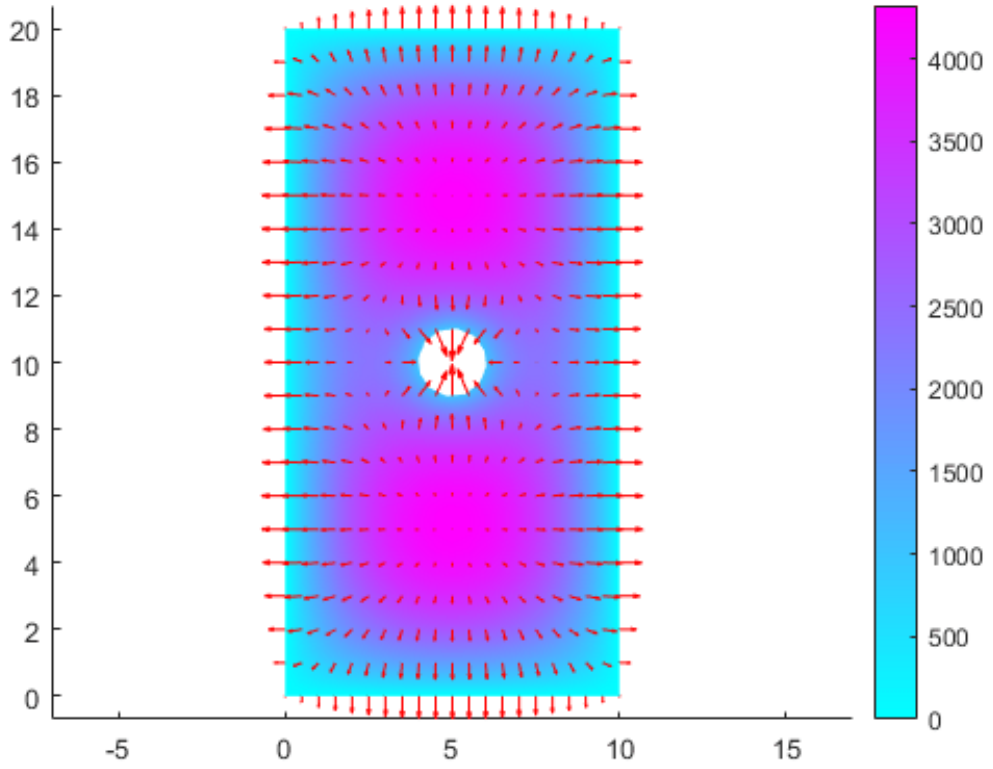
Solve the model.

```
R = solve(emagmodel)
```

```
R =
  ElectrostaticResults with properties:

      ElectricPotential: [1218x1 double]
          ElectricField: [1x1 FEStruct]
    ElectricFluxDensity: [1x1 FEStruct]
                   Mesh: [1x1 FEMesh]
```

Plot the electric potential and field.

```
pdeplot(emagmodel,'XYData',R.ElectricPotential, ...
                  'FlowData',[R.ElectricField.Ex ...
                              R.ElectricField.Ey])
axis equal
```



[p,e,t] Mesh and Solution Plots

Plot the `p,e,t` mesh. Display the solution using 2-D and 3-D colored plots.

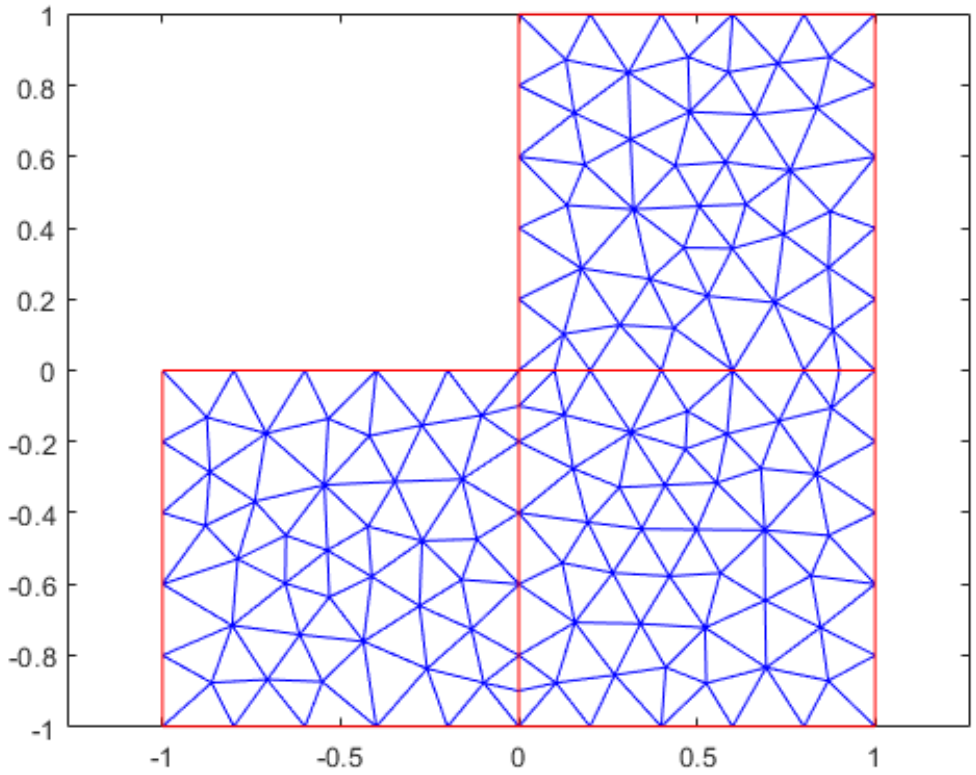
Open Live Script

Create the geometry, mesh, boundary conditions, PDE coefficients, and solution.

```
[p,e,t] = initmesh('lshapeg');
u = assempde('lshapeb',p,e,t,1,0,1);
```

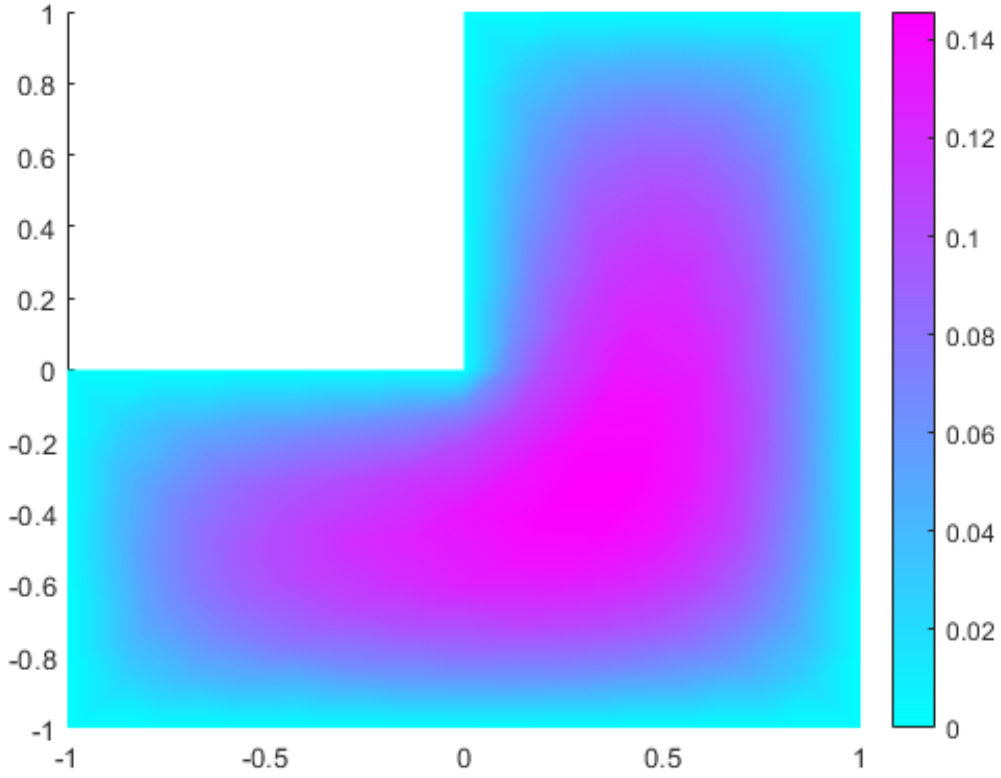
Plot the mesh.

```
pdeplot(p,e,t)
```



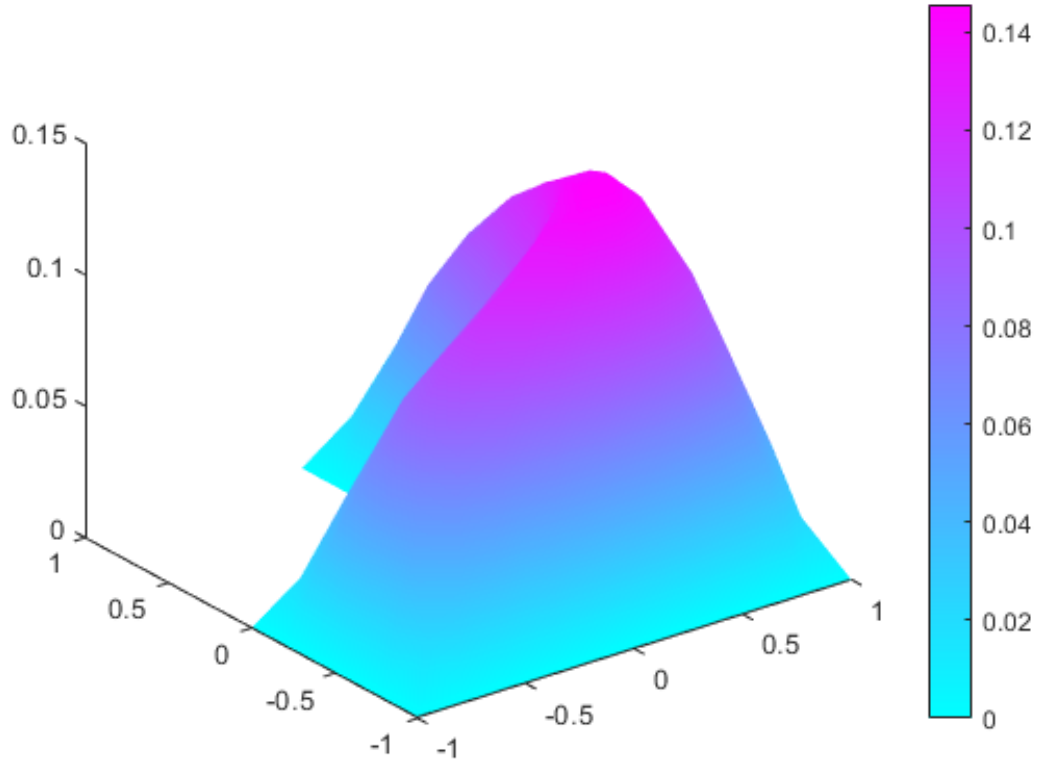
Plot the solution as a 2-D colored plot.

```
pdeplot(p,e,t,'XYData',u)
```



Plot the solution as a 3-D colored plot.

```
pdeplot(p,e,t,'XYData',u,'ZData',u)
```



Input Arguments

collapse all

`model` — Model object

`PDEModel` object | `ThermalModel` object | `StructuralModel` object | `ElectromagneticModel` object

Model object, specified as a `PDEModel` object, `ThermalModel` object, `StructuralModel` object, or `ElectromagneticModel` object.

Example: `model = createpde(1)`

Example: `thermalmodel = createpde('thermal','steadystate')`

Example: `structuralmodel = createpde('structural','static-solid')`

Example: `emagmodel = createpde('electromagnetic','magnetostatic')`

`mesh` — Mesh object

`Mesh` property of a `PDEModel` object | output of `generateMesh`

Mesh object, specified as the `Mesh` property of a `PDEModel` object or as the output of `generateMesh`.

Example: `model.Mesh`

`nodes` — Nodal coordinates

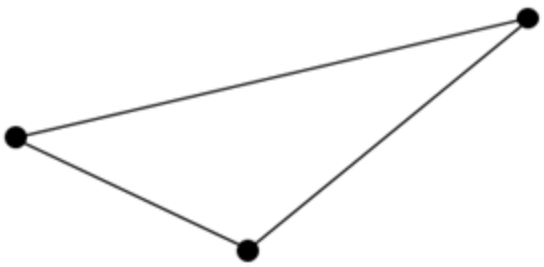
2-by-*NumNodes* matrix

Nodal coordinates, specified as a 2-by-*NumNodes* matrix. *NumNodes* is the number of nodes.

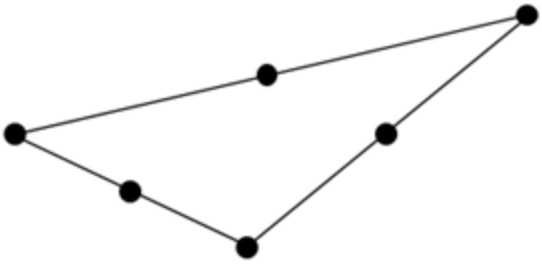
`elements` — Element connectivity matrix in terms of node IDs

3-by-*NumElements* matrix | 6-by-*NumElements* matrix

Element connectivity matrix in terms of the node IDs, specified as a 3-by-*NumElements* or 6-by-*NumElements* matrix. Linear meshes contain only corner nodes. For linear meshes, the connectivity matrix has three nodes per 2-D element. Quadratic meshes contain corner nodes and nodes in the middle of each edge of an element. For quadratic meshes, the connectivity matrix has six nodes per 2-D element.



2-D linear element



2-D quadratic element

`p` — Mesh points

matrix

Mesh points, specified as a 2-by-`Np` matrix of points, where `Np` is the number of points in the mesh. For a description of the (`p`,`e`,`t`) matrices, see Mesh Data as [p,e,t] Triples.

Typically, you use the `p`, `e`, and `t` data exported from the **PDE Modeler** app, or generated by `initmesh` or `refinemesh`.

Example: `[p,e,t] = initmesh(gd)`

Data Types: `double`

`e` — Mesh edges

matrix

Mesh edges, specified as a `7`-by-`Ne` matrix of edges, where `Ne` is the number of edges in the mesh. For a description of the (`p`,`e`,`t`) matrices, see Mesh Data as [p,e,t] Triples.

Typically, you use the `p`, `e`, and `t` data exported from the **PDE Modeler** app, or generated by `initmesh` or `refinemesh`.

Example: `[p,e,t] = initmesh(gd)`

Data Types: `double`

`t` — Mesh triangles
matrix

Mesh triangles, specified as a `4`-by-`Nt` matrix of triangles, where `Nt` is the number of triangles in the mesh. For a description of the (`p`,`e`,`t`) matrices, see Mesh Data as [p,e,t] Triples.

Typically, you use the `p`, `e`, and `t` data exported from the **PDE Modeler** app, or generated by `initmesh` or `refinemesh`.

Example: `[p,e,t] = initmesh(gd)`

Data Types: `double`

Name-Value Arguments

Specify optional comma-separated pairs of `Name,Value` arguments. `Name` is the argument name and `Value` is the corresponding value. `Name` must appear inside quotes. You can specify several name and value pair arguments in any order as `Name1,Value1,...,NameN,ValueN`.

Example: `pdeplot(model,'XYData',u,'ZData',u)`

When you use a `PDEModel` object, `pdeplot(model,'XYData',u,'ZData',u)` sets surface plot coloring to the solution `u`, and sets the heights for a 3-D plot to `u`. Here `u` is a `NodalSolution` property of the PDE results returned by `solvepde` or `solvepdeeig`.

When you use a `[p,e,t]` representation, `pdeplot(p,e,t,'XYData',u,'ZData',u)` sets surface plot coloring to the solution `u` and sets the heights for a 3-D plot to the solution `u`. Here `u` is a solution returned by a legacy solver, such as `assempde`.

> **Tip**
>
> Specify at least one of the `FlowData` (vector field plot), `XYData` (colored surface plot), or `ZData` (3-D height plot) name-value pairs. Otherwise, `pdeplot` plots the mesh with no data.

Data Plots

collapse all

`XYData` — Colored surface plot data
vector

Colored surface plot data, specified as the comma-separated pair consisting of `'XYData'` and a vector. If you use a `[p,e,t]` representation, specify data for points in a vector of length `size(p,2)`, or specify data for triangles in a vector of length `size(t,2)`.

- Typically, you set `XYData` to the solution `u`. The `pdeplot` function uses `XYData` for coloring both 2-D and 3-D plots.
- `pdeplot` uses the colormap specified in the `ColorMap` name-value pair, using the style specified in the `XYStyle` name-value pair.
- When the `Contour` name-value pair is `'on'`, `pdeplot` also plots level curves of `XYData`.
- `pdeplot` plots the real part of complex data.

To plot the kth component of a solution to a PDE system, extract the relevant part of the solution. For example, when using a `PDEModel` object, specify:

```
results = solvepde(model);
u = results.NodalSolution; % each column of u has one component of u
pdeplot(model,'XYData',u(:,k)) % data for column k
```

When using a `[p,e,t]` representation, specify:

```
np = size(p,2); % number of node points
uk = reshape(u,np,[]); % each uk column has one component of u
pdeplot(p,e,t,'XYData',uk(:,k)) % data for column k
```

Example: `'XYData',u`

Data Types: `double`

`XYStyle` — Coloring choice

`'interp'` (default) | `'off'` | `'flat'`

Coloring choice, specified as the comma-separated pair consisting of `'XYStyle'` and `'interp'`, `'off'`, or `'flat'`.

- `'off'` — No shading, only mesh is displayed.
- `'flat'` — Each triangle in the mesh has a uniform color.
- `'interp'` — Plot coloring is smoothly interpolated.

The coloring choice relates to the `XYData` name-value pair.

Example: `'XYStyle','flat'`

Data Types: `char` | `string`

`ZData` — Data for 3-D plot heights

matrix

Data for the 3-D plot heights, specified as the comma-separated pair consisting of `'ZData'` and a matrix. If you use a `[p,e,t]` representation, provide data for points in a vector of length `size(p,2)` or data for triangles in a vector of length `size(t,2)`.

- Typically, you set `ZData` to `u`, the solution. The `XYData` name-value pair sets the coloring of the 3-D plot.
- The `ZStyle` name-value pair specifies whether the plot is continuous or discontinuous.
- `pdeplot` plots the real part of complex data.

To plot the kth component of a solution to a PDE system, extract the relevant part of the solution. For example, when using a `PDEModel` object, specify:

```
results = solvepde(model);
u = results.NodalSolution; % each column of u has one component of u
pdeplot(model,'XYData',u(:,k),'ZData',u(:,k)) % data for column k
```

When using a `[p,e,t]` representation, specify:

```
np = size(p,2); % number of node points
uk = reshape(u,np,[]); % each uk column has one component of u
pdeplot(p,e,t,'XYData',uk(:,k),'ZData',uk(:,k)) % data for column k
```

Example: `'ZData',u`

Data Types: `double`

`ZStyle` — 3-D plot style

`'continuous'` (default) | `'off'` | `'discontinuous'`

3-D plot style, specified as the comma-separated pair consisting of `'ZStyle'` and one of these values:

- `'off'` — No 3-D plot.
- `'discontinuous'` — Each triangle in the mesh has a uniform height in a 3-D plot.
- `'continuous'` — 3-D surface plot is continuous.

If you use `ZStyle` without specifying the `ZData` name-value pair, then `pdeplot` ignores `ZStyle`.

Example: `'ZStyle','discontinuous'`

Data Types: `char` | `string`

`FlowData` — Data for quiver plot

matrix

Data for the quiver plot, specified as the comma-separated pair consisting of `'FlowData'` and an `M`-by-`2` matrix, where `M` is the number of mesh nodes. `FlowData` contains the x and y values of the field at the mesh points.

When you use a `PDEModel` object, set `FlowData` as follows:

```
results = solvepde(model);
gradx = results.XGradients;
grady = results.YGradients;
pdeplot(model,'FlowData',[gradx grady])
```

When you use a `[p,e,t]` representation, set `FlowData` as follows:

```
[gradx,grady] = pdegrad(p,t,u); % Calculate gradient
pdeplot(p,e,t,'FlowData',[gradx;grady])
```

When you use `ZData` to represent a 2-D PDE solution as a 3-D plot and you also include a quiver plot, the quiver plot appears in the $z = 0$ plane.

`pdeplot` plots the real part of complex data.

Example: `'FlowData',[ux uy]`

Data Types: `double`

`FlowStyle` — Indicator to show quiver plot

`'arrow'` (default) | `'off'`

Indicator to show the quiver plot, specified as the comma-separated pair consisting of `'FlowStyle'` and `'arrow'` or `'off'`. Here, `'arrow'` displays the quiver plot specified by the `FlowData` name-value pair.

Example: `'FlowStyle','off'`

Data Types: `char` | `string`

`XYGrid` — Indicator to convert mesh data to x-y grid

`'off'` (default) | `'on'`

Indicator to convert the mesh data to x-y grid before plotting, specified as the comma-separated pair consisting of `'XYGrid'` and `'off'` or `'on'`.

> **Note**
>
> This conversion can change the geometry and lessen the quality of the plot.

By default, the grid has about `sqrt(size(t,2))` elements in each direction.

Example: `'XYGrid','on'`

Data Types: `char` | `string`

`GridParam` — Customized x-y grid

`[tn;a2;a3]` from an earlier call to `tri2grid`

Customized x-y grid, specified as the comma-separated pair consisting of `'GridParam'` and a matrix `[tn;a2;a3]`. For example:

```
[~,tn,a2,a3] = tri2grid(p,t,u,x,y);
pdeplot(p,e,t,'XYGrid','on','GridParam',[tn;a2;a3],'XYData',u)
```

For details on the grid data and its `x` and `y` arguments, see `tri2grid`. The `tri2grid` function does not work with `PDEModel` objects.

Example: `'GridParam',[tn;a2;a3]`

Data Types: `double`

Mesh Plots

collapse all

`NodeLabels` — Node labels

`'off'` (default) | `'on'`

Node labels, specified as the comma-separated pair consisting of `'NodeLabels'` and `'off'` or `'on'`.

`pdeplot` ignores `NodeLabels` when you use it with `ZData`.

Example: `'NodeLabels','on'`

Data Types: `char` | `string`

`ElementLabels` — Element labels

`'off'` (default) | `'on'`

Element labels, specified as the comma-separated pair consisting of `'ElementLabels'` and `'off'` or `'on'`.

`pdeplot` ignores `ElementLabels` when you use it with `ZData`.

Example: `'ElementLabels','on'`

Data Types: `char` | `string`

Structural Analysis Plots

collapse all

`Deformation` — Data for plotting deformed shape

`Displacement` property of `StaticStructuralResults` object

Data for plotting the deformed shape for a structural analysis model, specified as the comma-separated pair consisting of `'Deformation'` and the `Displacement` property of the `StaticStructuralResults` object.

In an undeformed shape, center nodes in quadratic meshes are always added at half-distance between corners. When you plot a deformed shape, the center nodes might move away from the edge centers.

Example: `'Deformation',structuralresults.Displacement`

`DeformationScaleFactor` — Scaling factor for plotting deformed shape

real number

Scaling factor for plotting the deformed shape, specified as the comma-separated pair consisting of `'DeformationScaleFactor'` and a real number. Use this argument with the `Deformation` name-value pair. The default value is defined internally, based on the dimensions of the geometry and the magnitude of the deformation.

Example: `'DeformationScaleFactor',100`

Data Types: `double`

Annotations and Appearance

collapse all

`ColorBar` — Indicator to include color bar

`'on'` (default) | `'off'`

Indicator to include a color bar, specified as the comma-separated pair consisting of `'ColorBar'` and `'on'` or `'off'`. Specify `'on'` to display a bar giving the numeric values of colors in the plot. For details, see `colorbar`. The `pdeplot` function uses the colormap specified in the `ColorMap` name-value pair.

Example: `'ColorBar','off'`

Data Types: `char` | `string`

`ColorMap` — Colormap

`'cool'` (default) | `ColorMap` value or matrix of such values

Colormap, specified as the comma-separated pair consisting of `'ColorMap'` and a value representing a built-in colormap, or a colormap matrix. For details, see `colormap`.

`ColorMap` must be used with the `XYData` name-value pair.

Example: `'ColorMap','jet'`

Data Types: `double` | `char` | `string`

`Mesh` — Indicator to show mesh

`'off'` (default) | `'on'`

Indicator to show the mesh, specified as the comma-separated pair consisting of `'Mesh'` and `'on'` or `'off'`. Specify `'on'` to show the mesh in the plot.

Example: `'Mesh','on'`

Data Types: `char` | `string`

`Title` — Title of plot

character vector

Title of plot, specified as the comma-separated pair consisting of `'Title'` and a character vector.

Example: `'Title','Solution Plot'`

Data Types: `char` | `string`

`FaceAlpha` — Surface transparency for 3-D geometry

`1` (default) | real number from `0` through `1`

Surface transparency for 3-D geometry, specified as the comma-separated pair consisting of `'FaceAlpha'` and a real number from `0` through `1`. The default value `1` indicates no transparency. The value `0` indicates complete transparency.

Example: `'FaceAlpha',0.5`

Data Types: `double`

`Contour` — Indicator to plot level curves

`'off'` (default) | `'on'`

Indicator to plot level curves, specified as the comma-separated pair consisting of `'Contour'` and `'off'` or `'on'`. Specify `'on'` to plot level curves for the `XYData` data. Specify the levels with the `Levels` name-value pair.

Example: `'Contour','on'`

Data Types: `char` | `string`

`Levels` — Levels for contour plot

`10` (default) | positive integer | vector of level values

Levels for contour plot, specified as the comma-separated pair consisting of `'Levels'` and a positive integer or a vector of level values.

- Positive integer — Plot `Levels` as equally spaced contours.
- Vector — Plot contours at the values in `Levels`.

To obtain a contour plot, set the `Contour` name-value pair to `'on'`.

Example: `'Levels',16`

Data Types: `double`

Output Arguments

collapse all

`h` — Handles to graphics objects

vector

Handles to graphics objects, returned as a vector.

More About

collapse all

Quiver Plot

A *quiver plot* is a plot of a vector field. It is also called a *flow plot*.

Arrows show the direction of the field, with the lengths of the arrows showing the relative sizes of the field strength. For details on quiver plots, see `quiver`.

See Also

`pdegplot` | `pdemesh` | `pdeplot3D` | `PDEModel`

Topics

Solution and Gradient Plots with pdeplot and pdeplot3D

Deflection of Piezoelectric Actuator

Mesh Data

Solve Problems Using PDEModel Objects

Introduced before R2006a