

ZoomPlot

MATLAB Code for Interactive Magnification of Customized Regions

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Syntax

```
zp = BaseZoom()  
zp = BaseZoom(ax)  
zp = BaseZoom(ax, subAxesPosition, zoomAreaPosition)  
zp = BaseZoom(ax, zoomAreaPosition)
```

Description

The `BaseZoom` class provides interactive, customizable magnification of local regions in MATLAB figures and images by allowing users to select a subsection for zoomed display in a child axes.

```
zp = BaseZoom()
```

It creates an instance of the `BaseZoom` class that enables interactive magnification of a region within the current axes in a MATLAB figure window. The user can interact with the region to zoom and examine parts of the plot in detail.

```
zp = BaseZoom(ax)
```

It creates an instance of the `BaseZoom` class for interactive magnification, but specifically for the axes object `ax`. This allows the user to specify which axes to apply the zoom functionality to if there are multiple axes present in the figure.

```
zp = BaseZoom(ax, subAxesPosition, zoomAreaPosition)
```

It initializes a `BaseZoom` instance on the axes `ax` (type: `matlab.graphics.axis.Axes`), with `subAxesPosition` (type: [left bottom width height] vector) indicating the absolute position and size of the zoomed subplot within the figure window, and `zoomAreaPosition` (type: [x y width height] vector) defining the absolute rectangular area

of the image within the axes to be zoomed in pixel coordinates.

```
zp = BaseZoom(ax, zoomAreaPosition)
```

It creates an instance of the BaseZoom class for the axes object `ax` (type: `matlab.graphics.axis.Axes`), enabling zooming into a specified region of an image. The `zoomAreaPosition` parameter (type: `[x y width height]` vector) defines the rectangular zoom area in pixel coordinates, where `x` and `y` represent the pixel coordinates for the lower left corner of the rectangle, and `width` and `height` represent the rectangle's dimensions in pixels. This is used when you want to set a specific zoom region in an image without altering the magnified sub-axes display position.

Files

- `BaseZoom.m`: This is the core code file that contains the main functionality for the zoom feature.
- `parameters.json`: This file serves as the configuration file for plotting parameters, allowing customization of the visual appearance of the ZoomPlot.

Requirements

- Version 1.5 is only compatible with MATLAB release R2018b and later versions.
- The Image Processing Toolbox must be installed.

Preparations

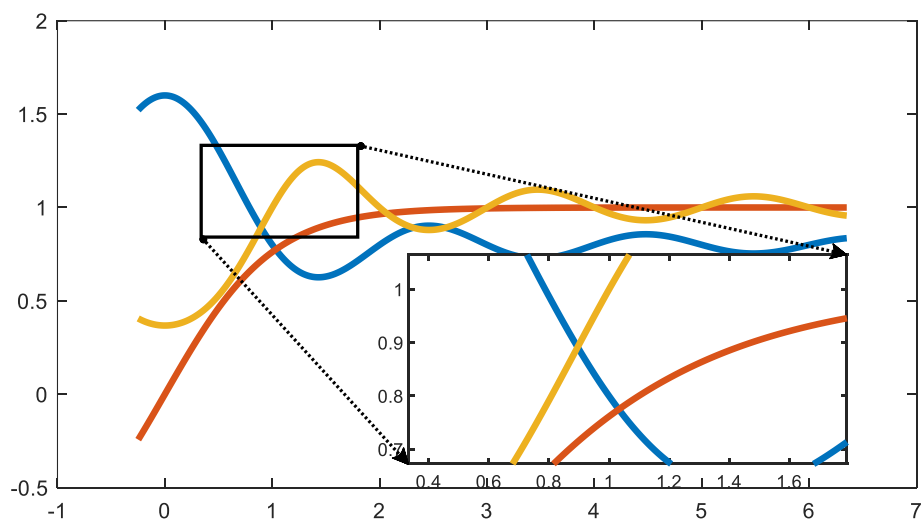
Add `BaseZoom.m` and `parameters.json` to MATLAB's search path or to the working directory where the plotting code resides.

Examples

Interactive Local Magnification for Figure Class

Create a zoomable area within the current axes interactively:

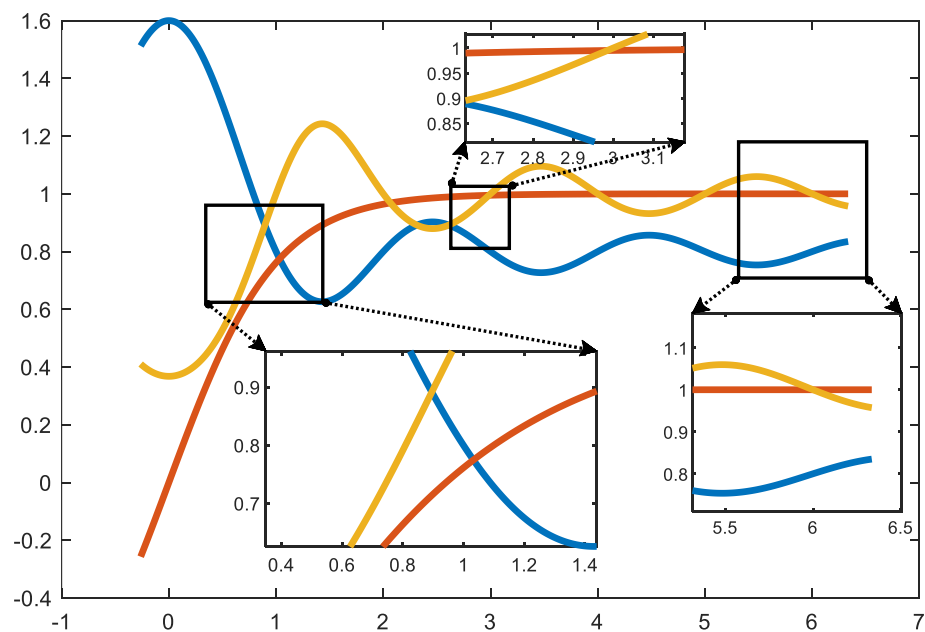
```
x = linspace(-0.1*pi,2*pi, 1000)+rand(1)*0.2;
y = cell(1, 3);
y{1, 1} = 0.8*sinc(x)+0.8;
y{1, 2} = tanh(x);
y{1, 3} = exp(-sinc(x));
figure
hold on
for i = 1:3
    plot(x, y{1, i}, 'LineWidth', 3)
end
box on
zp = BaseZoom();
zp.run;
```



Implement Multiple Local Magnifications for Figure Class

Set up multiple zoomable areas within the same figure:

```
x = linspace(-0.1*pi,2*pi, 1000)+rand(1)*0.2;
y = cell(1, 3);
y{1, 1} = 0.8*sinc(x)+0.8;
y{1, 2} = tanh(x);
y{1, 3} = exp(-sinc(x));
figure
hold on
for i = 1:3
    plot(x, y{1, i}, 'LineWidth', 3)
end
box on
zp = BaseZoom();
zp.run;
zp.run;
zp.run;
```



Specify Axes for Local Magnification for Figure Class

Define a zoomable area within a specific set of axes:

```
x = linspace(-0.1*pi,2*pi, 1000)+rand(1)*0.2;
y = cell(1, 3);
```

```

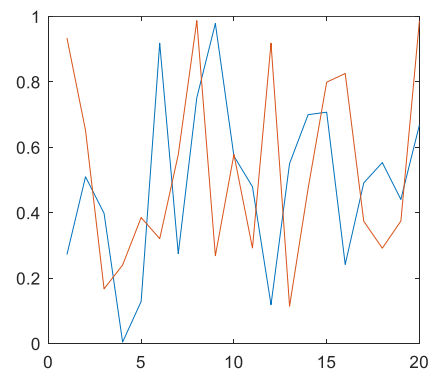
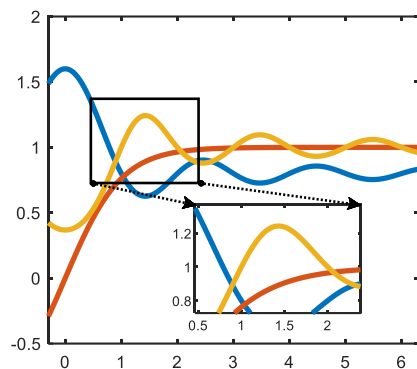
y{1, 1} = 0.8*sinc(x)+0.8;
y{1, 2} = tanh(x);
y{1, 3} = exp(-sinc(x));
figure

% axes 1
subplot(1, 2, 1)
hold on
for i = 1:3
    plot(x, y{1, i}, 'LineWidth', 3)
end
box on;
set(gca, 'LineWidth', 1.2, 'TickDir', 'in', 'YScale', 'linear');
ax_1 = gca;

% axes 2
subplot(1, 2, 2)
plot(rand(20,2))
ax_2 = gca;

zp = BaseZoom(ax_1);
zp.run;

```



Manually Set SubAxes and Zoom Area for Figure Class

Create a zoomable area within a specific axes object and define both the subplot display and the zoom region manually:

```

x = linspace(-0.1*pi, 2*pi, 1000) + rand(1)*0.2;
y = cell(1, 3);
y{1, 1} = 0.8*sinc(x)+0.8;
y{1, 2} = tanh(x);

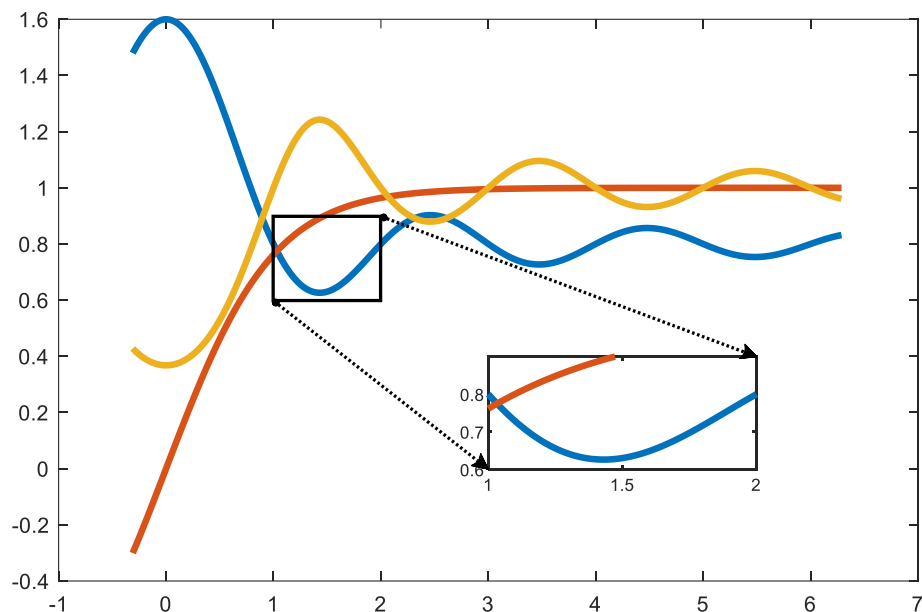
```

```

y{1, 3} = exp(-sinc(x));
figure
hold on
for i = 1:3
    plot(x, y{1, i}, 'LineWidth', 3)
end
box on;

% zoom plot
subAxesPosition = [3, 0, 2.5, 0.4];
zoomAreaPosition = [1, 0.6, 1, 0.3];
zp = BaseZoom(subAxesPosition, zoomAreaPosition);
zp.run;

```



Manually ZoomPlot in Sub Plots for Figure Class

Set up a zoomable area within specified sub plots by manually defining the display parameters and zoom region:

```

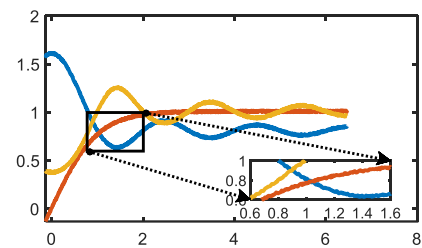
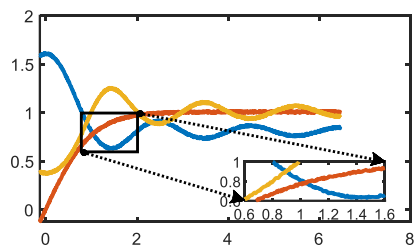
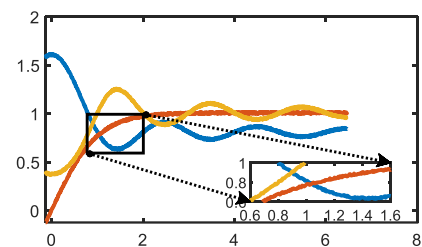
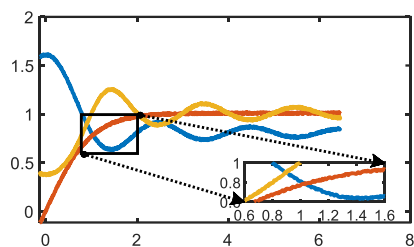
x = linspace(-0.1*pi, 2*pi, 1000) + rand(1)*0.2;
y = cell(1, 3);
y{1, 1} = 0.8*sinc(x) + 0.8;
y{1, 2} = tanh(x);
y{1, 3} = exp(-sinc(x));
ax = cell(4, 1);
figure
for j = 1:4

```

```

subplot(2, 2, j)
hold on
for i = 1:3
    plot(x, y{1, i}+0.02*rand(1, length(x)), 'LineWidth', 2)
end
box on;
set(gca, 'LineWidth', 1.2, 'TickDir', 'in', 'YScale', 'linear');
ax{j, 1} = gca;
subAxesPosition = [3.5, 0.1, 2.5, 0.4];
zoomAreaPosition = [0.6, 0.6, 1, 0.4];
zp = BaseZoom(ax{j, 1}, subAxesPosition, zoomAreaPosition);
zp.run;
end

```



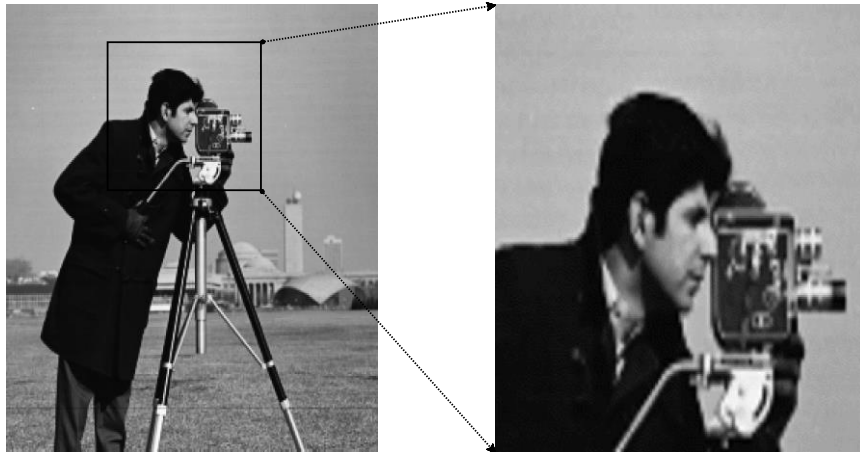
Interactive Local Magnification for Image Class

Initialize an interactive zoomable region within the current image displayed on the axes:

```

[X, cmap] = imread('cameraman.tif');
imshow(X, cmap);
zp = BaseZoom();
zp.run;

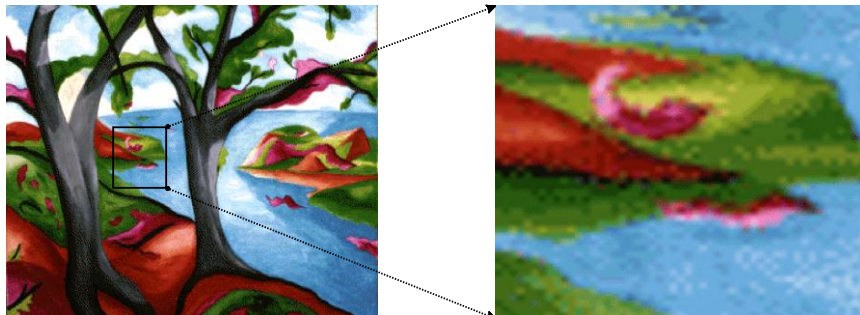
```

Manually Set Zoom Area for Image Class

Configure a specific zoomable region within an image displayed on the axes:

```
[X, cmap] = imread('trees.tif');
imshow(X, cmap);
zoomAreaPosition = [100, 100, 50, 50];
zp = BaseZoom(gca, zoomAreaPosition);
zp.run;
```



Parameter Configuration

The JSON file contains configuration parameters for the ZoomPlot feature, allowing users to customize the theme of ZoomPlot by modifying the default settings.

Sub Axes Theme

The "subAxes" section sets the appearance of the sub-axes, including the background color, line width, grid display, grid transparency and color, border display, tick direction, and more.

```
"subAxes":  
  {  
    "Color": "none",  
    "LineWidth": 1.2,  
    "XGrid": "off",  
    "YGrid": "off",  
    "ZGrid": "off",  
    "GridAlpha": 0.15,  
    "GridColor": [0.15, 0.15, 0.15],  
    "GridLineStyle": "-",  
    "Box": "on",  
    "TickDir": "in",  
    "Comments": "theme of the sub axes"  
  }
```

Zoomed Area Theme

The "zoomedArea" defines the theme for the zoomed area's border color, fill color and style, and border line width.

```
"zoomedArea":  
  {  
    "Color": "k",  
    "FaceColor": "none",  
    "FaceAlpha": 0,  
    "LineStyle": "-",  
    "LineWidth": 1.5,  
    "Comments": "theme of the zoomed area"  
  }
```

Dynamic Rectangle Theme

The "dynamicRect" is used for setting the theme of the dynamic rectangle, including the line color, line width, marker style, size, and edge color.

```

"dynamicRect":
{
  "LineColor": [0, 0.4471, 0.7412],
  "LineWidth": 2,
  "Marker": "s",
  "MarkerSize": 9,
  "FaceColor": [0, 0.4471, 0.7412],
  "FaceAspect": 0.3,
  "EdgeColor": "k",
  "Comments": "theme of the dynamic rectangle"
}

```

Connection Lines Theme

The "connection" includes the style settings for the connecting lines, such as line number, color, width, style, and the arrowhead's style, length, and width. For instance, the number of connection lines can be set to 0, 1, or 2. Setting it to 0 means there will be no connecting lines between the zoomed area and the sub-axes. If set to 1, there will be only one connecting line between them. When set to 2, there will be two connecting lines (which is the default configuration).

```

"connection":
{
  "LineNumber": 2,
  "LineColor": "k",
  "LineWidth": 1.5,
  "LineStyle": ":",
  "StartHeadStyle": "ellipse",
  "StartHeadLength": 3,
  "StartHeadWidth": 3,
  "EndHeadStyle": "cback2",
  "EndHeadLength": 7,
  "EndHeadWidth": 7,
  "Comments": "theme of the connected lines"
}

```