fctools Matlab toolbox, User's Guide*

version 0.0.38

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Abstract

The fctools Matlab toolbox contains some basic tools used in my other toolboxes.

*LaTeX manual, revision 0.0.38, compiled with Matlab 2022a, and toolbox `fc-tools`[0.0.38].

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0 Contents

1 graphics module

1.1 main functions

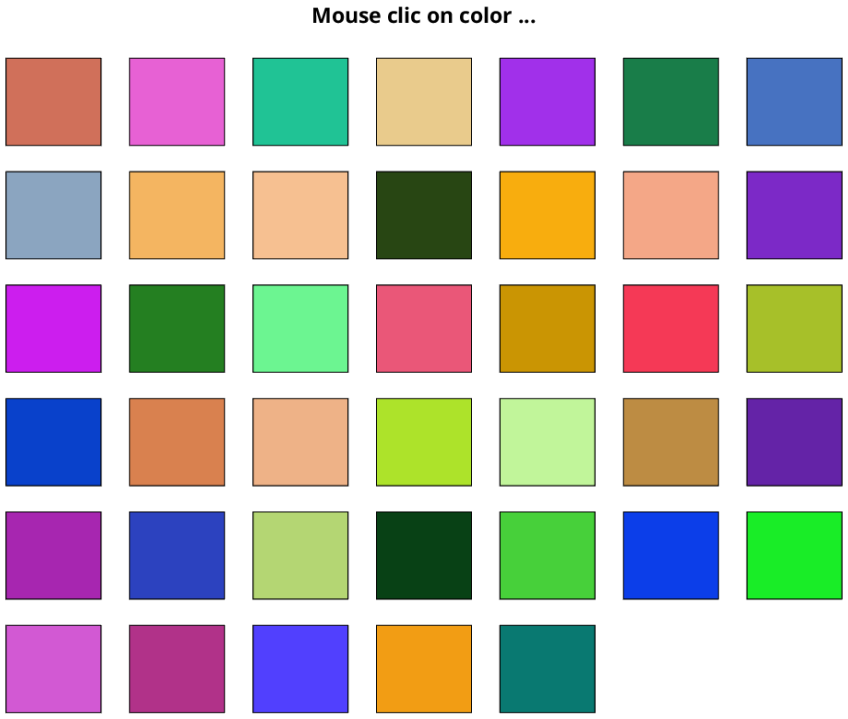
1.1.1 `fc_tools.graphics.display_rgb` function

The `fc_tools.graphics.display_rgb` displays colors of a n-by-3 RGB colors array.

Syntaxe

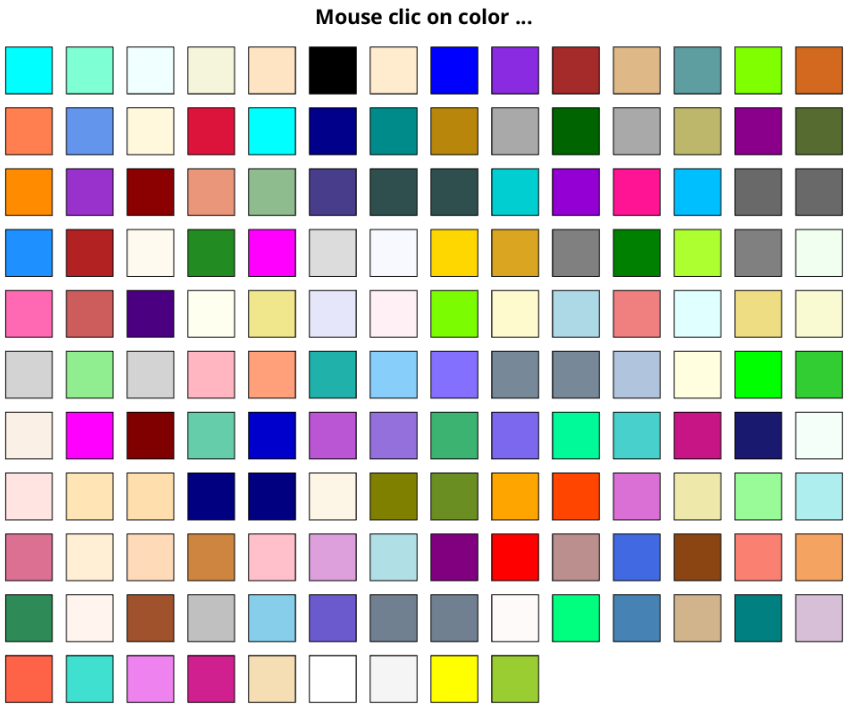
```
fc_tools.graphics.display_rgb(rgb)
fc_tools.graphics.display_rgb(rgb, names)
```

When mouse click on a specific color, its RGB color is printed with its index in the RGB colors array `rgb` and with its name if the second optional input argument `names` is given (1-by-n cell array of text).




```
fc_tools.graphics.display_rgb(rand(40,3))
```

Listing 1: `fc_tools.graphics.display_rgb` function




```
[names,colors]=fc_tools.graphics.xcolor.get_from_theme('svg');
fc_tools.graphics.display_rgb(colors,names)
```

Listing 2: `fc_tools.graphics.display_rgb_svg` function

1.1.2 `fc_tools.graphics.selectColors` function

The `fc_tools.graphics.selectColors` function returns colors that are maximally perceptually distinct without using the Image Processing Toolbox.

This function is inspired by the function `select_colors` (or `distinguishable_colors`) of *Timothy E. Holy* which uses the Image Processing Toolbox of Matlab.

Syntaxe

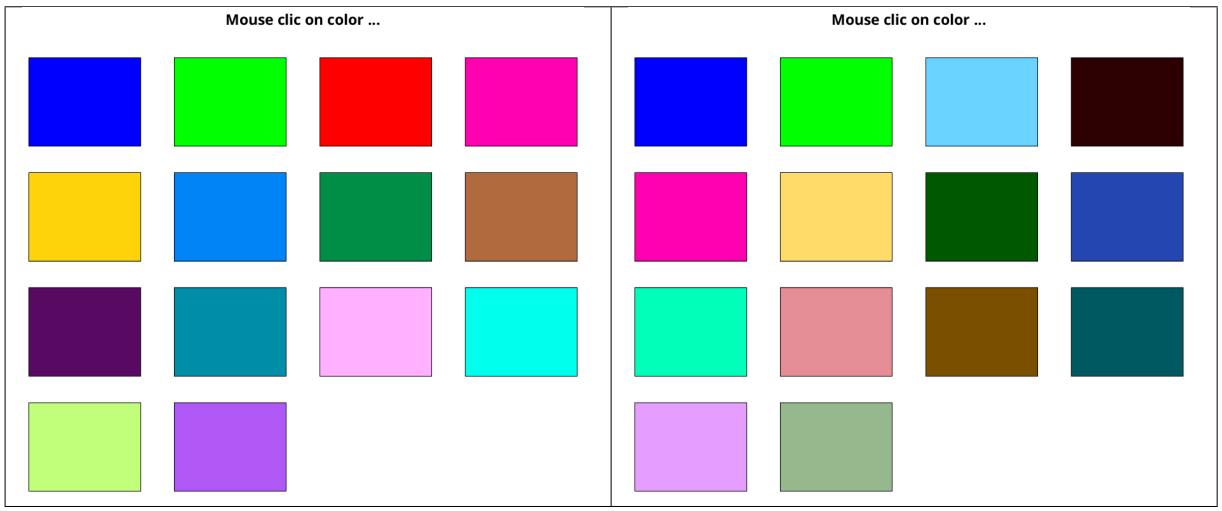
```
colors=fc_tools.graphics.selectColors(N)
colors=fc_tools.graphics.selectColors(N, key, value)
```

Description

`colors=fc_tools.graphics.selectColors(N)` Returns `N` colors that are maximally perceptually distinct as a `N`-by-3 RGB colors array.

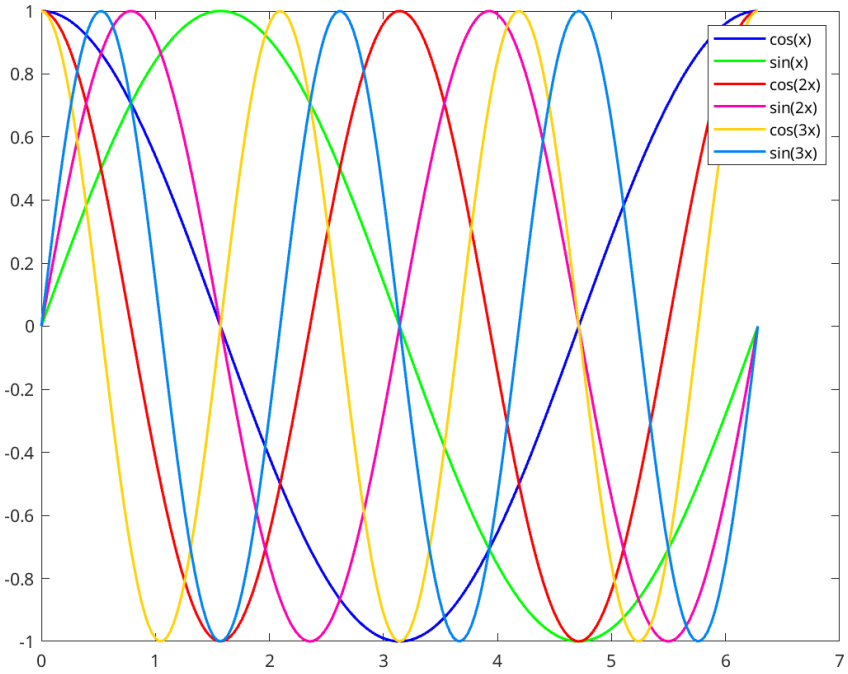
`colors=fc_tools.graphics.selectColors(N, Name, Value)` specifies function options using one or more `Name`,`Value` pair arguments. Options are

- `'background'` : the `N` colors selected will be as far as possible from the colors specified by this options as a n-by-3 RGB colors array. Default is `[1 1 1; 0 0 0]`
- `'func'` : To specify an other function for converting RGB colors to LAB colors. Default is local `RGB2LAB` function.




```
figure(1)
colors1=fc_tools.graphics.selectColors(14);
fc_tools.graphics.display_rgb(colors1)
figure(2)
colors2=fc_tools.graphics.selectColors(14,'background',[1 0 0]);
fc_tools.graphics.display_rgb(colors2)
```

Listing 3: `fc_tools.graphics.xcolor.selectColors` function




```
colors=fc_tools.graphics.selectColors(6);
x=0:pi/100:2*pi;
figure(1)
plot(x,cos(x),'color',colors(1,:),'Linewidth',1.5)
hold on
plot(x,sin(x),'color',colors(2,:),'Linewidth',1.5)
plot(x,cos(2*x),'color',colors(3,:),'Linewidth',1.5)
plot(x,sin(2*x),'color',colors(4,:),'Linewidth',1.5)
plot(x,cos(3*x),'color',colors(5,:),'Linewidth',1.5)
plot(x,sin(3*x),'color',colors(6,:),'Linewidth',1.5)
legend('cos(x)','sin(x)','cos(2x)','sin(2x)','cos(3x)','sin(3x)')
```

Listing 4: `fc_tools.graphics.xcolor.selectColors` function

1.1.3 `fc_tools.graphics.SaveAllFigsAsFiles` function

The `fc_tools.graphics.SaveAllFigsAsFiles` saves all figures as files.

Syntaxe

```
fc_tools.graphics.SaveAllFigsAsFiles(basename)
fc_tools.graphics.SaveAllFigsAsFiles(file, key, value, ...)
```

Description

`fc_tools.graphics.SaveAllFigsAsFiles(basename)` save each figure in the file

`[basename,'_fig',fignumber]`

of the current directory where `fignumber` is the number of the figure to be saved.

`fc_tools.graphics.SaveAllFigsAsFiles(file, key, value, ...)` specifies function options using one or more `Name`,`Value` pair arguments. Options are

- `'format'` : to specify the file format. `Value` could be `'epsc'` (default), `'pdf'`, `'png'` or `'pdflatex'`.
- `'dir'` : to specify the directory (default `'.'`). the directory is created if it does not exist.
- `'verbose'` : if `true`, prints file names. Default is `false`.
- `'tag'` : if `true` each figure is saved in the file:

  `[basename,'_fig',fignumber,'_',software,version]`

  where `software` is Matlab and `version` is its release. Default is `false`.
- `'size'` : to specify size of the image. Default is `[800,600]`.

1.2 xcolor submodule

1.2.1 `fc_tools.graphics.xcolor.get_themes` function

The `fc_tools.graphics.xcolor.get themes` function returns available color themes.

Listing 5: : example using `fc_tools.graphics.xcolor.get_themes` functions

```
themes=fc_tools.graphics.xcolor.get_themes()
```

Output

```
themes =

  1x5 cell array

    {'matlab'}    {'svg'}    {'X11'}    {'fullX11'}    {'wiki'}
```

1.2.2 `fc_tools.graphics.xcolor.val2rgb` function

The `fc_tools.graphics.xcolor.val2rgb` transform name(s) of usual colors (X11, svg, wiki, matlab) color as RGB triplet(s) (values in [0,1]).

Syntaxe

```
color=fc_tools.graphics.xcolor.val2rgb(val)
color=fc_tools.graphics.xcolor.val2rgb(val,'theme',text)
[color,theme]=fc_tools.graphics.xcolor.val2rgb(val)
```

Listing 6: : example using fc_tools.graphics.xcolor.val2rgb functions

```
color=fc_tools.graphics.xcolor.val2rgb('Olive')
[colors,themes]=fc_tools.graphics.xcolor.val2rgb({'Orange','LightGrey','Brown'})
```

Output

```
color =

   0.5000   0.5000        0


colors =

   1.0000   0.6480        0
   0.8280   0.8280   0.8280
   0.6480   0.1650   0.1650


themes =

  1x3 cell array

    {'svg'}    {'svg'}    {'svg'}
```

1.2.3 fc_tools.graphics.xcolor.get_from_theme function

The fc_tools.graphics.xcolor.get_from_theme function returns names and RGB values of an available theme colors.

Listing 7: : example using fc_tools.graphics.xcolor.get_from_theme functions

```
[name,rgb]=fc_tools.graphics.xcolor.get_from_theme('X11');
whos name rgb
k=15;
fprintf('color␣name␣:␣''%s'',␣rgb=[%.6f,%.6f,%.6f]\n',name{k},rgb(k,1),rgb(k,2),rgb(k,3))
```

Output

```
  Name       Size            Bytes  Class    Attributes

  name       1x317           38932  cell
  rgb      317x3              7608  double

color name : 'Bisque3', rgb=[0.804000,0.716000,0.620000]
```

1.2.4 fc_tools.graphics.xcolor.svg function

The fc_tools.graphics.xcolor.svg function returns names and RGB values of the 149 SVG colors.

Syntaxe

```
[name,rgb]=fc_tools.graphics.xcolor.svg()
```

name is cell array of string (color names) and rgb is 149-by-3 array (rgb values) such that the color name{i} has rgb(i,:) for rgb values.

1.2.5 fc_tools.graphics.xcolor.X11 function

The fc_tools.graphics.xcolor.X11 function returns names and RGB values of the 317 X11 colors.

Syntaxe

```
[name,rgb]=fc_tools.graphics.xcolor.X11()
```

name is cell array of string (color names) and rgb is 317-by-3 array (rgb values) such that the color name{i} has rgb(i,:) for rgb values.

1.2.6 fc_tools.graphics.xcolor.fullX11 function

The fc_tools.graphics.xcolor.fullX11 function returns names and RGB values of the 738 X11 colors.

Syntaxe

```
[name,rgb]=fc_tools.graphics.xcolor.fullX11()
```

`name` is cell array of string (color names) and `rgb` is 738-by-3 array (rgb values) such that the color `name{i}` has `rgb(i,:)` for rgb values.

1.3 monitors submodule

This module is **experimental** ...

1.3.1 `fc_tools.graphics.monitors.onGrid` function

The `fc_tools.graphics.monitors.onGrid` displays figures on a virtual `m`-by-`n` grid (as `subplot` command with axes) positioned on a selected monitor.

Syntaxe

```
fc_tools.graphics.monitors.onGrid(n,m)
fc_tools.graphics.monitors.onGrid(n,m, key,value, ...)
```

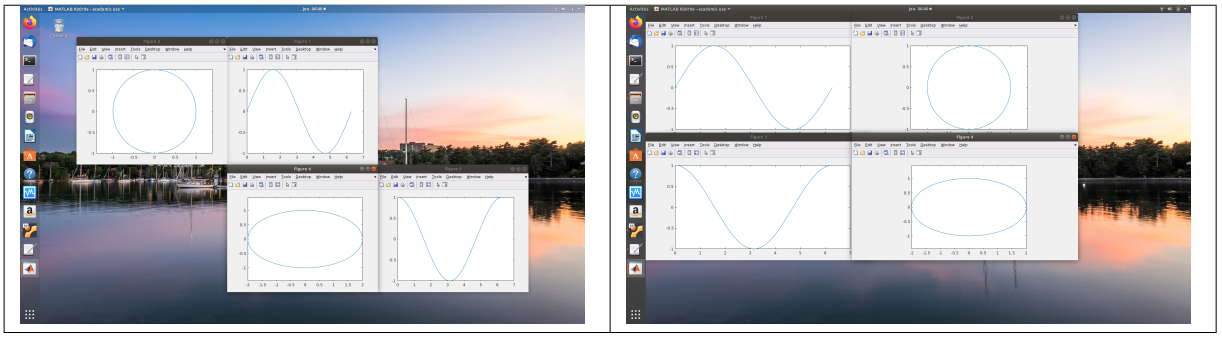
Description

`fc_tools.graphics.monitors.onGrid(n,m)`

A virtual `m`-by-`n` grid is created on the first monitor and the figures numbered from 1 to `m*n` are moved or created (if it doesn't exist) respectively to the position given by an index (default is the figure number). This index runs row-wise; all columns of the first row are numbered from left to right and so on with rows 2 to `m`.

`fc_tools.graphics.monitors.onGrid(n,m, key,value)` specifies function options using one or more `key,value` pair arguments. Options are

- `'figures'` : specifies the numbers of the figures to be used. Default is `1:m*n`.
- `'positions'` : specifies the index on the grid corresponding to the `'figures'` option. Default is `1:m*n`.



```
1  x=0:pi/100:2*pi;
2  close all
3  fc_tools.graphics.monitors.onGrid(2,3,'figures',[1,3], 'positions',[2,6],'covers',4/5)
4  figure(1)
5  plot(x,sin(x))
6  figure(3)
7  plot(x,cos(x))
8  fc_tools.graphics.monitors.onGrid(2,3,'figures',[2,4], 'positions',[1,5],'covers',4/5)
9  figure(2)
10 plot(sin(x),cos(x))
11 axis equal
12 figure(4)
13 plot(2*sin(x),cos(x))
14 axis equal
15 fprintf('waiting␣2s␣...\n');pause(2)
16 fc_tools.graphics.monitors.onGrid(2,2,'figures',1:4,'covers',4/5, 'location','NorthWest')
```

Listing 8: Using `fc_tools.graphics.monitors.onGrid` function, part of `fc_tools.graphics.monitors.demos.demo02` function. Figures are screenshot taken at line 15 (left) and after last line (right).

1.3.2 `fc_tools.graphics.monitors.show` function

The `fc_tools.graphics.monitors.show` displays monitors with their resolution, position and number on a figure. When arguments are provided, they are those of the `fc_tools.graphics.monitors.onGrid` function and then the grid is also drawn with the indices of the positions of the grid elements.

Syntaxe

```
fc_tools.graphics.monitors.show()
fc_tools.graphics.monitors.show(n,m)
fc_tools.graphics.monitors.show(n,m, key,value, ...)
```

Description

`fc_tools.graphics.monitors.show()`

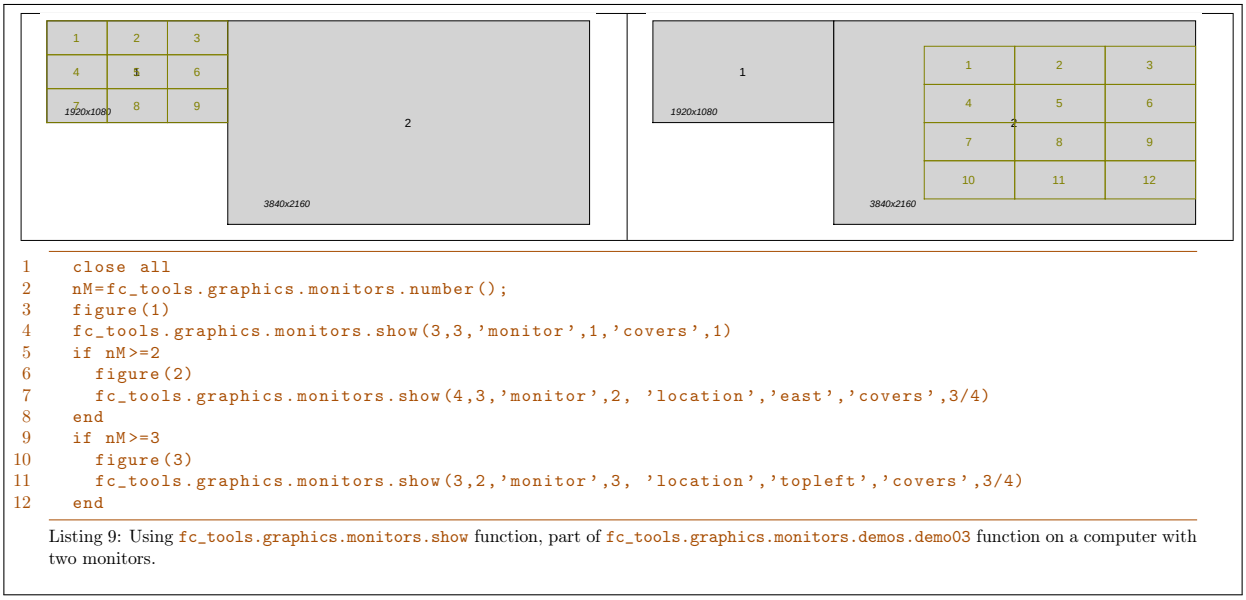
Displays monitors with their resolution, position and number on a figure.

`fc_tools.graphics.monitors.show(n,m)`

Add the `m`-by-`n` grid on the figure created by the `fc_tools.graphics.monitors.show()` command to to preview positions of figures created or moved by the `fc_tools.graphics.monitors.onGrid(n,m)` command.

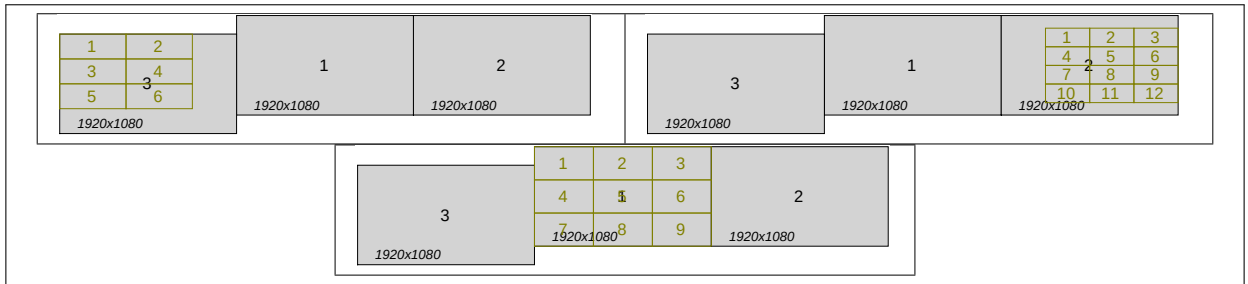
`fc_tools.graphics.monitors.show(n,m, key,value)`

specifies function options using one or more `key`,`value` pair arguments. Options are those of the `fc_tools.graphics.mon` function.




```
close all
nM=fc_tools.graphics.monitors.number();
figure(1)
fc_tools.graphics.monitors.show(3,3,'monitor',1,'covers',1)
if nM>=2
  figure(2)
  fc_tools.graphics.monitors.show(4,3,'monitor',2, 'location','east','covers',3/4)
end
if nM>=3
  figure(3)
  fc_tools.graphics.monitors.show(3,2,'monitor',3, 'location','topleft','covers',3/4)
end
```

Listing 9: Using `fc_tools.graphics.monitors.show` function, part of `fc_tools.graphics.monitors.demos.demo03` function on a computer with two monitors.




```
close all
nM=fc_tools.graphics.monitors.number();
figure(1)
fc_tools.graphics.monitors.show(3,3,'monitor',1,'covers',1)
if nM>=2
  figure(2)
  fc_tools.graphics.monitors.show(4,3,'monitor',2, 'location','east','covers',3/4)
end
if nM>=3
  figure(3)
  fc_tools.graphics.monitors.show(3,2,'monitor',3, 'location','topleft','covers',3/4)
end
```

Listing 10: Using `fc_tools.graphics.monitors.show` function, part of `fc_tools.graphics.monitors.demos.demo03` function on a computer with three monitors.

1.4 gptoolbox submodule

This submodule contains some files of the **gptoolbox** from *Alec Jacobson* (see `https://github.com/alecjacobson/gptoolbox`)

1.5 crop submodule

This submodule contains the function `crop` from *Andrew Bliss*.

1.6 vfield3 submodule

This submodule contains the function `vfield3` from *M MA* (see `https://www.mathworks.com/matlabcentral/fileexchange/8653-vfield3`)

2 utils module

- `fc_tools.utils.deleteCellOptions` deletes specified key/value pairs in a cell array of key/value pairs.
- `fc_tools.utils.isfunHandle` test if the input argument is a function handle.
- `fc_tools.utils.funHandleName` test if the input argument is a function handle.
- `fc_tools.utils.fun2str` ...

3 sys module

- `fc_tools.sys.getComputerName()` returns the name of the computer as a string.
- `fc_tools.sys.getUserName()` returns the name (login) of the current user as a string.
- `fc_tools.sys.getRAM()` returns available memory (RAM) in GB of the computer.
- `fc_tools.sys.getCPUinfo()` returns CPU(s) informations as a structure.
- `fc_tools.sys.getOSinfo()` returns OS informations as a structure.
- `fc_tools.sys.isfolder()` return true if a folder exists.
- `fc_tools.sys.isfileexists()` return true if a file exists.

In Listing 11, some examples are provided.

Listing 11: : example using `fc_tools.sys` functions

```
fprintf('RAM : %.2f GB\n',fc_tools.sys.getRAM())
CPU= fc_tools.sys.getCPUinfo()
OS=fc_tools.sys.getOSinfo()
```

Output

```
RAM : 42.85 GB

CPU =

  struct with fields:

            name: 'AMD Ryzen 9 6900HX with Radeon Graphics'
    nthreadspercore: 2
       ncoreperproc: 8
             nprocs: 1


OS =

  struct with fields:

    distributor: 'Ubuntu'
    description: 'Ubuntu 24.04.2 LTS'
        release: '24.04'
       codename: 'noble'
           arch: 'x86_64'
      shortname: 'Ubuntu'
```

Informations for git maintainers of the fctools Matlab toolbox

git informations on the toolboxes used to build this manual

```
------------------------------------------------
  name : fc-tools
   tag : 0.0.38
commit : 9c1f7a1397d2507d7d70b9e2702f819acec04c5f
  date : 2025-03-17
  time : 16-24-58
status : 0
------------------------------------------------
```

git informations on the LaTeX package used to build this manual

```
------------------------------------------------
  name : fctools
   tag :
commit : 03d38737a795cdbf4e1a8754470e963cdfe83316
  date : 2025-01-24
  time : 09:58:52
status : 1
------------------------------------------------
```

Using the remote configuration repository:

url	ssh://lagagit/MCS/Cuvelier/Matlab/fc-config
commit	0ef87a34dc2f013c217b9b1b3f178db83249369e