Mid1 RC part 4

Advanced MATLAB

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2D Plotting

Basic plotting functions:

- Plot the columns of x, versus their index: plot(x)
- Plot the vector x, versus the vector y: plot(x,y)
- e.g. plot y =logx with x=[0:0.1:20];y=log(x);plot(x,y); More than one graph on the figure: hold

Plotting properties:

- Axis properties: axis
- Marker properties (use help function)

Erase figure:

- Without the use of hold
- Delete figure: delete(p), if you use p=plot(x) previously
- Clear current figure window: clf

Shape Plotting

Some easy approach (not unique) Rectangle

- rectangle('Position',[1 2 3 4]);
  vertices: (1, 2), (1, 6), (4, 2), (4, 6)
- Circle: plot(x, y, 'o');
  center at (x, y), 'o' for circle
- Polygon Use plot(x, y) neatly: plot([0 2 2 0 0], [0 2 4 8 0]);
  vertices: (0, 0), (2, 2), (2, 4), (0, 8)

3D Plotting & Misc

- 3D Plotting
  Know the usage of these functions:
  Contour: contour(x,y,z)
  Color map: pcolor(x,y,z) 3D view: surf(x,y,z)
- Useful functions
  Polar graph: polar(t,r)
  More than one plot: subplot(mnp)
- Interpolation
  What is interpolation?
  2D: interp1(X,Y,xi,m)
  3D: interp2(X,Y,Z,xi,yi,m)

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Why we have different data types?

- Why we have different data types? Different numbers (integer, real, complex, etc.)
  Different ranges (short, long, etc.)
  Different precisions (single, double, etc.)
- Numeric Types in matlab (c4.12)
  1 int: int8, int16, int32 and int64
  2 uint: unit8, uint16, uint32 and uint64
  3 32 bits: realmax('single'), realmin('single')
  4 64 bits: realmax, realmin
- Distinguish char type and string type in matlab
  'c': single char
  "c": single string
  'ace': char array with size 1×3
  "ace": single string with length 3

Two's complement

- A method of expressing signed integers in binary.
- Method:
  for integer a, invert all the bits of a, add 1 to get -a e.g.
  00101010: $11010101 + 1 = 11010110$
  $00101010 = 0 * 2^7 + 2^5 + 2^3 + 2 = 42$
  $11010110 = \text{-}1 * 2^7 + 2^6 + 2^4 + 2^2 + 2 = 86\text{-}128 = \text{-}42$

Type Related Functions (c4.13)

Solve the problem (3.13—3.93) using an alternative algorithm and different Matlab functions.

- You need to know:
  1 type casting functions
  2 string manipulation functions

Binary File vs. Text File

All files are saved in one of two file formats - binary or text. The two file types may look the same on the surface, but their internal structures are different.
While both binary and text files contain data stored as a series of (bits (binary values of 1s and 0s), the bits in text files represent characters, while the bits in binary files represent custom data.

Contents

The need for structures

- Structure:
  Array with “named data containers” called fields A fields can contain data of any type
  We need a data structure that can contain variables of different types.
- Structure: Organized, nested data
  With same format
  Integrate different types together for convenience

You need to clearly know how to define and use it

```
students=struct('name',{'ZKW','XZ','ZJC','YQZ','ZBM'},...

'grade',{100,0,100,100,100});

[m,i]=min([students.grade]);
disp(students);
disp(students(i).name);

Output:
1×5 struct array with fields:
name grade
XZ
```