Learning Matlab

A program for:

computation,
visualization,
programming

工程評估實驗室　傅增棣

Contents

- What can it do?
  - Demo files
- What does it need?
  - Structure & format
- How does it work?
  - An example from the textbook
- The exercise

Demos

- Matrix operations - (fundamental theory), matrix manipulation
- Visualization - plots, images, vib. movie
- Gallery
- Game
- Miscellaneous - 3D drawing, travelling salesmen
- Toolbox - /optimisation, /Fuzzy logic/truck, /statistics/pdf
- Simulink - bounce ball, pendulum, etc

Brief introduction for the format

- Basically interactive execution
- Commands frequently used:
  - explanations: %
  - clear all; clf;
  - for…end; if…end
  - plot, fprintf, axes
  - end with “;”, output results without “;”
  - more in “help xxx(keyword)”
  - named after “*.m”

Appearance of Matlab program

```
%This program is to show the unsuitable optimisation function given in Kinzel, p277,
%which attempts to use exp(n-F) to imply F<or =n by looking for its minimum.
format compact
clear
n=5
F=710:1:730;
for k=1:length(F)
    U(k)=exp(n-F(k));
end
plot(F,U)
[v,c]=min(U)
Fmin=F(c)
```

Example procedures

- Translating, roller follower cam mechanism. (Example 6.7, p367)
- Files are available from the CD. (mainly
  rf_cam.m - the main program for analysis,
  follower.m - displacement function, & follower type, etc.)
- Convert files (to make *.m text file for execution)
- Find other files required from its error messages. (a short-cut to make it work)

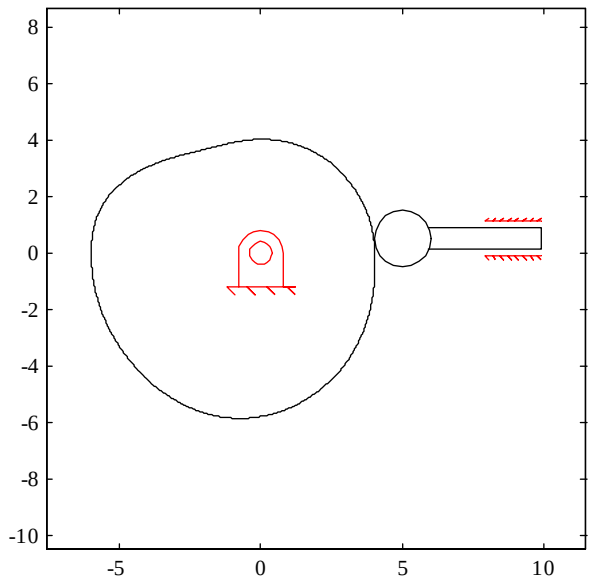
Sample inputs of rf_cam.m

?rf_cam

Cam Synthesis for Axial Roller Follower

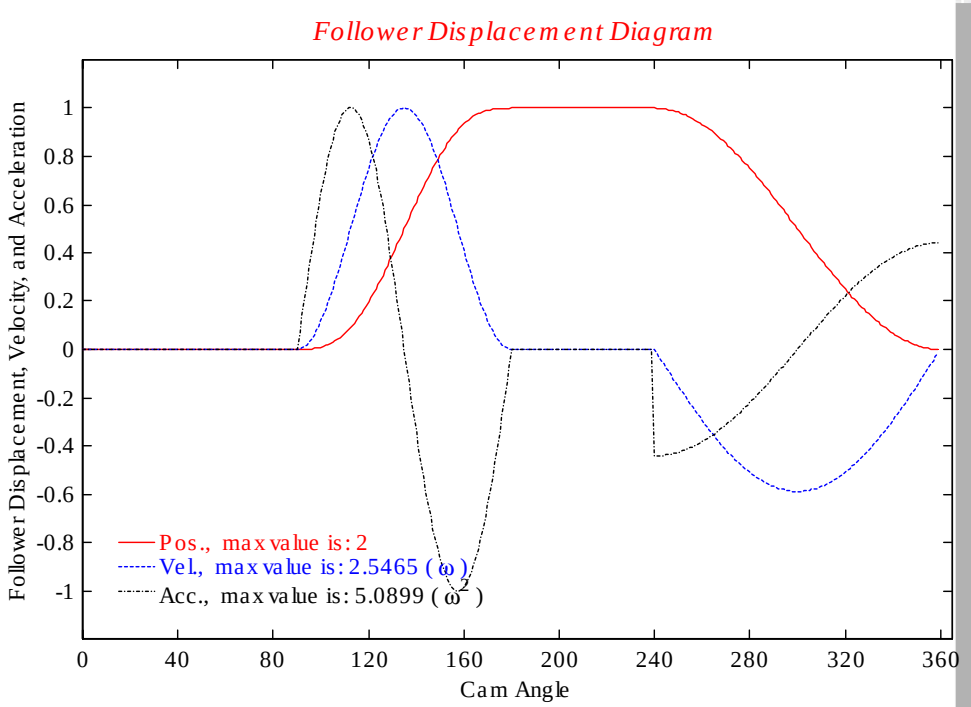
Enter 1 for file input and 2 for interactive input [1]: 2
Enter input file name (rf_camio.dat): text.dat
Enter base circle radius [2]:
Enter radius of cylindrical or roller follower [0.5]:
Enter follower offset [1]:
Enter follower rise [2]:
Enter cam rotation direction (CW(-), CCW(+)) [-]:
Enter cam angle increment for design (deg) [10]: 1
Enter number of animation cycles [4]:

Sample outputs(1)



Cam profile

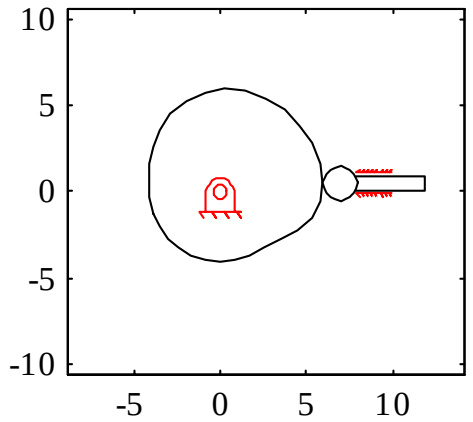
Displacement diagram

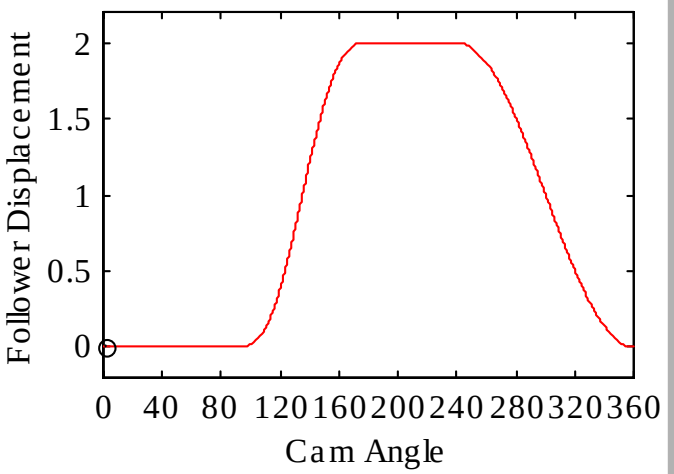


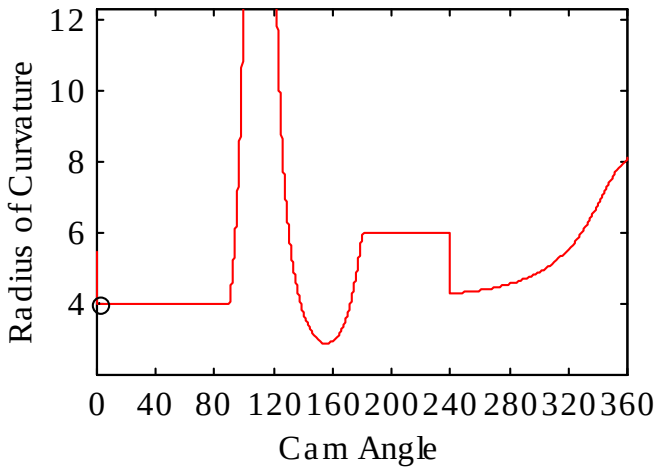
Sample outputs(2)

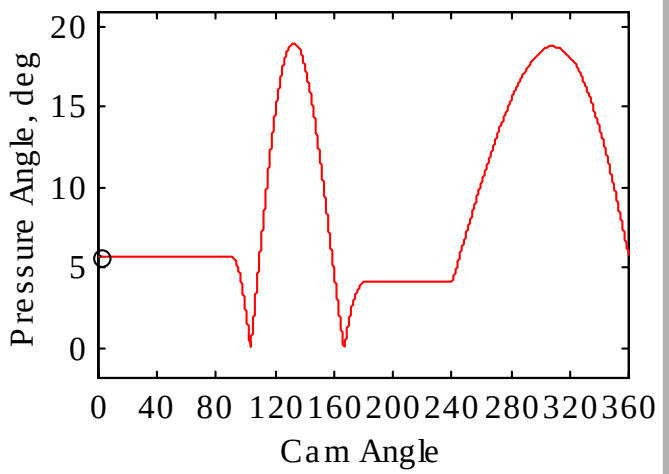
Results:

XY-plots
&
animation









The exercise

Sensitivity Analysis of Cam Designs

Tasks of the sensitivity analysis

- 12 plots in total for the trend and sensitivity:

<Four factors:>

Base circle radius
Follower offset
Follower rise
Cam rotating directions

V.S.

<Three characteristics:>

a) maximum pressure angle
b) minimum radius of curvature of the cam profile
c) maximum acceleration

Scope of the exercise

- Each group performs one task for one type of cam designs.
- “Map” of the cam sensitivity is completed by the whole class as a team after the oral presentation --- design methodology
- The more effort you make, the more sense of achievement you get!

The suggested procedure

- Identify and modify the main analysis program (e.g. rf_cam.m).
- Choose the right type for the follower and modify the displacement formulas in the program (e.g. follower.m).
- Find and convert all the files required by the main analysis program by its error messages.
- Perform the sensitivity analysis.

問題與回應

Important dates

- 91/4/9
  - two weeks for you to locate all problems to be solved and ask questions on the day.
- 91/4/16
  - one week for you to complete the task and report.
- 91/5/7 or 14 (to be determined)
  - oral presentations by all groups and create the Map.