

Homework 3 Part I - MA Calculation & User Interface

Objectives

Write a program that creates two plots, one at a time and by user selection.

1. Plot 1: The MA over a range of the input handle angle from 105 to 145 degrees.
2. Plot 2: The average MA as a function of all possible start angles.
3. When the program is run first time, it should plot for the following default design values and allow the user to enter new values.

Link 2 (r_2) = 60 mm (*Adjustable range: 50 - 100 mm*)

Link 3 (r_3) = 100 mm (*Fixed*)

Offset (y) = 75 mm (*Adjustable range: 0 - 100 mm*)

Programming Requirements

MA Calculation

Write two MATLAB function m-files named "cutter_ma.m" and "cutter_avg_ma.m."

1. *function ma = cutter_ma(theta2)*

Given the input handle angle theta2, the function calculate corresponding MA. The input argument theta2 can be a scalar or a vector. The output variable ma will be a scalar or a vector, depending on the type of theta2.

2. *function avg_ma = cutter_avg_ma(theta2_s)*

This function accepts a start angle of link 2, named theta2_s, and calculates the average MA over the duty cycle - cutting through a thickness of 12 mm. To determine the duty cycle, you will need to know the angle traveled by link 2 (theta2_s to theta2_f, where theta2_f is the final angular position of link 2 after

the knife has moved 12 mm). A function m-file “handle_pos.m” is provided to help you with this task.

User Interface

Write a MATLAB script, named “cutter_analysis.m,” that generates a figure tool to plot one of the two plots: MA and average MA. A sample figure tool is shown in Figure 1.

A menu named “MA Analysis” with three sub menus

1. Plot MA - to plot MA vs. Angle of the handle
2. Plot Average MA - to plot average MA vs. Start angle of the handle
3. Setup - to allow user to change design configuration, i.e. the length of link 2 and offset. A dialog (Figure 2) should pop up when the user click on this sub menu.

An annotation box (use text command) should appear at an appropriate location to inform the design configuration for the current plot (Figure 1 and Table 1).

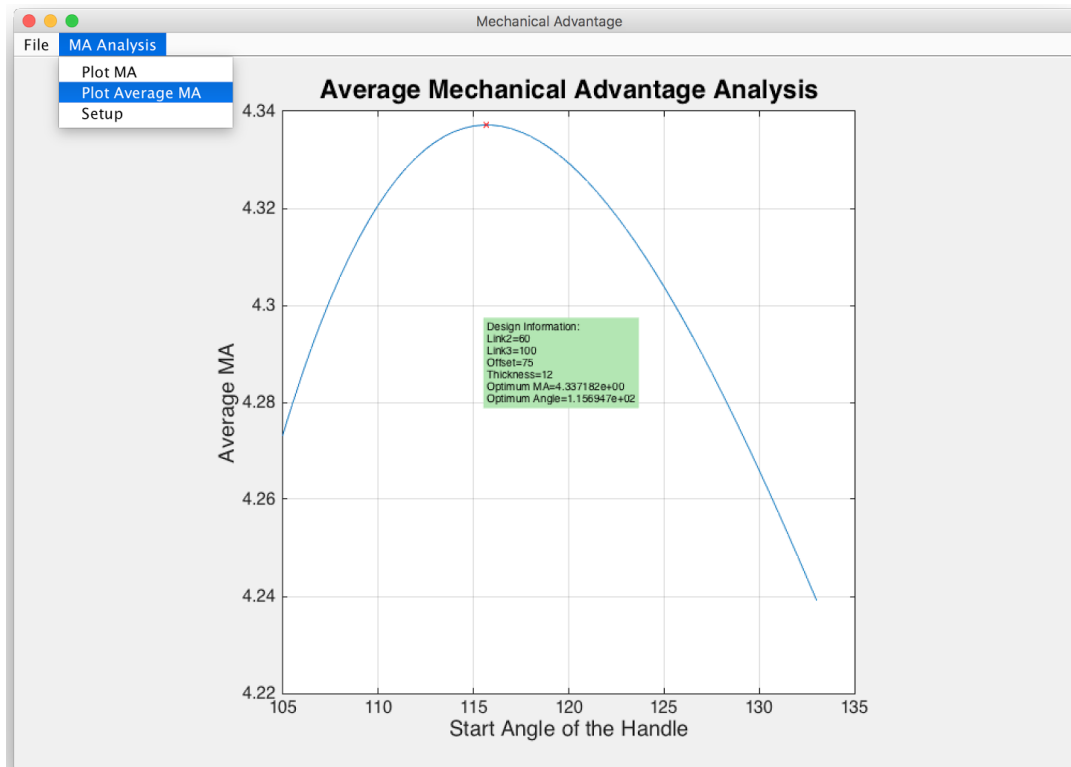


Figure 1: A sample figure tool

Set up configu...

Enter link2 length(mm):

60

Enter offset(mm):

75

OK Cancel

Figure 2: A sample figure tool

Table 1: Sample information to be displayed in the annotation box

In MA Plot	In Average MA Plot
Link 2: 60mm Offset: 100mm EI method: optimum MA=7.7, handle angle=120 deg, iteration = 1000 or cpu time = 3.24875 seconds AEI method: (same as above) GS method: (same as above)	Link 2: 60mm Offset: 100mm EI method: optimum avg MA=5.2, handle start angle=135 deg, iteration = 3000 or cpu time = 5.94435 seconds AEI method: (same as above) GS method: (same as above)