Applied Numerical Computing for Scientists and Engineers

Computational Assignment 5

Electronic submission via Bitbucket and course website.
Assignment weight: 10%.

The purpose of this assignment is to give you practice with GUI development in MATLAB starting with an existing model. You will need the beefiles.zip file available on the course website for this assignment. The .zip must be unzipped or extracted into the same directory as the files you generate for this assignment.

1. Git (2%)

Use your Bitbucket repository named firstname_lastname_applnumcomp for version control with the .m and .fig files associated with Exercise 2 (2 new files required along with the unzipped beefiles folder). Create a subfolder called "CA 5". Work on this assignment in the "CA 5" subfolder. There should be at least one commit of each required file and at least three total commits for this assignment with comments that briefly explain states of progress on the assignment, e.g., "starting MATLAB code". You should also include the .mlappinstall file at the end (it does not need more than one commit). The last commit you wish to submit for a grade must have the commit -m message "assignment 5 submission". Everything between the assignment 4 submission commit and assignment 5 submission commit will be evaluated.

For the course website Computational Assignment 5 submission, use the text box to enter the web address for the commit that corresponds to the submission. For example, `https://bitbucket.org/ashleefv/ashleefordversyptapplnumcomp/commits/d8390344f1b0ef0faed7db84c01ffce95c2f0423`. This is simply to have a clear time stamp for your submission. **Submissions and/or final**

commits after the deadline submitted on the due date will receive maximum of half credit for the assignment.

2. MATLAB GUI Creation (98%)

This Exercise has four required files and folders:

1. `BeeAttraction.m` GUI .m file
2. `BeeAttraction.fig` GUI .fig file
3. `beefiles` folder (included but not edited)
4. `CA5_firstname_lastname.mlappinstall` app file created from packaging the three files and folders listed above

2.1. Problem statement

Download the `beefiles.zip` file. Unzip this file into the folder where your other files for CA 5 are located on your computer. Do not edit any of the files in the beefiles folder. Do not store your assignment inside the beefiles folder. The beefiles folder should be a subfolder in the folder where you store CA 5 files that you do create called `BeeAttraction.m` and `BeeAttraction.fig`.

You will create a graphical user interface sketched in Fig. 1 to demonstrate the effects of attraction on bees swarming on a nest. The beefiles folder contains the data and functions that model this effect. The GUI will take user supplied values of attraction from an editable text box and the length of the simulation from a pop-up menu. The resulting simulation plots will be diplayed on the right hand side.

2.2. Assignment Requirements

Use GUIDE in MATLAB to create and edit the GUI to meet the following objectives. A good rule of thumb is to commit your changes after each item is completed. You do not have to work on the items in any particular order after #1 and #2 (except the last item should go last).

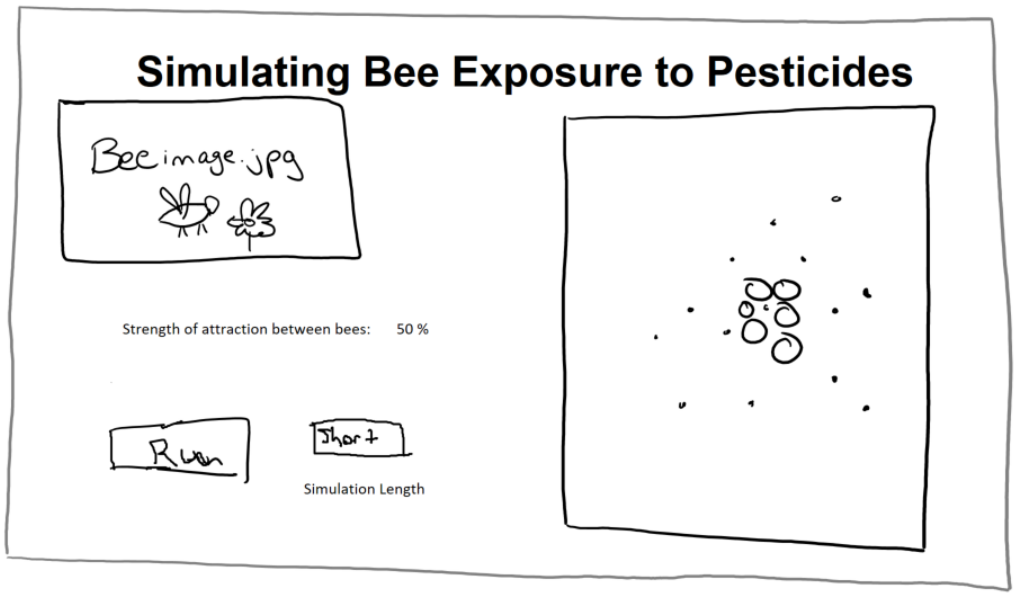

Figure 1: Layout for GUI for CA5

1. Use GUIDE to create a layout similar to Fig. 1. Save as `BeeAttraction.m` and `BeeAttraction.fig`.

2. Commit the initial versions of the original GUI codes before you make any changes to the .m file, so that you can go back to them in the future and so that differences between the original and your edited files are distinguishable easily on Bitbucket.

3. Use a static text box at the top of the GUI layout that includes the text "Simulating Bee Exposure to Pesticides" in 28 point boldface font.

4. Include axes on the upper left quadrant of the GUI layout and display `beefiles/Beeimage.jpg` in that axes.

5. Include axes on the right half of the GUI layout for plotting the output of the bee simulation.

6. Edit the `BeeAttraction_OpeningFcn` function to match the following lines of code to initialize attraction and totalTimePoints and to add beefiles to the path.

```
% --- Executes just before BeeAttraction is made visible.
function BeeAttraction_OpeningFcn(hObject, eventdata, ...
    handles, varargin)
% This function has no output args, see OutputFcn.
% hObject    handle to figure
% eventdata  reserved - to be defined in a future ...
    version of MATLAB
% handles    structure with handles and user data ...
    (see GUIDATA)
% varargin   command line arguments to BeeAttraction ...
    (see VARARGIN)
%default parameters
handles.attraction = 0.0; %no attraction
handles.totalTimePoints = 150;% number of time points
handles.output = hObject;
addpath(genpath('beefiles'))
% Update handles structure
guidata(hObject, handles);
```

7. Using a combination of static and editable text boxes have the user enter the desired value for the strength of attraction between bees in percentage.

8. In the call-back function for the editable text box, have the entered value update `handles.attraction` by converting into a fraction (pseudocode: `handles.attraction` = enteredvalue/100) and save the updated `handles`.

9. Use a pop-up menu labeled "Simulation Length" to create three options for simulation length: short, medium, and long.

10. In the call-back for the pop-up menu, set `handles.totalTimePoints` to 150 for short, 300 for medium, and 1500 for long simulation lengths. Short should be the first option, followed by medium, and then long. Save the updated `handles`.

11. Add a pushbutton labeled "Run".

12. In the call-back function for the Run pushbutton, call the following function (which is inside of the beefiles subfolder): `simulation_attraction(hObject, eventdata, handles)`. This

will take the current values of `handles.totalTimePoints` and `handles.attraction`, run the simulation and display the resulting plot on the current axes. Note: you may have to add a line of code in this callback function to specify which axes is the desired one.

13. When the GUI runs, within about 5 seconds of pushing the"Run" a plot with gray circles denoting bee nest structures and blue circles denoting bees should appear in the right pane and move around. The motions of the bees should be very sensitive to the strength of attraction value. Also, the simulation visualization should last longer if the medium or long simulation length options are selected.

14. When you are finished with ALL of the previous steps, package a MATLAB app titled CA5_firstname_lastname for your completed assignment. This must include the beefiles subfolder along with your .m and .fig files for the GUI. Make sure to submit your .mlappinstall file on the course website dropbox folder, but it does not need to be tracked with version control.