Documentation for the *octave* coffee machine project

Emre Arapcic-Uevak
Vedad Siljic

January 12, 2023

Abstract

This is a documentation file for the final project assignment for the course **ENS101**

Contents

1   Assignments

The following table will show all the assignemtns taken by the corresponding students:

	Emre Arapcic-Uevak	Vedad Siljic
Design	✓✓	x
Functionality	x	✓✓

2   Design

Lets take a look at the code that was used to generate all the ui components

2.1   UI component set up

```matlab
% Set up all needed frames
mainFrame = figure(
        'position', [0 0 800 600],
        'Name','Coffee Machine',
        'NumberTitle', 'off',
        'color', primaryColor,
        'toolbar','none',
        'resize', 'off');

titleFrame = uipanel(
        'Parent', mainFrame,
        'position', [0 .85 1 .15],
        'HighLightColor', primaryColor);

rightHalf = uipanel('Parent', mainFrame,
        'position', [0.5 0 0.5 .85],
        'backgroundcolor', primaryColor,
        'HighLightColor', primaryColor );

keypadFrame = uipanel('Parent', rightHalf,
        'position', [0.05 0.3 0.5 0.5],
        'HighLightColor', primaryColor );

coffeeSlotFrame = uipanel('Parent', rightHalf,
        'position', [0.6 0.3 0.35 0.5],
        'HighLightColor', primaryColor );

leftHalf = uipanel('Parent', mainFrame,
        'position', [0 0 .5 0.85],
        'backgroundcolor', primaryColor ,
        'HighLightColor', primaryColor );

coffeeMenu = uipanel('Parent', leftHalf,
        'position', [0.025 0.05 0.95 .9],
        'backgroundcolor', primaryColor,
        'HighLightColor', primaryColor );

% Set up all elements
data.coffeeGifDisplayAxes = axes('Parent', coffeeSlotFrame,
        'position', [0 0 1 1],
        'xtick', [], 'ytick', [], 'xlim', [0 1], 'ylim', [0 1],
        'Color', primaryColor);
data.consoleOutput = uicontrol(rightHalf, 'Style', 'edit', 'units', 'normalized' ...
        ,'string', 'IUS Coffee Machine','position', [0.05 0.85 0.9 0.13], 'Max', 5, ...
        'Min', 0, 'enable', 'off','backgroundcolor', '#000000');

% Set up coffee animation
axes(data.coffeeGifDisplayAxes)
frame = imread('./CoffeePercentBarFrames/finalCoffeeVideo-0.png');
imshow(frame, []);

% Set up title
uicontrol('parent', titleFrame,
        'Style', 'text',
```

```
53          'units', 'normalized' ,
54          'string', 'IUS COFFEE',
55          'position', [0 0 1 1],
56          'backgroundcolor', primaryColor, 'fontsize', 18);
```

Quick note about about some of the functions used in the given code block:

- Figure is an function used for generating a new figure with the given properties.

- Uipanel is a function used for generating a panel(frame) which acts as a group for other ui components.

- Axes is a function used for generating a new axes with the given properties.

As we can see from line 2 to 8 we are generating a new figure that will not have a tool bar and will be called "Coffee Machine", it will as well not be resizable. it will start on the bottom left of the users screen with a fixed size of 800×600 pixels.

After that from line 10 all the way down to line 36 we will seperate the figure into multiple frames on on the far top for the title and then split it in 2 vertically with the rest of the space remaining, we called these spaces *rightHalf* and *leftHalf* in our program. Afterwards we will set up some *Axes* that will parented to the given frames which will be later used for image displaying. The coffeeGifDisplayAxes is an Axes that will be used for displaying a progress bar type gif, but unfortunately since *Octave* is really slow at handling image loading and does not have *GIF* **nor** *Video* support all the images had to be loaded one after another.

2.2 Setting up Interacting drop down menu

```
1  % Set up menubar
2    interactions = uimenu('Text', 'Interactions');
3    interactionsItem1 = uimenu(interactions, 'Text', 'Insert 5KM', 'callback',
4          { @interactionPressed, '5        ' });
5
6    interactionsItem2 = uimenu(interactions, 'Text', 'Insert 2KM', 'callback',
7          { @interactionPressed, '2        ' });
8
9    interactionsItem3 = uimenu(interactions, 'Text', 'Insert 1KM', 'callback',
10         { @interactionPressed, '1        ' });
11
12   interactionsItem4 = uimenu(interactions, 'Text', 'Insert 50F', 'callback',
13         { @interactionPressed, '0.5      ' });
14
15   interactionsItem5 = uimenu(interactions, 'Text', 'Insert 20F', 'callback',
16         { @interactionPressed, '0.2      ' });
17
18   interactionsItem6 = uimenu(interactions, 'Text', 'Insert 10F', 'callback',
19         { @interactionPressed, '0.1      ' });
20
21   interactionsItem7 = uimenu(interactions, 'Text', 'Insert 5F', 'callback',
22         { @interactionPressed, '0.05     ' });
23
24   interactionsItem8 = uimenu(interactions, 'Text', 'Take the coffee', 'callback',
25         { @interactionPressed, 'takeCoffee' });
26
27   interactionsItem9 = uimenu(interactions, 'Text', 'Take the change', 'callback',
28         { @interactionPressed, 'takeChange' });
```

The above presented code is fairly simple to understand, firstly we use Uimenu function to create a new menu component that will be dispalyed on the top of the frame, afterwards we just create the wanted tabs, parents them to the given menu we just created, change their text, and a call back function to every single one of them.

2.3   Set up KeyPad buttons

```matlab
1  % Set up KeyPad Buttons
2    for i = 1:4
3        for j = 1:3
4            if (i != 4)
5                uicontrol(keypadFrame,
6                'Style', 'pushbutton',
7                'units', 'normalized' ,
8                'string', num2str(3*(i-1) + j - 1),
9                'callback', { @buttonPressed, num2str(3*(i-1) + j - 1) },
10               'position', [1/3*(j-1) 1-1/4*i 1/3 1/4],
11               'Max', 5, 'Min', 0, 'enable', 'on', 'fontsize', 14, 'backgroundcolor', ...
                    secondaryColor);
12           else
13               if (j == 2)
14                   uicontrol(keypadFrame,
15                   'Style', 'pushbutton',
16                   'units', 'normalized' ,
17                   'string', '9',
18                   'callback', { @buttonPressed, '9' },
19                   'position', [1/3 0 1/3 1/4],
20                   'Max', 5, 'Min', 0, 'enable', 'on',
21                   'fontsize', 14,'backgroundcolor', secondaryColor);
22               elseif (j == 1)
23                   uicontrol(keypadFrame,
24                   'Style', 'pushbutton',
25                   'units', 'normalized' ,
26                   'string', 'Yes',
27                   'callback', { @buttonPressed, 'yes' },
28                   'position', [0 0 1/3 1/4],
29                   'Max', 5, 'Min', 0, 'enable', 'on',
30                   'fontsize', 14,'backgroundcolor', secondaryColor);
31               else
32                   uicontrol(keypadFrame,
33                   'Style', 'pushbutton',
34                   'units', 'normalized' ,
35                   'string', 'No',
36                   'callback', { @buttonPressed, 'no ' },
37                   'position', [2/3 0 1/3 1/4],
38                   'Max', 5, 'Min', 0, 'enable', 'on',
39                   'fontsize', 14,'backgroundcolor', secondaryColor);
40               end
41           end
42        end
43    end
```

The above mentioned code was used to generate all the buttons that can be found on the kaypad frame, here we can see the use of nested loops to allow us to automatically add all the needed buttons, and we can also see that we have a special case if we are dealing with the last row since we do not only want numbers to be displayed there, we also want to display the words "Yes", "No". For the rest of the document the documentation about all of these functions will be linked at the end of the document

2.4   Set up coffee menu

```
1   % Set up for coffee menu
2     for i = 1:3
3         for j = 1:3
4             if (3*(i-1) + j > length(data.coffeeNames)) break; end
5             coffeeFrame = uipanel('Parent', coffeeMenu,
6             'position', [(j-1)/3 1-i/3 1/3 1/3],
7             'HighLightColor', primaryColor ,
8             'backgroundcolor',primaryColor );
9
10            axes('Parent', coffeeFrame,
11            'position', [0 0.4 1 0.6],
12            'xtick', [], 'ytick', [], 'xlim', [0 1], 'ylim', [0 1],
13            'Color', primaryColor);
14
15            imshow(strcat('./Images/', data.coffeeNames{3*(i-1) + j}, '.png'), []);
16
17            uicontrol(coffeeFrame,
18            'Style', 'text',
19            'units', 'normalized' ,
20            'string', num2str(3*(i-1) + j),
21            'position', [0 0.2 1 0.2],
22            'enable', 'on', 'fontsize', 14,
23            'backgroundcolor',primaryColor );
24
25            uicontrol(coffeeFrame,
26            'Style', 'text',
27            'units', 'normalized' ,
28            'string', data.coffeeNames{3*(i-1) + j},
29            'position', [0 0 1 0.2],
30            'enable', 'on', 'fontsize', 14,
31            'backgroundcolor',primaryColor );
32        end
33    end
```

The above mentioned code was used to generate all images for coffees that can be found in the coffee menu upon ordering, what the code does is it goes by the same principal as the generation for keypad buttons by using a nested loop to make frames that all take $\frac{1}{3}$ of width and height of the available space. Afterwards it makes an axis and 2 text components that is lays next to each other vertically and sets all of their properties.

2.5   Save all UI data

```
1   guidata(mainFrame, data);
```

And finally we will use this line of code to set up everything we have saved in the structure variables called *"data"* and link that variable to the figure. We do this because Octaves scope is function based meaning any variables made in a function is *only* visible in the said function. But by doing this we can use the function guidata again to read the structure we connected to the figure element.

3 Functionality

In this section we will take a look at the code responsible for functionality of the program.

3.1 KeyPad Buttons Functionalities

```matlab
% For all buttons on the keypad
function buttonPressed(hObject, eventdata, value)

   data = guidata(gcf());

   if (data.enableButtons != 1)
      return;
   end

   % Yes Butoon
   if (value == 'yes')

      if (data.askForExtraMilk == 1)
         data.askForExtraMilk = 0;
         data.askForExtraSugar = 0;
         data.extraMilk = 1;
         pause(1);
         set(data.consoleOutput, 'string', cstrcat('The total is ', ...
               num2str(data.coffeePrice{str2num(data.number)}), 'KM'));
         data.enableButtons = 0;
         data.enableInteractions = 1;
      end

      if (data.askForExtraSugar == 1)
         data.askForExtraSugar = 0;
         data.extraSugar = 1;
         pause(1);
         set(data.consoleOutput, 'string', 'Do you want extra milk?');
         data.askForExtraMilk = 1;
      end

      if (data.numberEntered == 0)
          if (str2num(data.number) == 1 || str2num(data.number) == 2 || ...
                str2num(data.number) == 3 || str2num(data.number) == 4 || ...
                str2num(data.number) == 5 || str2num(data.number) == 6 || ...
                str2num(data.number) == 7 || str2num(data.number) == 8 || ...
                str2num(data.number) == 9)
             set(data.consoleOutput, 'string', ...
                  strcat(data.coffeeNames{str2num(data.number)}, ' selected.'));
             pause(1);
             data.numberEntered = 1;
             data.enableNumbers = 0;
             set(data.consoleOutput, 'string', 'Do you want extra sugar?');
             data.askForExtraSugar = 1;
          else
             set(data.consoleOutput, 'string', 'Wrong number entered.');
             pause(2);
             data.number = '';
             set(data.consoleOutput, 'string', data.number);
          end
      end

   % No Button
   elseif (value == 'no ')

      if (data.askForExtraMilk == 1)
         data.askForExtraMilk = 0;
         data.askForExtraSugar = 0;
         data.extraMilk = 0;
         pause(1);
         set(data.consoleOutput, 'string', cstrcat('The total is ', ...
               num2str(data.coffeePrice{str2num(data.number)}), 'KM'));
         data.enableButtons = 0;
         data.enableInteractions = 1;
```

```
58        end
59
60        if (data.askForExtraSugar == 1)
61          data.askForExtraSugar = 0;
62          data.extraSugar = 0;
63          pause(1);
64          set(data.consoleOutput, 'string', 'Do you want extra milk?');
65          data.askForExtraMilk = 1;
66        end
67
68        if (data.numberEntered == 0)
69          data.number = '';
70          set(data.consoleOutput, 'string', data.number);
71        else
72
73      end
74
75      % Number Buttons
76      else
77        if (data.enableNumbers == 0)
78          return;
79        end
80        data.number = strcat(data.number, value);
81        set(data.consoleOutput, 'string', data.number);
82      end
83
84      guidata(gcf(), data);
85
86    end
```

This function is for all interactions with keypad of the coffee machine. It has every functionality for selecting which coffee you want and if you want extra sugar and milk.

3.2   Coffee Machine Interaction Functionality

```
1   % For all interactions on the menubar
2   function interactionPressed(hObject, eventdata, value)
3
4     data = guidata(gcf());
5
6
7     if (value == 'takeCoffee')
8       if (data.coffeeFinished == 1)
9         set(data.consoleOutput, 'string', 'Enjoy your coffee.');
10        pause(2);
11        close all;
12        return;
13      else
14        return;
15      end
16    end
17
18
19    if (value == 'takeChange')
20      if (data.hasChange == 1)
21        data.coffeeFinished = 1;
22        data.hasChange = 0;
23        set(data.consoleOutput, 'string', 'Please wait while the coffee is being made.');
24        pause(1);
25
26        % Coffee making sound and animation
27        [y, fs] = audioread('./Audio/coffeeMakingAudio.wav');
28        player = audioplayer(y, fs);
29        play(player);
30
31        axes(data.coffeeGifDisplayAxes)
32          for i = 1:49
33              frame = imread(strcat('./CoffeePercentBarFrames/finalCoffeeVideo-', ...
34                  num2str(i), '.png'));
              imshow(frame, []);
```

```matlab
35              pause(50/450);
36          end

38          if (data.extraSugar == 1 && data.extraMilk == 1)
39            set(data.consoleOutput, 'string', cstrcat('Here is your ', ...
                   data.coffeeNames{str2num(data.number)}, ' with extra sugar and extra milk.'));
40          elseif(data.extraSugar == 1 && data.extraMilk == 0)
41            set(data.consoleOutput, 'string', cstrcat('Here is your ', ...
                   data.coffeeNames{str2num(data.number)}, ' with extra sugar.'));
42          elseif(data.extraSugar == 0 && data.extraMilk == 1)
43            set(data.consoleOutput, 'string', cstrcat('Here is your ', ...
                   data.coffeeNames{str2num(data.number)}, ' with extra milk.'));
44          else
45            set(data.consoleOutput, 'string', cstrcat('Here is your ', ...
                   data.coffeeNames{str2num(data.number)}, '.'));
46          end
47          pause(2);
48          set(data.consoleOutput, 'string', 'Please take your coffee.');
49      else
50          return;
51      end
52  end

55  guidata(gcf(), data);

58  if (data.coffeePaid == 1)
59      return;
60  end

63  numValue = str2num(value);
64  data.coffeePrice{str2num(data.number)} -= numValue;
65  strValue = num2str(data.coffeePrice{str2num(data.number)});

68  if (data.coffeePrice{str2num(data.number)} > 0)

70    set(data.consoleOutput, 'string', strcat(strValue, 'KM left to enter.'));

73  elseif (data.coffeePrice{str2num(data.number)} == 0)

75    set(data.consoleOutput, 'string', 'Please wait while the coffee is being made.');
76    data.coffeePaid = 1;
77    pause(1);

79    % Coffee making sound and animation
80    [y, fs] = audioread('./Audio/coffeeMakingAudio.wav');
81    player = audioplayer(y, fs);
82    play(player);

84    axes(data.coffeeGifDisplayAxes)
85      for i = 1:49
86          frame = imread(strcat('./CoffeePercentBarFrames/finalCoffeeVideo-', ...
                   num2str(i), '.png'));
87          imshow(frame, []);
88          pause(50/450);
89      end

91    data.coffeeFinished = 1;
92    if (data.extraSugar == 1 && data.extraMilk == 1)
93      set(data.consoleOutput, 'string', cstrcat('Here is your ', ...
             data.coffeeNames{str2num(data.number)}, ' with extra sugar and extra milk.'));
94    elseif(data.extraSugar == 1 && data.extraMilk == 0)
95      set(data.consoleOutput, 'string', cstrcat('Here is your ', ...
             data.coffeeNames{str2num(data.number)}, ' with extra sugar.'));
96    elseif(data.extraSugar == 0 && data.extraMilk == 1)
97      set(data.consoleOutput, 'string', cstrcat('Here is your ', ...
             data.coffeeNames{str2num(data.number)}, ' with extra milk.'));
98    else
```

```matlab
 99         set(data.consoleOutput, 'string', cstrcat('Here is your ', ...
               data.coffeeNames{str2num(data.number)}, '.'));
100      end
101      pause(2);
102      set(data.consoleOutput, 'string', 'Please take your coffee.');
103
104
105    else
106      set(data.consoleOutput, 'string', 'Please take your change');
107      data.hasChange = 1;
108      data.coffeePaid = 1;
109    end
110
111    guidata(gcf(), data);
112
113  end
```

This function is for all the interactions options that can be found in the intercation drop down menu like:

- Inserting coins

- Taking change

- Taking coffee

4 How To Use

How to use the coffee machine

Step1: Choose one of the coffee's on the left side of the application.

Step2: Enter the code of the coffe with the keypad on the right. If you think that you entered the code correctly press yes, else press no to reset the code input.

Step3: After selecting the coffee you want you will be asked do you want extra sugar. After pressing yes or no you will be asked the same question but for milk.

Step4: After answering the question about extras you will be prompted with the price of the coffee you selected. To insert coins into the coffee machine press on the Interactions option on the menu bar. Then you will see options to insert several types of coins (We accept only bosnian marks for the moment :)). After inserting the exact needed amount of money go to the next step. If you entered more money than needed you will be prompted to take your change. To take your change go to the Interactions menu and press on the take the change option.

Step5: Wait for the coffee to be made and enjoy the coffee making simulation.

Step6: To take the coffee go to the Interactions option and there you will the take the coffee option. Press it and enjoy your coffee :).

5 Resources Used

- https://www.mathworks.com/help/matlab/ref/guidata.html

- https://www.mathworks.com/help/matlab/ref/uicontrol.html

- https://wiki.octave.org/Uicontrols

- https://www.mathworks.com/help/matlab/ref/uipanel.html

- https://www.mathworks.com/help/matlab/ref/gca.html

- https://www.mathworks.com/help/matlab/ref/gcf.html

- https://www.mathworks.com/help/matlab/ref/gcbo.html