

Project Report

Coffee Vending Machine Using MATLAB GUI

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Submitted To:

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Objective:

The objective of this project is to design a user-friendly Coffee Vending Machine using MATLAB's GUI (Graphical User Interface). This machine allows users to:

- Select from 6 coffee types.
- Enter money for the coffee.
- Customize sugar and strength levels.
- Receive a final message with change details.

Features:

1. Welcome Panel:

A warm welcome screen with a "Start" button to initiate the coffee selection process.

2. Coffee Menu Panel:

- Offers 6 types of coffees: Espresso, Latte, Cappuccino, Mocha, Americano, Macchiato.
- Each coffee displays an image and its price.

3. Amount Entry Panel:

- Displays the price of the selected coffee.
- Allows the user to enter money.
- Displays an error message if the amount is insufficient.

4. Customization Panel:

- Allows the user to choose sugar level (0–5).
- Allows the user to choose coffee strength (1–5).

5. Final Panel:

- Displays the selected coffee, sugar and strength level, and the change returned.
- Provides options to Restart or Exit the machine.

Technologies Used:

- **MATLAB App Designer / GUIDE (Converted to App Designer)**
- **UI Controls:** uicontrol, uipanel, popupmenu, slider, axes
- **File I/O & Images:** Coffee images are displayed based on user selection.
- **Event Handling & Callbacks:** For interactive GUI transitions.

Learning Outcomes:

- Developed strong understanding of GUI components in MATLAB.
- Improved skills in user interaction handling and GUI design.
- Learned to manage code modularly using nested functions and callbacks.

Code:

```
function coffee_vending_machine()
    f = figure('Name', 'Coffee Vending Machine', ...
              'Position', [400 150 600 480], ...
              'MenuBar', 'none', 'NumberTitle', 'off', ...
              'Color', [0.94 0.9 0.85]);
    movegui(f, 'center');

    welcomePanel = uipanel(f, 'Position', [0 0 1 1],
                          'BackgroundColor', [0.96 0.87 0.78]);
    menuPanel = uipanel(f, 'Position', [0 0 1 1], 'Visible',
                      'off', 'BackgroundColor', [0.9 0.8 0.7]);
    amountPanel = uipanel(f, 'Position', [0 0 1 1],
                        'Visible', 'off', 'BackgroundColor', [0.9 0.8 0.7]);
    customPanel = uipanel(f, 'Position', [0 0 1 1],
                        'Visible', 'off', 'BackgroundColor', [0.9 0.8 0.7]);
    finalPanel = uipanel(f, 'Position', [0 0 1 1],
                       'Visible', 'off', 'BackgroundColor', [0.96 0.87 0.78]);

    data.selectedCoffee = '';
    data.price = 0;      data.image
    = '';               data.money = 0;
```

```

coffeeList = {
    'Espresso - Rs.100', ...
    'Latte - Rs.150', ...
    'Cappuccino - Rs.120', ...
    'Mocha - Rs.160', ...
    'Americano - Rs.110', ...
    'Macchiato - Rs.130'
};
coffeeImages = {
    'images/espresso.jpg', ...
    'images/latte.jpg', ...
    'images/cappuccino.jpg', ...
    'images/mocha.jpg', ...
    'images/americano.jpg', ...
    'images/macchiato.jpg'
};
coffeePrices = [100, 150, 120, 160, 110, 130];

uicontrol(welcomePanel, 'Style', 'text', 'String', '?
Welcome to Your Coffee Vending Machine ?', ...
    'FontSize', 22, 'FontWeight', 'bold', ...
'Position', [80 300 440 100],
'BackgroundColor', [0.96 0.87 0.78], ...
    'ForegroundColor', [0.36 0.2 0.09]);
    uicontrol(welcomePanel, 'Style',
'pushbutton', 'String', 'Start', ...
    'FontSize', 16, 'FontWeight', 'bold', ...
    'Position', [250 180 100 50], ...
'BackgroundColor', [0.55 0.27 0.07], 'ForegroundColor',
'white', ...
    'Callback', @(~,~) switchPanel(menuPanel,
welcomePanel));

    uicontrol(menuPanel, 'Style', 'text', 'String', 'Step
1 of 4: Select Your Coffee', ...
    'FontSize', 16, 'FontWeight', 'bold', ...
'Position', [180 390 280 80], 'BackgroundColor', [0.9 0.8
0.7], ...
    'ForegroundColor', [0.4 0.2 0]);
    coffeeMenu = uicontrol(menuPanel,
'Style', 'popupmenu', ...
    'String', coffeeList, 'Position', [200 340
200 35], 'FontSize', 14, ...
    'Callback', @updateCoffeeImage);

```

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        coffeeImageAxes = axes(menuPanel, 'Units', 'pixels',
'Position', [200 140 200 180]);
        showImage(coffeeImages{1}, coffeeImageAxes);
        uicontrol(menuPanel, 'Style', 'pushbutton',
'String', 'Next', ...
        'FontSize', 14, 'Position', [250 70 100
50], ...
        'BackgroundColor', [0.55 0.27 0.07],
'ForegroundColor', 'white', ...
        'Callback', @nextAmount);
        function updateCoffeeImage(~, ~)
idx = get(coffeeMenu, 'Value');
        showImage(coffeeImages{idx}, coffeeImageAxes);
end
        function nextAmount(~,~)            idx =
get(coffeeMenu, 'Value');
data.selectedCoffee = coffeeList{idx};
data.price = coffeePrices(idx);
data.image = coffeeImages{idx};
switchPanel(amountPanel, menuPanel);        end

priceText = uicontrol(amountPanel, 'Style', 'text',
'String', '', ...
        'FontSize', 14, 'Position', [240 320 150
40], 'BackgroundColor', [0.9 0.8 0.7]);
        uicontrol(amountPanel, 'Style', 'text',
'String', 'Step 2 of 4: Enter Money', ...
        'FontSize', 16, 'FontWeight', 'bold', ...
'Position', [180 390 280 40], 'BackgroundColor', [0.9 0.8
0.7], ...
        'ForegroundColor', [0.4 0.2 0]);
        moneyInput = uicontrol(amountPanel, 'Style',
'edit', ...
        'Position', [220 280 150 35], 'FontSize',
14, 'BackgroundColor', 'white');
        moneyMsg = uicontrol(amountPanel, 'Style',
'text', 'String', '', ...
        'FontSize', 12, 'Position', [180 220 250
40], ...
        'ForegroundColor', 'r', 'BackgroundColor',
[0.9 0.8 0.7]);
        uicontrol(amountPanel, 'Style',
'pushbutton', 'String', 'Next', ...
        'FontSize', 14, 'Position', [250 140 100
50], ...

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        'BackgroundColor', [0.55 0.27 0.07],
'ForegroundColor', 'white', ...
        'Callback', @checkAmount);

addlistener(menuPanel, 'Visible', 'PostSet', @(src, ev)
updatePriceText());      addlistener(amountPanel,
'Visible', 'PostSet', @(src, ev) updatePriceText());

    function updatePriceText()
        if strcmp(get(amountPanel, 'Visible'), 'on')
set(priceText, 'String', sprintf('Price: Rs.
%d', data.price));
end        end
    function checkAmount(~,~)
        entered = str2double(get(moneyInput, 'String'));
if isnan(entered) || entered < data.price
set(moneyMsg, 'String',
sprintf('Insufficient! Price is Rs. %d', data.price));
else        data.money = entered;
set(moneyMsg, 'String', '');
switchPanel(customPanel, amountPanel);        end
    end

uicontrol(customPanel, 'Style', 'text', 'String', 'Step 3
of 4: Customize Your Coffee', ...
        'FontSize', 16, 'FontWeight', 'bold', ...
'Position', [160 390 320 60], 'BackgroundColor', [0.9 0.8
0.7], ...
        'ForegroundColor', [0.4 0.2 0]);
    uicontrol(customPanel, 'Style', 'text',
'String', 'Sugar Level (0-5):', ...
        'FontSize', 14, 'Position', [150 320 150
30], 'BackgroundColor', [0.9 0.8 0.7]);
    sugarSlider = uicontrol(customPanel,
'Style', 'slider', ...
        'Min', 0, 'Max', 5, 'Value', 2, ...
        'Position', [300 325 150 25]);
    uicontrol(customPanel, 'Style', 'text',
'String', 'Strength (1-5):', ...
        'FontSize', 14, 'Position', [150 260 150
30], 'BackgroundColor', [0.9 0.8 0.7]);
    strengthSlider = uicontrol(customPanel,
'Style', 'slider', ...
        'Min', 1, 'Max', 5, 'Value', 3, ...
        'Position', [300 265 150 25]);

```

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        uicontrol(customPanel, 'Style',
'pushbutton', 'String', 'Finish', ...
        'FontSize', 14, 'Position', [250 150 100
50], ...
        'BackgroundColor', [0.55 0.27 0.07],
'ForegroundColor', 'white', ...
        'Callback', @finalScreen);

function finalScreen(~,~)
    sugar = round(get(sugarSlider, 'Value'));
    strength = round(get(strengthSlider, 'Value'));
    change = data.money - data.price;

    delete(allchild(finalPanel));

    msg = sprintf(['Enjoy your %s!\nSugar
Level: %d | Strength: %d\n' ...
        'Change: Rs. %d\n\nThank you for
using the vending machine!'], ...
        data.selectedCoffee, sugar,
strength, change);

    uicontrol(finalPanel, 'Style', 'text', 'String',
msg, ...
        'FontSize', 14, 'Position', [80 150 440
200], ...
        'BackgroundColor', [0.96 0.87 0.78],
'ForegroundColor', [0.36 0.2 0.09]);
    uicontrol(finalPanel, 'Style',
'pushbutton', 'String', 'Restart', ...
        'FontSize', 14, 'Position', [150 20 120
40], ...
        'BackgroundColor', [0.55 0.27 0.07],
'ForegroundColor', 'white', ...
        'Callback', @(~,~) restart());
    uicontrol(finalPanel, 'Style',
'pushbutton', 'String', 'Exit', ...
        'FontSize', 14, 'Position', [320 20 120
40], ...
        'BackgroundColor', [0.7 0.1 0.1],
'ForegroundColor', 'white', ...
        'Callback', @(~,~) close(f));

    switchPanel(finalPanel, customPanel);
end

```

```

function restart()
data.selectedCoffee = '';
data.price = 0;
data.image = '';
data.money = 0;

    set(coffeeMenu, 'Value', 1);
    showImage(coffeeImages{1}, coffeeImageAxes);
set(moneyInput, 'String', '');          set(moneyMsg,
'String', '');          set(sugarSlider, 'Value', 2);
set(strengthSlider, 'Value', 3);

    switchPanel(welcomePanel, finalPanel);
end

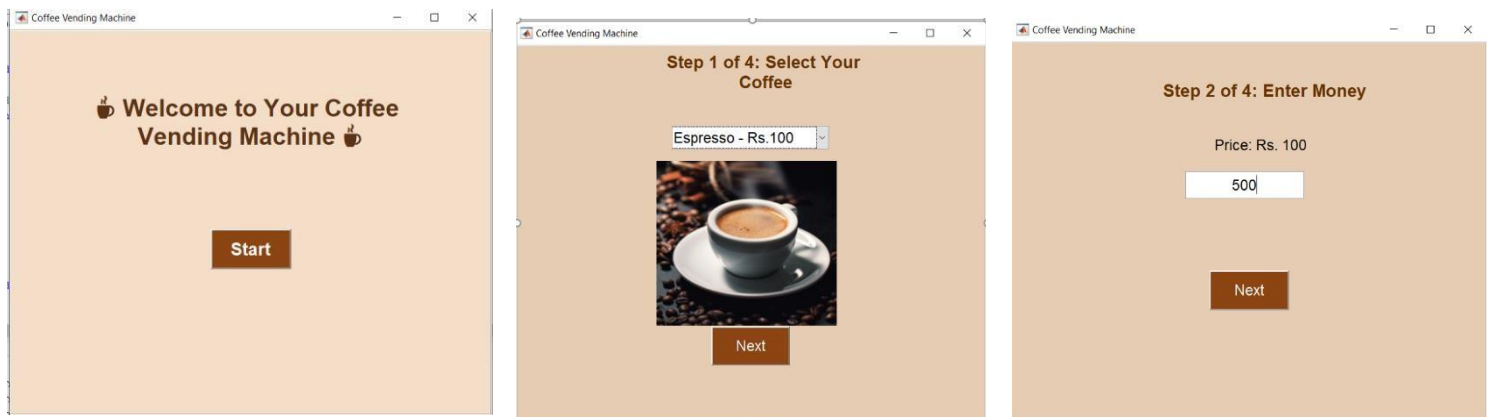
function switchPanel(toShow, toHide)
set(toHide, 'Visible', 'off');
set(toShow, 'Visible', 'on');

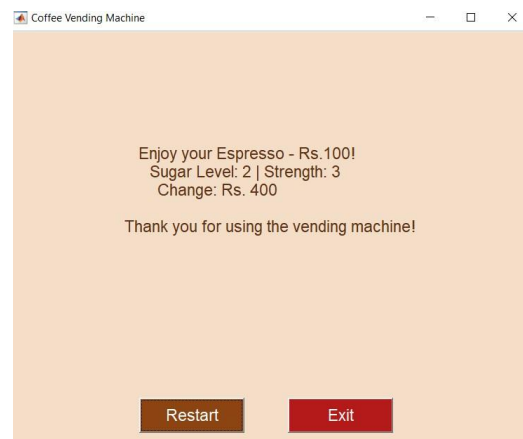
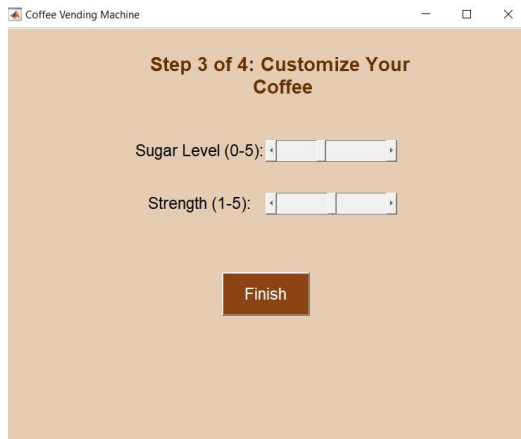
if toShow == amountPanel                set(priceText,
'String', sprintf('Price: Rs.
%d', data.price));
end      end

function showImage(filename, ax)        if
exist(filename, 'file')                img =
imread(filename);                    axes(ax);
imshow(img);                        else        cla(ax);
text(0.5, 0.5, 'No Image', 'Parent', ax, ...
'HorizontalAlignment', 'center', 'FontSize', 14, ...
'Color', [0.6 0.4 0.2]);
end      end end

```

Output:





Conclusion:

This project successfully simulates a real-world coffee vending machine using an interactive MATLAB GUI. It provides a smooth user experience, handles input validations, and allows full customization of coffee, making it a useful educational and simulation tool.
