**Part II:**

**Bonus:**

1. **.m file (GUI Script):**

function varargout = No\_3\_PID\_Controller(varargin)

%

gui\_Singleton = 1;

gui\_State = struct('gui\_Name', mfilename, ...

'gui\_Singleton', gui\_Singleton, ...

'gui\_OpeningFcn', @ No\_3\_PID\_Controller\_OpeningFcn, ...

'gui\_OutputFcn', @ No\_3\_PID\_Controller\_OutputFcn, ...

'gui\_LayoutFcn', [] , ...

'gui\_Callback', []);

if nargin && ischar(varargin{1})

gui\_State.gui\_Callback = str2func(varargin{1});

end

if nargout

[varargout{1:nargout}] = gui\_mainfcn(gui\_State, varargin{:});

else

gui\_mainfcn(gui\_State, varargin{:});

end

% --- Executes just before No\_3\_PID\_Controller is made visible.

function No\_3\_PID\_Controller\_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 untitled1 (see VARARGIN)

%%% %%%

%%% Start Changes %%%

%%% %%%

model\_open(handles)

% Choose default command line output for final

handles.output = hObject;

% Update handles structure

guidata(hObject, handles);

% Now we can use the figure, as required.

% Set model parameters to match GUI settings

model\_open(handles)

%%% %%%

%%% End Changes %%%

%%% %%%

% Choose default command line output for No\_3\_PID\_Controller

handles.output = hObject;

% Update handles structure

guidata(hObject, handles);

% --- Outputs from this function are returned to the command line.

function varargout = No\_3\_PID\_Controller\_OutputFcn(hObject, eventdata, handles)

% varargout cell array for returning output args (see VARARGOUT);

% hObject handle to figure

% eventdata reserved - to be defined in a future version of MATLAB

% handles structure with handles and user data (see GUIDATA)

% Get default command line output from handles structure

varargout{1} = handles.output;

%end function No\_3\_PID\_Controller

%%% %%%

%%% Start Changes %%%

%%% %%%

% Ensure that the Simulink model is open

function model\_open(handles)

% Make sure the diagram is still open

if isempty(find\_system('Name','No\_3\_PID\_Controller\_Simulink')),

% check whether our Simulink model is opened or not

open\_system('No\_3\_PID\_Controller\_Simulink');

end

%endfunction model\_open

%%% %%%

%%% End Changes %%%

%%% %%%

function edit1\_Callback(hObject, eventdata, handles)

% hObject handle to edit1 (see GCBO)

% eventdata reserved - to be defined in a future version of MATLAB

% handles structure with handles and user data (see GUIDATA)

% Ensure model is open

model\_open(handles)

% Get the new value

kp\_NewStrVal = get(hObject,'String');

kp\_NewVal = str2double(kp\_NewStrVal);

% Set the Gain parameter of the Kp Gain Block to the new value

set\_param('No\_3\_PID\_Controller\_Simulink/Proportional\_Gain','Gain',kp\_NewStrVal);

% --- Executes during object creation, after setting all properties.

function edit1\_CreateFcn(hObject, eventdata, handles)

% hObject handle to edit1 (see GCBO)

% eventdata reserved - to be defined in a future version of MATLAB

% handles empty - handles not created until after all CreateFcns called

% Hint: edit controls usually have a white background on Windows.

% See ISPC and COMPUTER.

if ispc && isequal(get(hObject,'BackgroundColor'), get(0,'defaultUicontrolBackgroundColor'))

set(hObject,'BackgroundColor','white');

end

function edit2\_Callback(hObject, eventdata, handles)

% hObject handle to edit2 (see GCBO)

% eventdata reserved - to be defined in a future version of MATLAB

% handles structure with handles and user data (see GUIDATA)

% Ensure model is open

model\_open(handles)

% Get the new value

ki\_NewStrVal = get(hObject,'String');

ki\_NewVal = str2double(ki\_NewStrVal);

% Set the Gain parameter of the Ki Gain Block to the new value

set\_param('No\_3\_PID\_Controller\_Simulink/Integral\_Gain','Gain',ki\_NewStrVal);

% --- Executes during object creation, after setting all properties.

function edit2\_CreateFcn(hObject, eventdata, handles)

% hObject handle to edit2 (see GCBO)

% eventdata reserved - to be defined in a future version of MATLAB

% handles empty - handles not created until after all CreateFcns called

% Hint: edit controls usually have a white background on Windows.

% See ISPC and COMPUTER.

if ispc && isequal(get(hObject,'BackgroundColor'), get(0,'defaultUicontrolBackgroundColor'))

set(hObject,'BackgroundColor','white');

end

function edit3\_Callback(hObject, eventdata, handles)

% hObject handle to edit3 (see GCBO)

% eventdata reserved - to be defined in a future version of MATLAB

% handles structure with handles and user data (see GUIDATA)

% Ensure model is open

model\_open(handles)

% Get the new value

kd\_NewStrVal = get(hObject,'String');

kd\_NewVal = str2double(kd\_NewStrVal);

% Set the Gain parameter of the Kd Gain Block to the new value

set\_param('No\_3\_PID\_Controller\_Simulink/Derivative\_Gain','Gain',kd\_NewStrVal);

% --- Executes during object creation, after setting all properties.

function edit3\_CreateFcn(hObject, eventdata, handles)

% hObject handle to edit3 (see GCBO)

% eventdata reserved - to be defined in a future version of MATLAB

% handles empty - handles not created until after all CreateFcns called

% Hint: edit controls usually have a white background on Windows.

% See ISPC and COMPUTER.

if ispc && isequal(get(hObject,'BackgroundColor'), get(0,'defaultUicontrolBackgroundColor'))

set(hObject,'BackgroundColor','white');

end

% --- Executes on button press in simulatebutton.

function simulatebutton\_Callback(hObject, eventdata, handles)

% hObject handle to simulatebutton (see GCBO)

% eventdata reserved - to be defined in a future version of MATLAB

% handles structure with handles and user data (see GUIDATA)

myfunc()

function myfunc

a = sim('No\_3\_PID\_Controller\_Simulink','SimulationMode','normal');%PID simulation

b = a.get('Input\_Data');

c = a.get('Output\_Data'); %import data

assignin('base','Input\_Data',b);

assignin('base','Output\_Data',c);

% --- Executes on button press in plotbutton.

function plotbutton\_Callback(hObject, eventdata, handles)

sim('No\_3\_PID\_Controller\_Simulink');

axes(handles.axes1)

x1=Input\_Data(:,1);

y1=Input\_Data(:,2);

x2=Output\_Data(:,1);

y2=Output\_Data(:,2);

plot(x1,y1);

grid on;

axis([min(x1) max(x1) min(y2)-0.5 max(y2)+0.5]);

axes(handles.axes2)

x1=Input\_Data(:,1);

y1=Input\_Data(:,2);

x2=Output\_Data(:,1);

y2=Output\_Data(:,2);

plot(x2,y2);

grid on;

axis([min(x1) max(x1) min(y2)-0.5 max(y2)+0.5]);

1. **.fig file (GUI Figure) with waveforms:**

