RIYA Week 1 Presentation

Review and Exploration of MATLAB Code

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Objective

- To annotate, review and explore the MATLAB Code used to analyse the force-deflection behavior and other characteristics of the 2-spring stack

Tasks accomplished

- Refactored and simplified sections of code for better readability
- Improved graph quality by adding labels and title
- Created a crude GUI for visualizing the results better
- Altered parameters to see different results

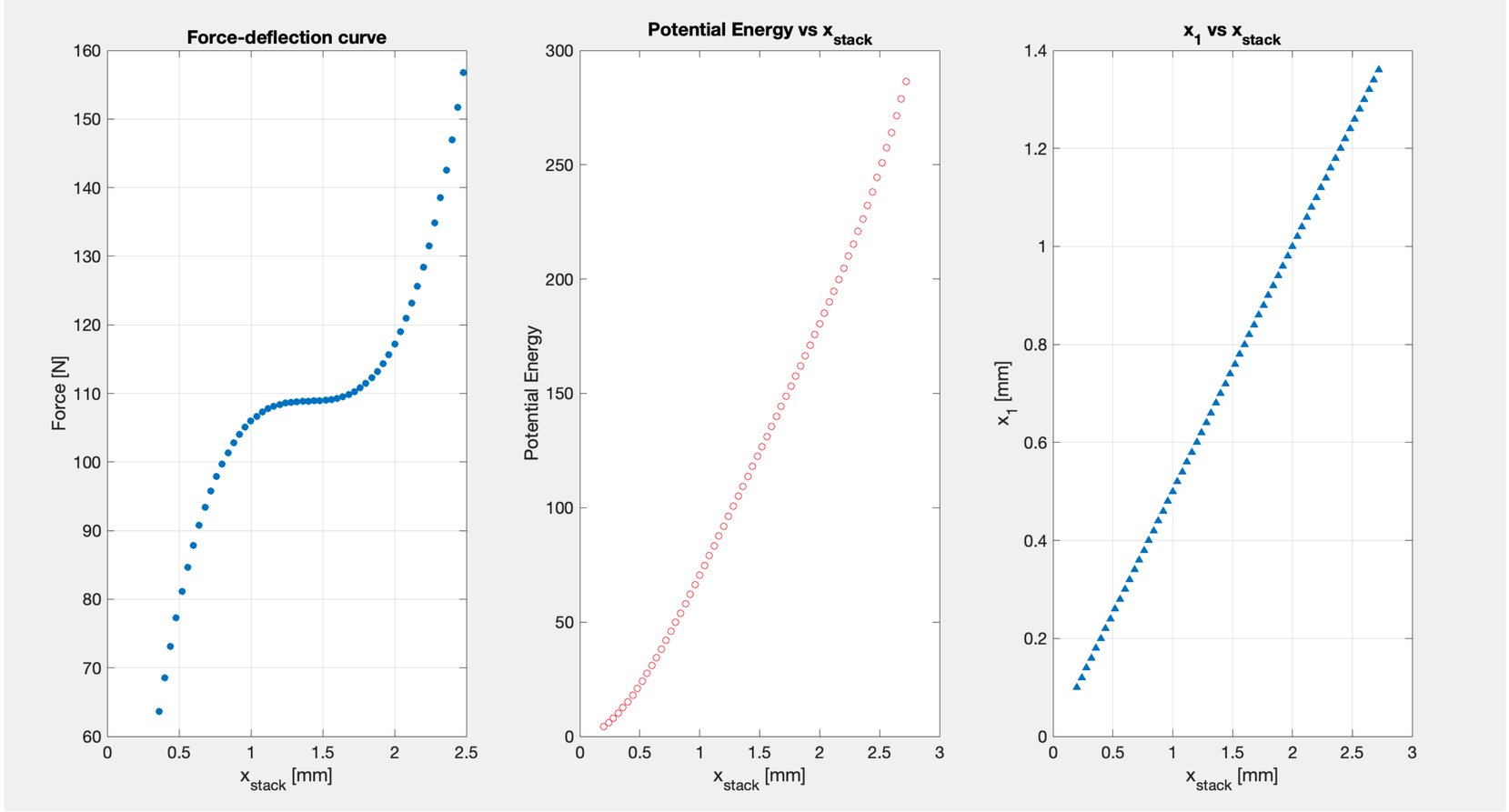
Annotated and simplified code

Editor - /Users/jacobsony/Documents/IITB/RIYA/RIYA project/Code/stack_equations_solver_mm_2spring

stack_equations_solver_mm_2springs_annotated.m

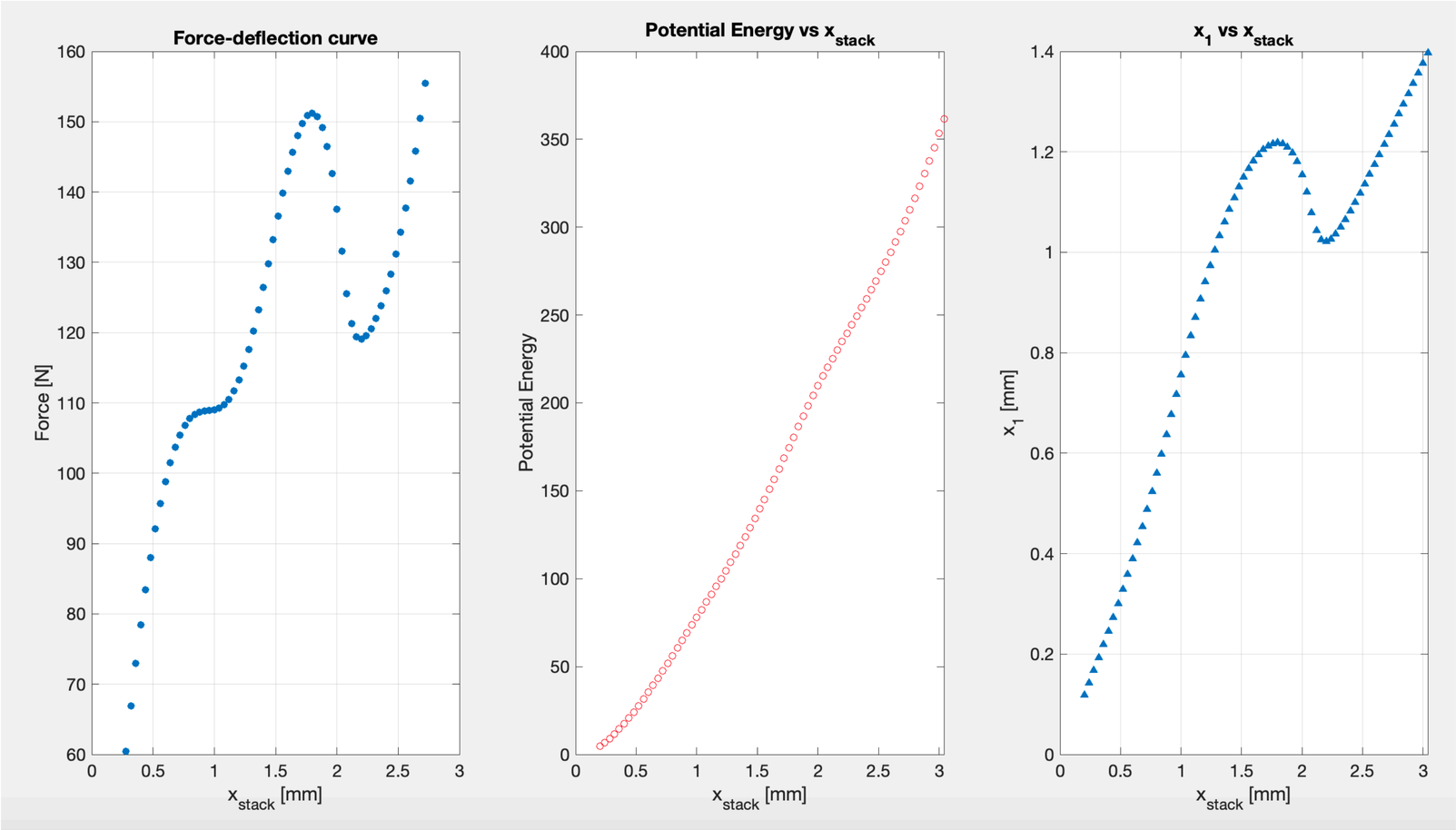
```
%% Annotated and simplified version of the MATLAB Code used to analyse the 2-spring stack

% The code below is used to solve the 2-spring stack non-linear equations
% in order to obtain the force-deflection behaviour and potential energy
% curves of the 2-spring stack

clear all;
close all;
clc;
Colors = lines(6);
%% Parameters - Material Properties and Spring Geometry

E = 200*10^9/1e6;  % N/mm^2
a = 34.5/2;        % outer diameter, mm
b = 22.4/2;        % inner diameter, mm
t = 0.5;           % thickness, mm

% h/t ratios of Spring 1
ht1_list = 1.6;
%ht1_list =1.69;
%ht1_list = 1.18:.01:1.41;
%ht1_list = 1.30:.04:2.2;

% h/t ratios of Spring 2
ht2_list = 2.1;
%ht2_list =1.75;
%ht2_list = 1.19:.01:1.41;
%ht2_list = 1.28:.04:2.2;

dx = .04; % step size [mm] - Smalleset variation in delta_st
closeness_tolerance = .1475; % Used in algorithm for detecting snap-through evenets
direction = 1; % Forward or reverse sweep (1 or -1);
```

Improved visualization - 1



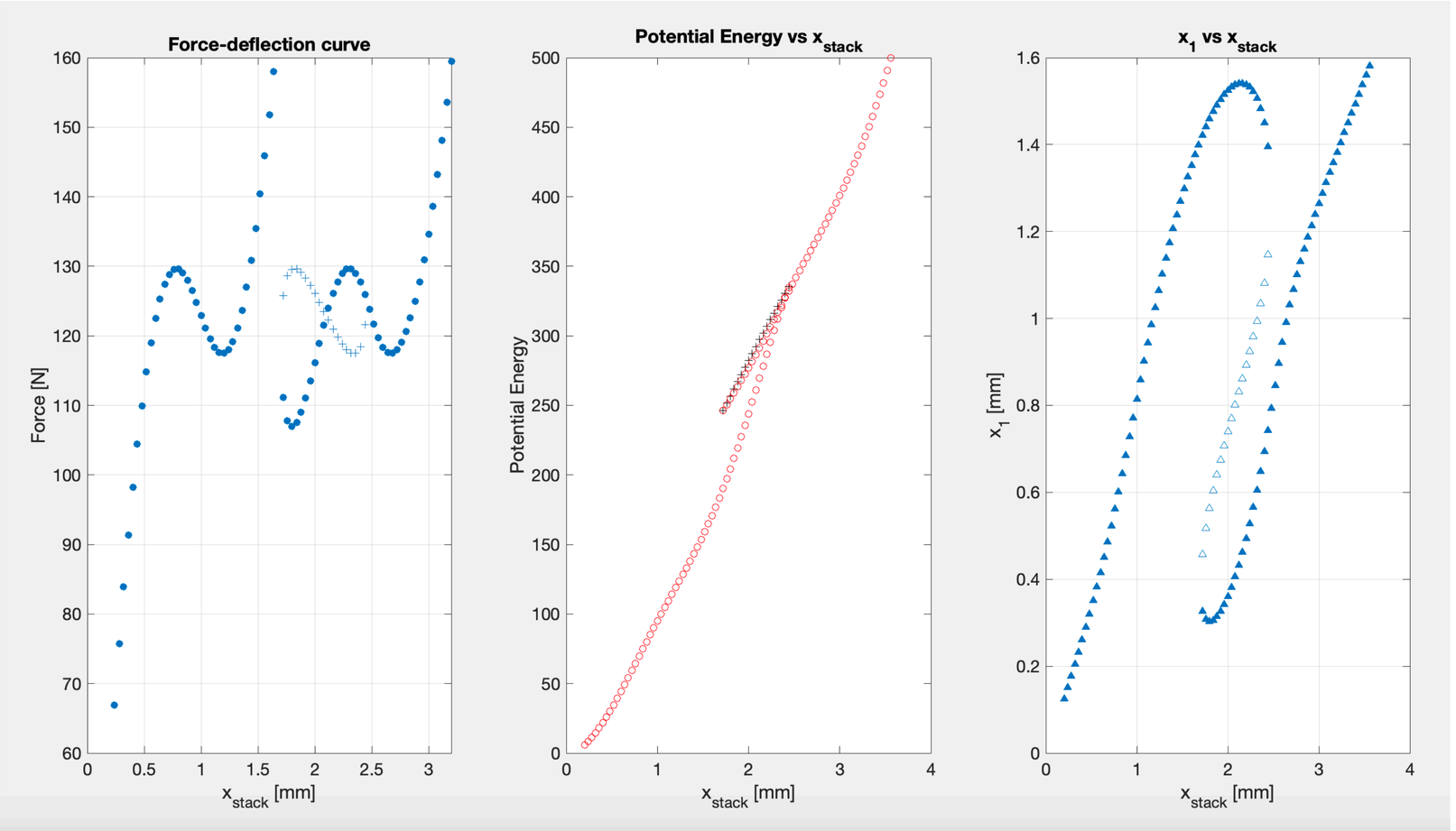
Case 1 : $\frac{h_1}{t} = \frac{h_2}{t} = 1.41$

Improved visualization - 2



Case 2 : $\frac{h_1}{t} = 1.41, \frac{h_2}{t} = 1.75$

Improved visualization - 3



Case 3 : $\frac{h_1}{t} = 1.6, \frac{h_2}{t} = 2.1$

Scope for Future work

- Abstract sections of code using **functions**
- Rename some of the variables for better personal interpretability
- Possible improvement in code efficiency - preallocate arrays beforehand, etc
- Improve the graphical interface / windows for seeing the graphs better
- Incorporate an animation that shows the compression of the spring-stack