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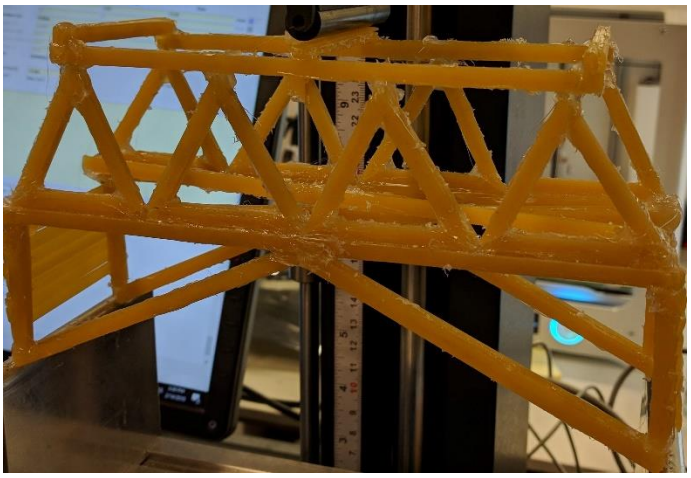
GE1501/1502 MWT



Contents

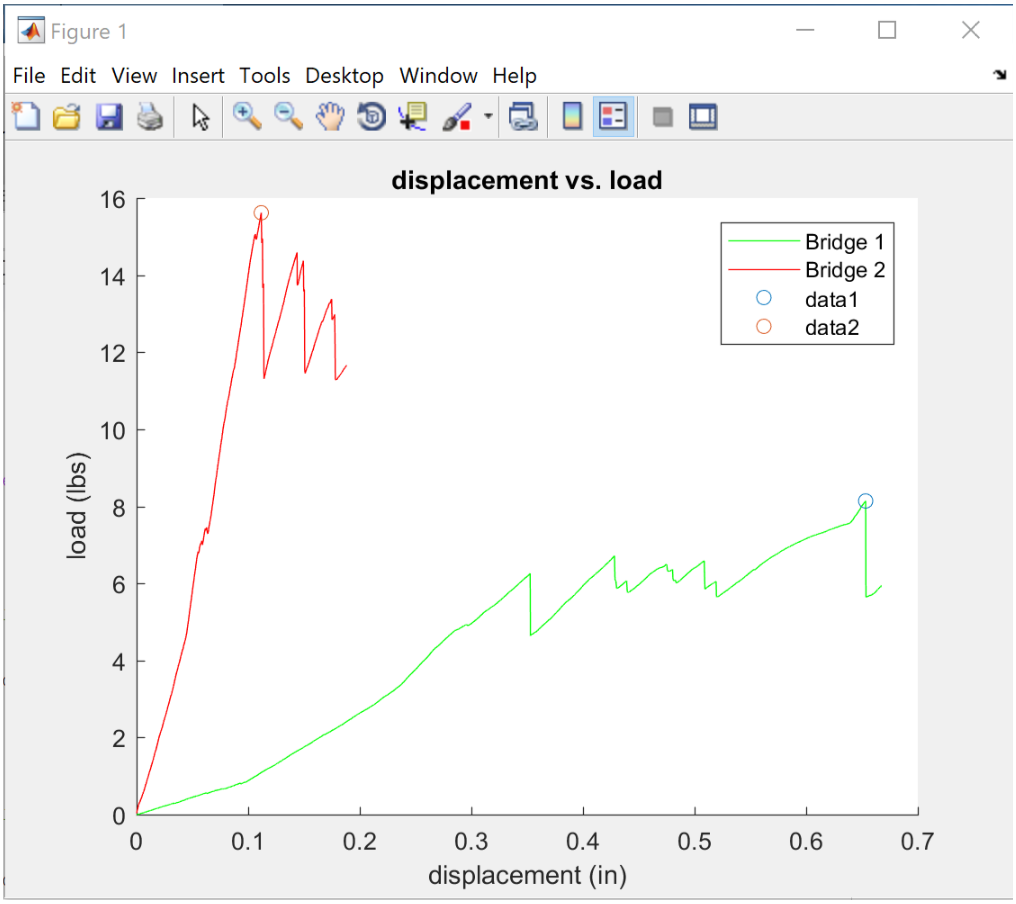
Write Up:

Reflecting on both bridges and performance, Bridge two had almost twice the strength to wait ratio than Bridge one. Bridge two was .052 pounds heavier, but was able to hold 7.48 pounds more. Bridge two had a similar warren truss top, but also had an addition 4 triangles supporting the middle of the bridge. The triangles on the top level of the bridge were also sanded and fit better than bridge one. These changes allowed bridge two to have nearly a 91% increase than bridge 1.

While coding matlab for this project I had a little difficulty using the max() function on matlab. I had never used it before with an array with more than two columns. My data had a column for load and another for position. When the max() function is called using my data it returns an array with the max of each column. However, I wanted the max load and its corresponding position value. I instead had to write my own algorithm for it. In the Algorithm I had a for loop find the max load (like we had learned in class), but instead of saving the max position value I saved the position of where in the data the max position value was. I was then able to find the corresponding position value using the position I had found using the for loops.

Throughout the past semester, GE has explored many different commands and applications MatLab has. Instead of learning how to code I have been able to understand what it means to code through the scope of an engineer. At home I learned how to code because I wanted to make video games. Although that taught me a very intuitive approach to programming, I did not know how to do anything but make games. MatLab has taught me what it means to use code to manipulate, understand, and store data.

Bridge Graph:



Function to calculate toughness:

```
function [ toughness ] = toughness( Bridge, failed )

    %add up toughness for each data set until the estimated failed point
    for i = 1: 2004
        if Bridge(i,2) > failed
            break; %exit the for loop
        end

       toughness = toughness + (Bridge(i+1,2) - Bridge(i,2)) * ((Bridge(i+1,1) +
Bridge(i,1))/2);
    end
    %fprintf('Sum of all Rectangles: %-.2f\n',toughness1);

end
```

Main ML4 Code:

```
clc;
clear;

load BridgeData1.txt
Bridge1 = BridgeData1;

load BridgeData2.txt
Bridge2 = BridgeData2;

for i = 1: 2004
    Bridge1(i,2) = BridgeData1(i,2) - BridgeData1(1,2);
    if i < 566
        Bridge2(i,2) = BridgeData2(i,2) - BridgeData2(1,2);
    end

end

%plot bridge1 and bridge2
hold on
plot(Bridge1(:,2),Bridge1(:,1),'g');

plot(Bridge2(:,2),Bridge2(:,1),'r');

%set graph variables
title('displacement vs. load');
xlabel('displacement (in)');
ylabel('load (lbs)');
legend('Bridge 1', 'Bridge 2');


%find max on bridge1
max1 = 1;
for i =  1: 2004
    if Bridge1(i,1) > Bridge1(max1,1)
        max1 = i;
    end
end
scatter(Bridge1(max1,2),Bridge1(max1,1))


%find max on bridge2
max2 = 1;
for i =  1: 565
    if Bridge2(i,1) > Bridge2(max2,1)
        max2 = i;
    end
end
scatter(Bridge2(max2,2),Bridge2(max2,1))

weight1 = input('Please enter the weight of bridge #1 in lbs: ');
weight2 = input('Please enter the weight of bridge #2 in lbs:');

fprintf('\nPlease examine your plots and determine the displacement \nvalue where you reach
catastrophic failure\n');



%where did we fail for bridge1?
failed1 = input('\nPlease enter a failure displacement value for Bridge #1: ');
toughness1 = toughness(Bridge1, failed1);



%where did we fail for bridge2?
failed2 = input('Please enter a failure displacement value for Bridge #2: ');
toughness2 = toughness(Bridge2, failed2);

%fprintf('Sum of all Rectangles : %-.2f\n',toughness2);

%second bridge weight is .225
%first bridge weight is .173
```

Main ML4 Code (Cont):

```
%output all of our data to a .txt file named Hulsey_ML4_results
fileID = fopen('Hulsey_ML4_results.txt','w');

fprintf(fileID, '                                                Bridge #1    Bridge #2\n');
fprintf(fileID, 'Maximum Load (lbs):                             %-.2f         %-
.2f\n',Bridge1(max1,1),Bridge2(max2,1));
fprintf(fileID, 'Toughness by catastrophic failure (in-lbs):  %-.2f         %-.2f\n',toughness1,
toughness2);
fprintf(fileID, 'Strength to Weight Ratio:                       %-.2f        %-
.2f\n',(Bridge1(max1,1) / weight1),(Bridge2(max2,1) / weight2));
fprintf(fileID, 'Toughness to Weight Ratio:                      %-.2f        %-
.2f\n',(toughness1/weight1), (toughness2/weight2));

fclose(fileID);
```