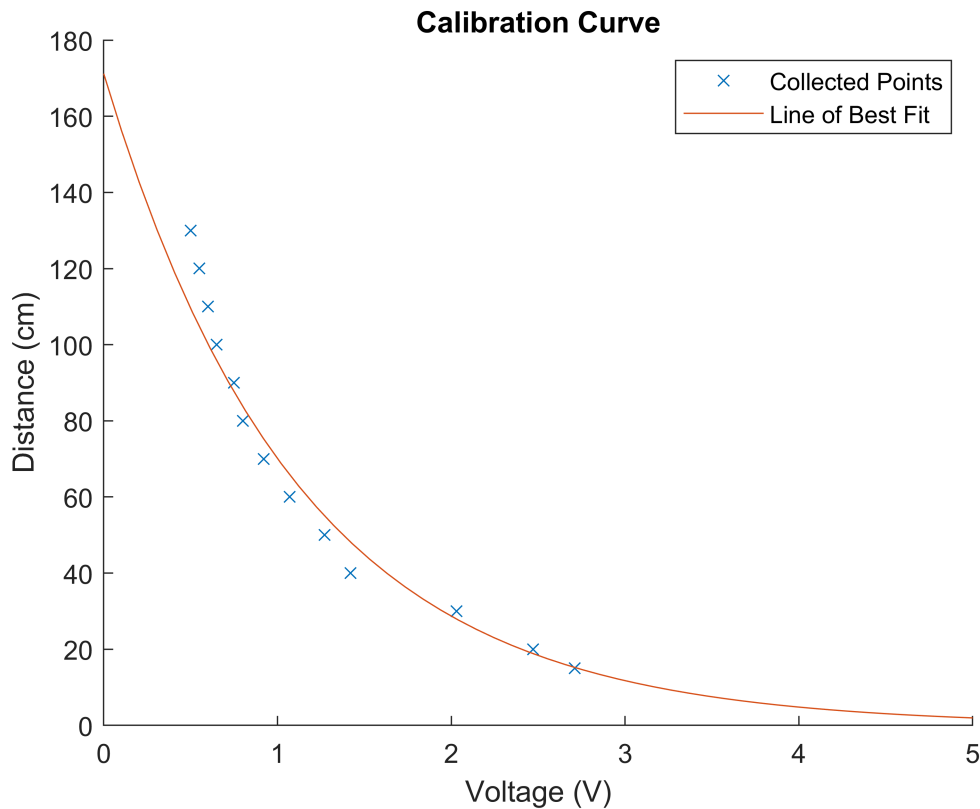


```
clear all
load('fullScan.mat');
```

Calibrate Distance to Voltage

```
%collected IR calibration data
calibrateData = [15, 2.71;
    20, 2.47;
    30, 2.03;
    40, 1.42;
    50, 1.27;
    60, 1.07;
    70, 0.92;
    80, 0.8;
    90, 0.75;
    100, 0.65;
    110, 0.6;
    120, 0.55;
    130, 0.5];
calibrateDataDistance = calibrateData(:, 1);
calibrateDataVoltage = calibrateData(:, 2);
%cftool          %use this tool to find the line of best fit
a = 171.1799;
b = -0.8929;
x = linspace(0, 5, 50);
calCurve = a*exp(b*x);

% Plot Calibration Information
figure(1)
hold on
plot(calibrateDataVoltage, calibrateDataDistance, "x")
plot(x, a*exp(b*x))
hold off
title("Calibration Curve")
ylabel("Distance (cm)")
xlabel("Voltage (V)")
legend("Collected Points", "Line of Best Fit")
```



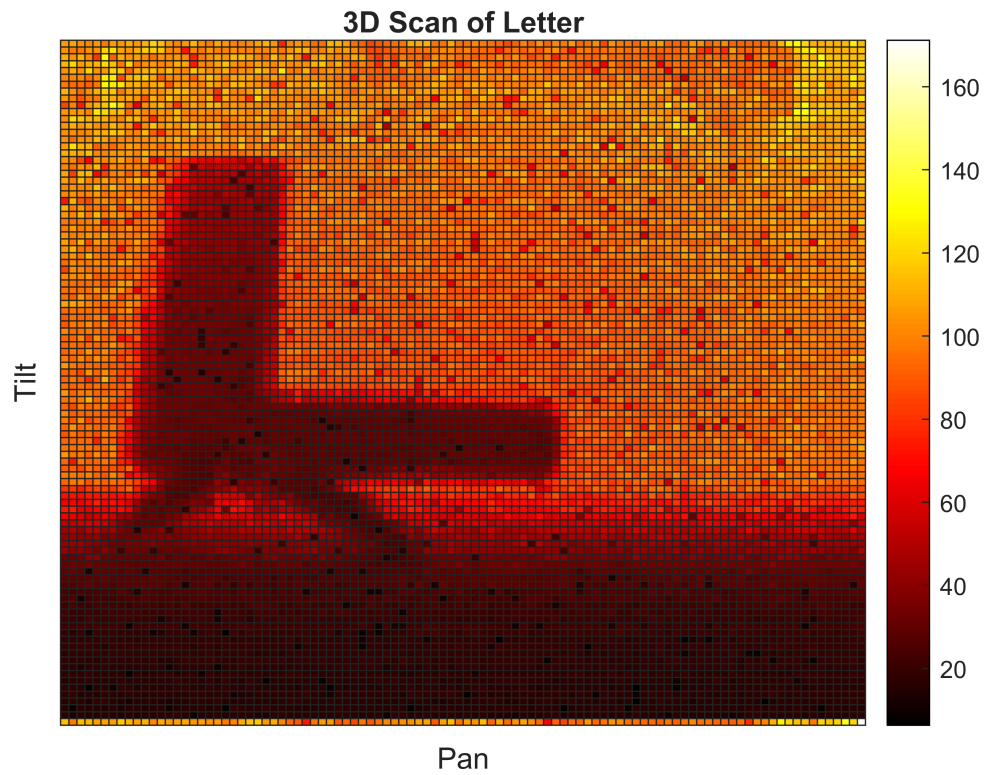
Creating the heatmap of the scan

```
Az = sensorData(3, :); % Azimuth - pan angle
El = sensorData(2, :); % Elevation - tilt angle
Rd = sensorData(1, :); % voltage data

pan = fliplr(Az); % Flip because our data collects upside down
tilt = fliplr(El); % Flip because our data collects upside down
dist = a*exp(b*Rd); % Convert Voltage to Distance using line of best fit above

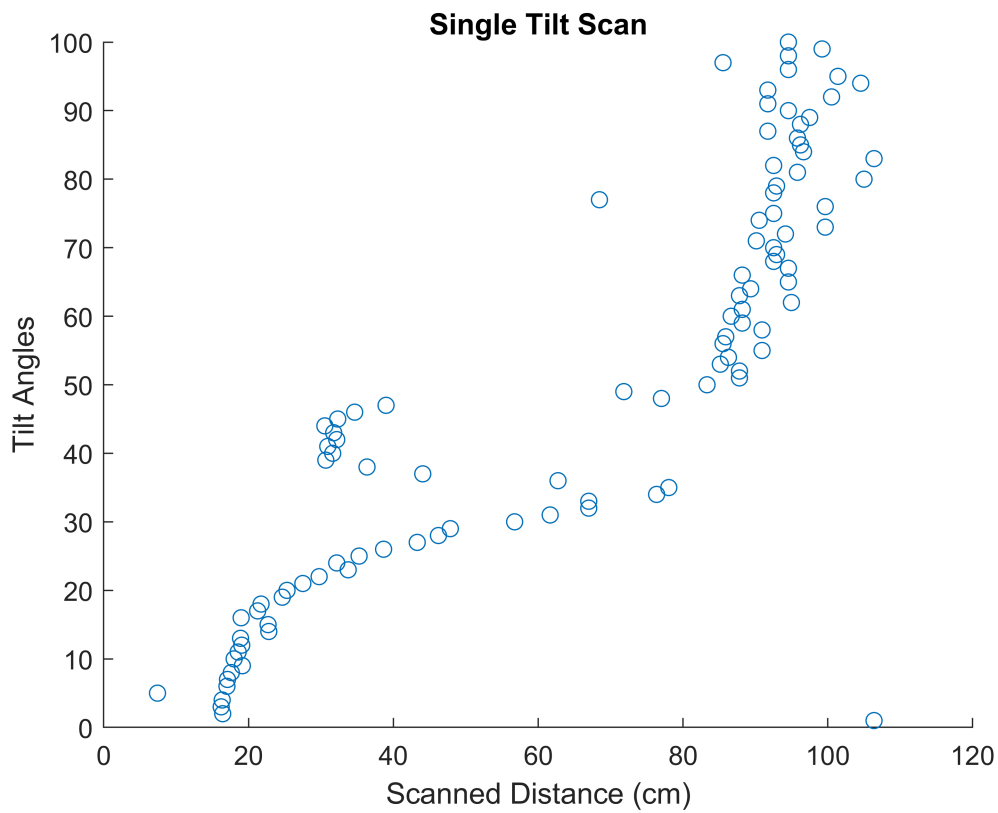
refitArray = [dist; tilt; pan]'; % transpose array to make it vertical
dataTable = array2table(refitArray, 'VariableNames', {'Distance', 'Tilt', 'Pan'});

% Create heatmap
SCAN = heatmap(dataTable, "Pan", "Tilt", 'ColorVariable', "Distance", "Title", "3D Scan of Letter",
% Get rid of tick labels
SCAN.XDisplayLabels = nan(size(SCAN.XDisplayData));
SCAN.YDisplayLabels = nan(size(SCAN.YDisplayData));
```



Display single scan

```
load("SingleAxisScan.mat")  
  
scatter(singleScan(2, :), 1:length(singleScan))  
xlabel("Scanned Distance (cm)")  
ylabel("Tilt Angles")  
title("Single Tilt Scan")
```



Display Error Plot

```
load("ErrorPlotData.mat")

a = 171.1799;
b = -0.8929;
positionData(:,3) = a*exp(b*positionData(:,2));

stem(positionData(:,1), positionData(:,1)-positionData(:,3))
xlim([0 110])
xlabel("Distance (cm)")
ylabel("Residuals (Measured Distance - Curve Fit Distance)")
title("Residuals of Fitted Curve")
```

