

Bang Bang Control

Open serial to Pico data port

```
clear s % closes ports already open
s = serialport('COM4',9600) % Check COM#
```

```
s =
  Serialport with properties:

    Port: "COM4"
  BaudRate: 9600
 NumBytesAvailable: 0

Show all properties, functions
```

Calculate linear fit parameters to find base voltages

```
duty_cycle = [50 55 60 65 70 75]; % expiremented duty cycles
height = [3.352055 6.177309 8.201722 10.70005 15.25231 18.58077];
%hole_num = [3.5 5 6.5 7.5 9.5 11 12]; % resultant hold number

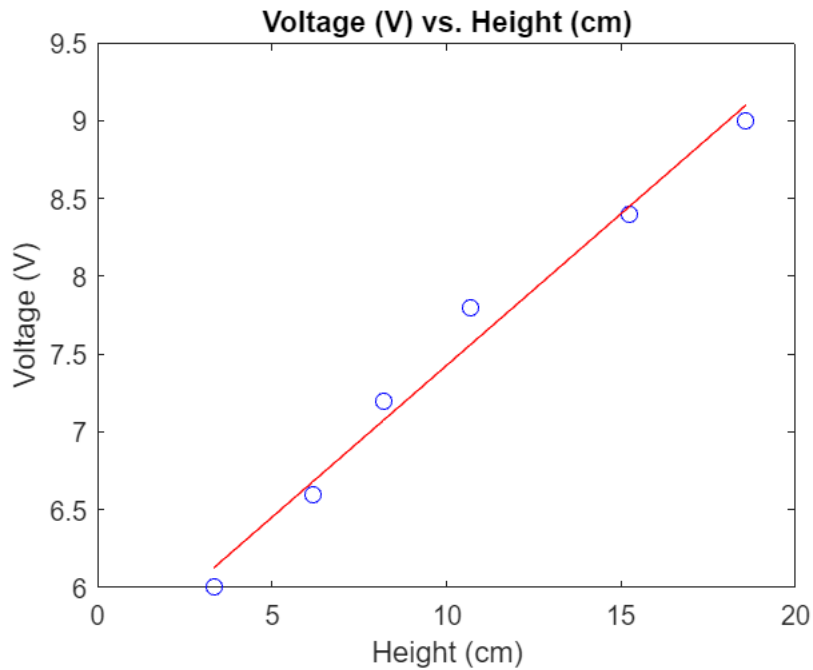
voltage = (duty_cycle ./ 100) .* 12; % convert duty_cycle to fan voltage
%height = hole_num .* 2; % convert hole_num to ball height

plot(height, voltage, 'bo') % plot data points

pfit = polyfit(height,voltage,1); % fit line to data
pval = polyval(pfit, height); % evaluate fitted line

hold on
plot(height, pval, 'r') % plot fitted line
hold off

title("Voltage (V) vs. Height (cm)")
xlabel("Height (cm)")
ylabel("Voltage (V)")
```



```
% extract parameters
```

```
a = pfit(1)
```

```
a = 0.1950
```

```
b = pfit(2)
```

```
b = 5.4767
```

Send request for number of samples to Pico and begin live plotting

```
desired_height = 10;
s.writeline(num2str(desired_height)) % send desired height to Pico

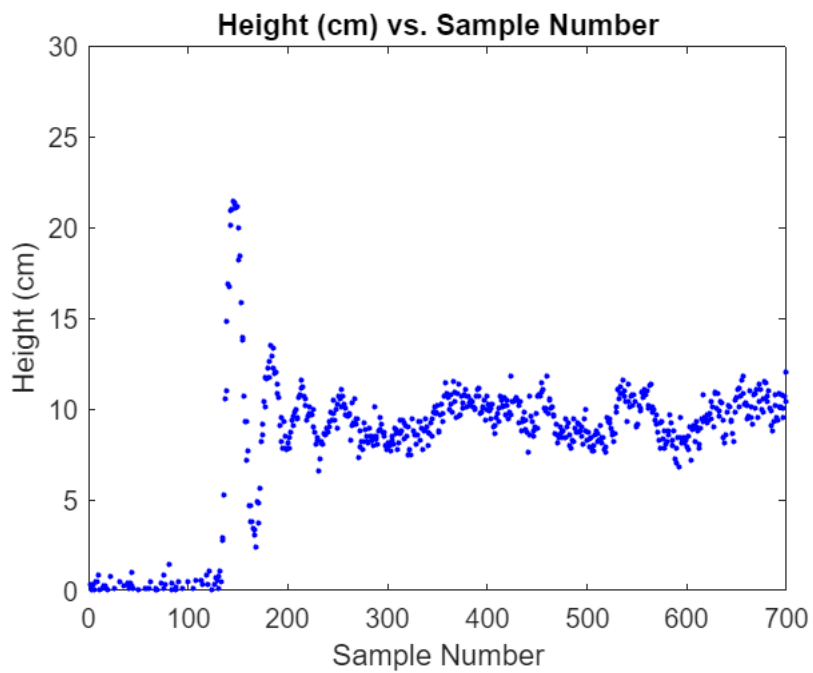
samples = 700;
s.writeline(num2str(samples)) % send number of samples to Pico

data = zeros(1, samples); % create empty row vector for data collection

% loop for every sample
for i = 1:samples
    data(i) = s.readline(); % receive distance from serial
    plot(i,data(i),'b.') % plot data

    title("Height (cm) vs. Sample Number")
    xlabel("Sample Number")
    ylabel("Height (cm)")
    axis([0 samples 0 30]) % x and y axis limits
    hold on
end
```

```
hold off
```



```
save data3_04_05_2024.mat data
```

```
load data3_04_05_2024.mat

plot(data, "b")
hold on
yline(10, "r", "LineWidth", 2)
hold off
xlim([300 500])
%xlim([0 500])
title("Height (cm) vs. Sample Number Trial 4 Zoomed")
xlabel("Sample Number")
ylabel("Height (cm)")
legend("Sensor Reading", "Desired Height")
```

