Project 1: Bonk

Ethan Storer

Numerical Methods ME 355

Section A

Code Written on September 30, 2022

Report Submitted on September 30, 2022

I have neither given or received, nor have I tolerated others' use of unauthorized aid.

-Ethan Storer

Introduction:

This code predicts the needed launch angle to hit a target at a specified location. Given initial velocity, initial height, target height, and target distance, it plots a predicted path with the target location to visualize how close the path will come to hitting the target.

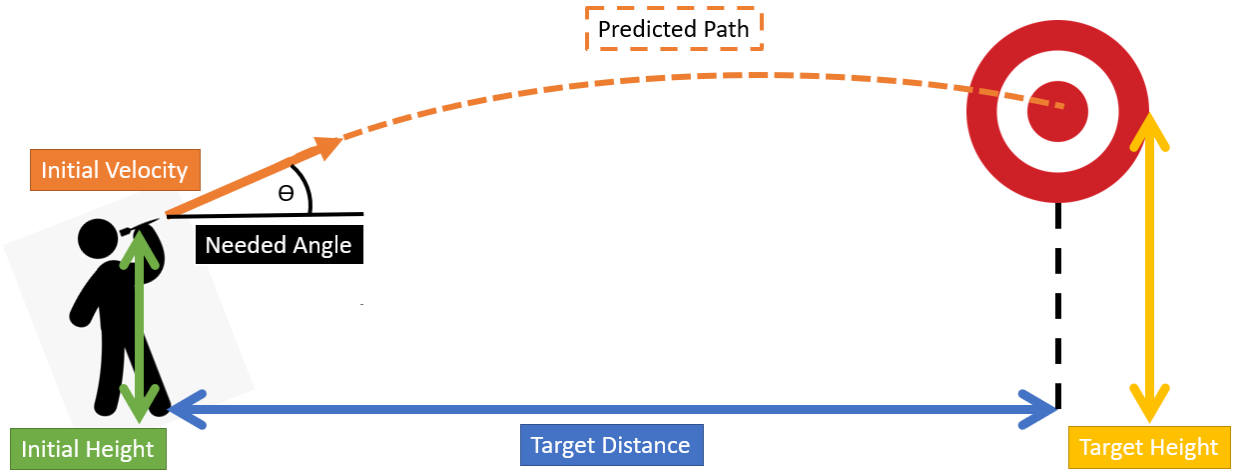

Figure 1. Physical representations of the parameters mentioned above show the practicality of the code.

Figures and Tables:

Table 1. Values used to computationally verify the code's ability to calculate Θ.

Row No.	y0 [m]	v0 [m/s]	X_target [m]	Y_target [m]	Θ0 [degrees]
Row 1	16	50	250	10	38.477
Row 2	20	80	660	4	42.765
Row 3	9	40	30	20	25.632

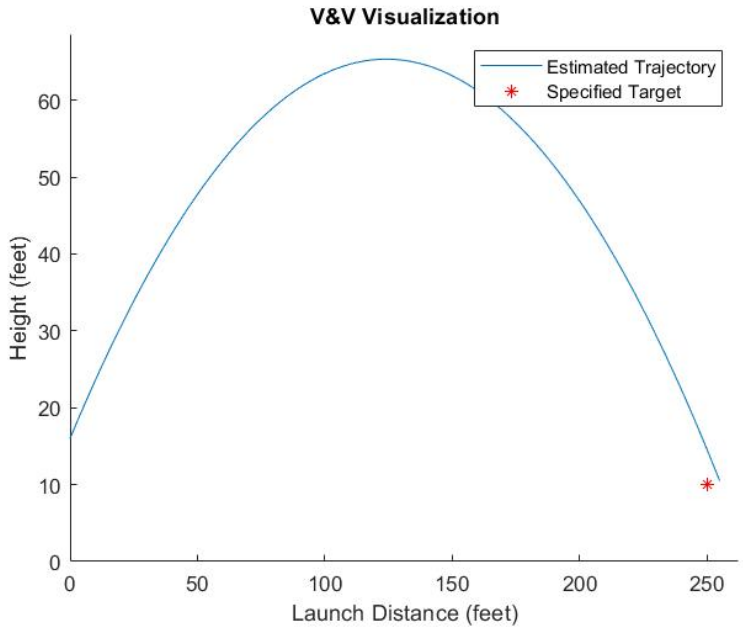

Figure 2. Plotted values from Row 1 show the Estimated Trajectory slightly overshoots the target location.

Figures and Tables:

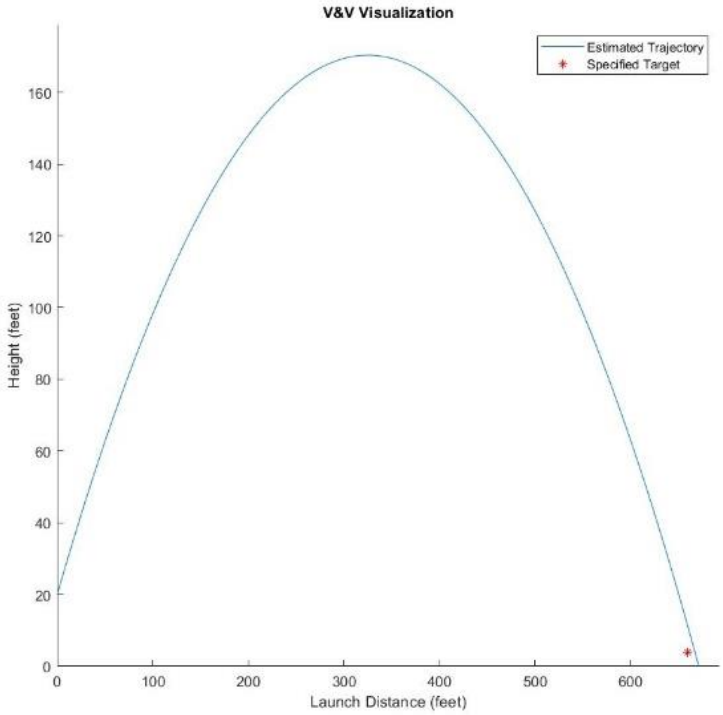

Figure 3. Plotted values from Row 2 show the Estimated Trajectory slightly overshoots the target.

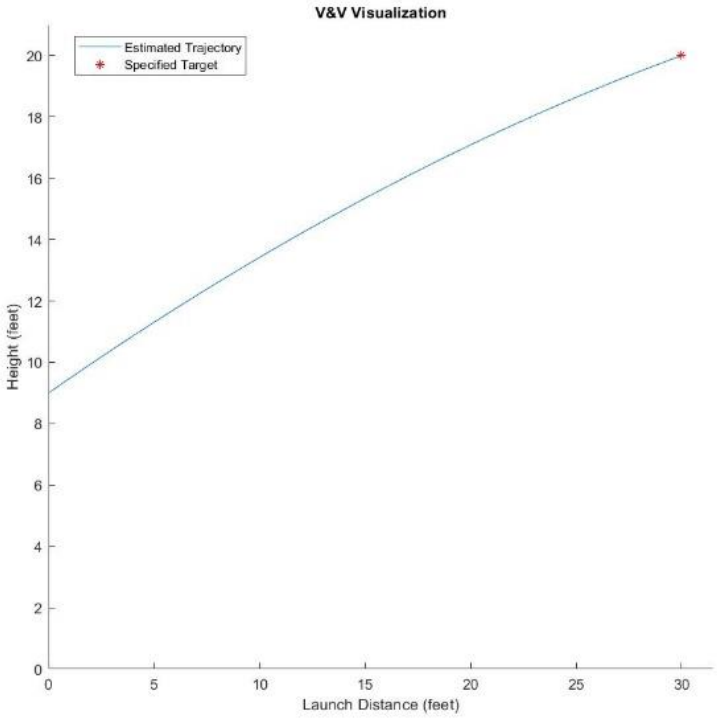

Figure 4. Plotted values from Row 3 show the Estimated Trajectory hits the target before the vertex of the path.

Calculations:

Table 2. Using the calculated Θ, y_target is calculated using the equation from trajectory.m.

Row No.	Calculated y_target
Row 1	14.6
Row 2	11
Row 3	20

$$y_{target} = (tan\theta_0)x - \frac{g}{2v_0^2 cos^2\theta_0}x^2 + y_0$$

Calculation for Row 1:

$$14.6 = (\tan(38.477))250 - \frac{9.81}{2(50)_0^2 cos^2(38.477)}250^2 + 16$$

Considering the figures above, the code is graphically verified. In Figure 2 and Figure 3, the Estimated Path has some error, but is very close to hitting the target. Figure 4 goes exactly through the point of the target. The calculated y_target values are a cause of concern, however. Despite coming very close on the graphs, the calculated values are off by a considerable amount. Row 2 is especially poor in the prediction. This could be from launchangle.m choosing the other solution of the Estimated Trajectory. The code mostly works, but it is not perfect.

Results

Analysis

Table captions go on top

Figure Captions go on bottom

Consist of curves, tables, or a single number, see “post lab requirements”

See appendix C for formatting

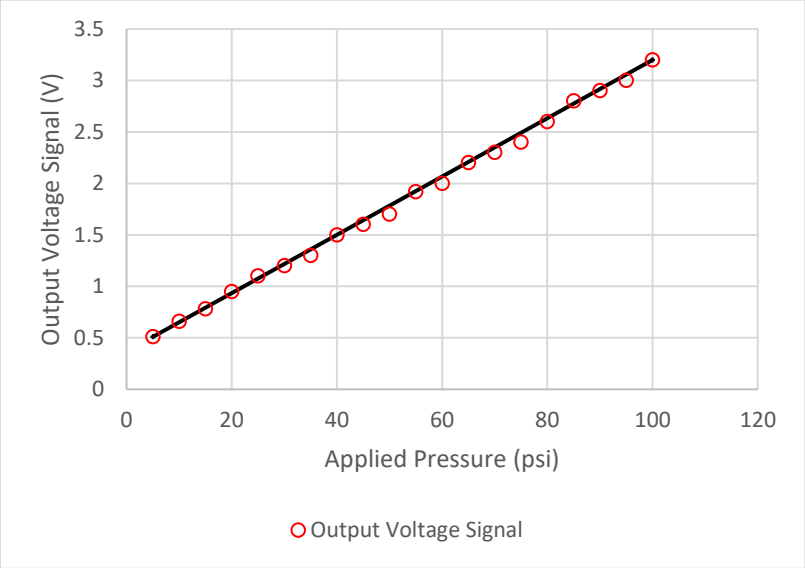

Figure 3. Chicken Nugget.

Discussion and Conclusions:

Posit and prove conclusions from experiment

Communicate conclusion in topic sentence

Use tables and graphs, review questions posed before lab

Work Sheet:

Center numbers in columns

Embed equations to show progression of calculations

When in matlab, .m file should be commented

Use section feature and matlab publisher

Neat and organized if handwritten

Data Sheet:

1. Date and locations where tests were made
2. Personnel involved
3. Atmospheric temp and barometric pressure
4. Brief description of experimental apparatus
5. List of equipment used
6. Place to enter running log of observations
7. Notes of unusual events