Optimizing Range and Height of a Projectile using Matlab

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Problem Statement:

The problem considered is about idealized projectile motion, without any air drag, indicated in the figure with a dashed line. A gun is being test fired in a firing range to estimate the distance a cannon ball travel or in other words, estimate it's range (R). The initial velocity of the cannon is v_o, which is shot at angle θ.

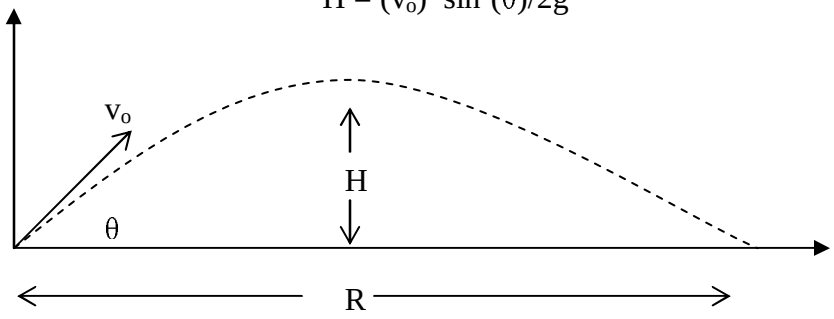
The range (R) is a function of initial velocity of the cannon (v_o) and the angle at which it is shot (θ), with the following relation:

$$R = (v_o)^2 \sin(2\theta)/g$$

Where 'g'is the acceleration due to gravity = 9.8 m/s.

The height the cannon reaches (H) is also a function of initial velocity of the cannon (v_o) and the angle at which it is shot (θ) with the following relation:

$$H = (v_o)^2 \sin^2(\theta)/2g$$



MATLAB Project:

Write a matlab script with the following requirements:

1. Vary the angle θ between 10 degrees and 90 degrees in steps of 2 degrees and calculate the range (R) for an initial velocity of the cannon (v_o = 5 m/s)
   (note: is matlab using degrees or radians? Check help to find out.)
2. Plot R vs. θ for v_o = 5 *(indicate units on axis or legend)*
3. Find the maximum range (R) from the data generated.
4. Find the value of (θ) –in degrees-- that yields the maximum value of (R).

Note: for questions 3 & 4, matlab commands must be used to obtain these values, reading the value off of the graph is unacceptable

5. Repeat questions 1-4 by calculating H and plot H vs. θ for v_o = 5m/s