MAE 8 - Winter 2015
Project Submission Guideline

Instructions: Follow the homework solution template. Remember to **clear all**, **close all**, **clc**, and fill in your name and PID. Set **hw_num = 9**. Create a zip archive named **project.zip**. The zip archive should include the following files: **project.m**, **terrain.mat**, **report.pdf**, and other scripts / functions that you have written for the project. Make sure that you include all necessary files so that your **project.m** will run properly. Submit **project.zip** through TED before 9 PM on 3/13/2015. Use double precision unless otherwise stated.

The **project.m** file should include the tasks described in the following sections. Make sure that all 3 figures are plotted when your **project.m** is executed.

Task 1A: Here, you compute the projectile motion without the influence of air resistance. There are four trajectories with different initial conditions. For each trajectory, the outputs should include time (T), three components of position (X, Y, Z) and three components of velocities (U, V, W), and all of these variables should be vectors with the same length.

Task 1B: Create a 4-element data structure named **table1** with the following field names: **trajectory**, **time**, **max_height_position** and **final_position**. The **trajectory** field should have a single number indicating the trajectory number between 1 and 4. The **time** field should have a single number showing the total elapsed time. The **max_height_position** field should be a vector with 6 elements which correspond to the components of position and velocity at the maximum-height position in the following order: X, Y, Z, U, V, and W. Similarly, the **final_position** field should be a vector with 6 elements which correspond to the components of position and velocity at the final position in the same order.

Set the following in your **project.m**:

```
p1a = table1(1);
p1b = table1(2);
p1c = table1(3);
p1d = table1(4);
```

Task 1C: Create a figure named **figure1** to plot the four trajectories in this task. Use different colors for each trajectory. The figure should have the title, legend and grid. The axes should be labelled with units. Set **p1e = 'See figure 1'**.

Task 2A: Here, you compute the projectile motion with the influence of air resistance. There are four trajectories with different coefficients of friction. For each trajectory, outputs should include time (T), three components of position (X, Y, Z) and three components of velocities (U, V, W), and all of these variables should be vectors with the same length.

Task 2B: Create a 4-element data structure named **table2** with the following field names: **trajectory**, **time**, **max_height_position** and **final_position**. The **trajectory** field should have a single number indicating the trajectory number between 1 and 4. The **time** field should have a single number showing the total elapsed time. The **max_height_position** field should be a vector with 6 elements which correspond to the components of position and velocity at the maximum-height position in the following order: X, Y, Z, U, V, and W. Similarly, the **final_position** field should be a vector with 6 elements which correspond to the components of position and velocity at the final position in the same order.

Set the following in your **project.m**:

p2a = table2(1);
p2b = table2(2);
p2c = table2(3);
p2d = table2(4);

Task 2C: Create a figure named **figure2** to plot the four trajectories in this task. Use different colors for each trajectory. The figure should have the title, legend and grid. The axes should be labelled with units. Set **p2e = 'See figure 2'**.

Task 3A: Here, you compute the project motion to track the positions where the ball lands on the terrain. There are three trajectories with different initial conditions. For each trajectory, outputs should include time (T), three components of position (X, Y, Z) and three components of velocities (U, V, W), and all of these variables should be vectors with the same length.

Task 3B: Create a 3-element data structure named **table3** with the following field names: **trajectory**, **time**, and **final_position**. The **trajectory** field should have a single number indicating the trajectory number between 1 and 3. The **time** field should have a single number showing the total duration of the trajectory. The **final_position** field should be a 6-element vector which lists the components of position and velocity at the final position on the terrain in the following order: X, Y, Z, U, V, and W. Set the following in your **project.m**:

p3a = table3(1);
p3b = table3(2);
p3c = table3(3);

Task 3C: Create a **figure 3** to plot the three trajectories and the terrain in this task. Use different colors for each trajectory. Use large symbols to indicate the final positions of the ball on the terrain. The figure should have the title, legend and grid. The axes should be labelled with units. Set **p3d = 'See figure 3'**.