Information Technology Degree Program

Basic of Mathematical Software

Author:

Vu Quoc Bao

Supervisor:

Jussi Ojanen

Date: 30/01/2020

REPORT

Free falling

I used the free fall formula based on Newton's second law to implement to this project.

First, I need to set the initial input data for the object

```
g = 9.81; %gravitational acceleration

%% INPUT DATA
y = 45; % Original altitude

x = 0;
v = 0;
t = 0;
dt = 0.01;
s = 0;

t_array = t;
s_array = s;
v_array = v;
a_array = g;
```

Figure 1 Input data initialize

Second, I created figure for object as well as the for velocity, distance and acceleration to show.

fig_object = figure('name','Falling Object','numbertitle','off');

In this line I defined the object's figure with the the name 'Falling Object' and no number title.

set(fig_object,'Units','normalized','position',[0 0.1 0.2 0.78]);

This line I set the units to normalized unit, then the position of this figure set on the left of the screen using set function.

graph_object = plot(x,y,'gs','MarkerSize',30,'markerfacecolor','r');

Now, the object created with the initial x and y as in the input data part. The object is the red square with the green border and the size is 30.

xlabel('X [m]');

ylabel('Y [m]');

I set the label for x and y-axis

axis equal

axis([-5 5 0 50]);

Set the tick mark increments on the axes of this figure are equal in size. The scope of this survey is limit from -5 to 5 horizontally and from 0 to 50 vertically.

I do the same with the graphs of distance, velocity and acceleration with some adjustments in name, position and the plot's parameters to make the figures lie on the screen reasonably.

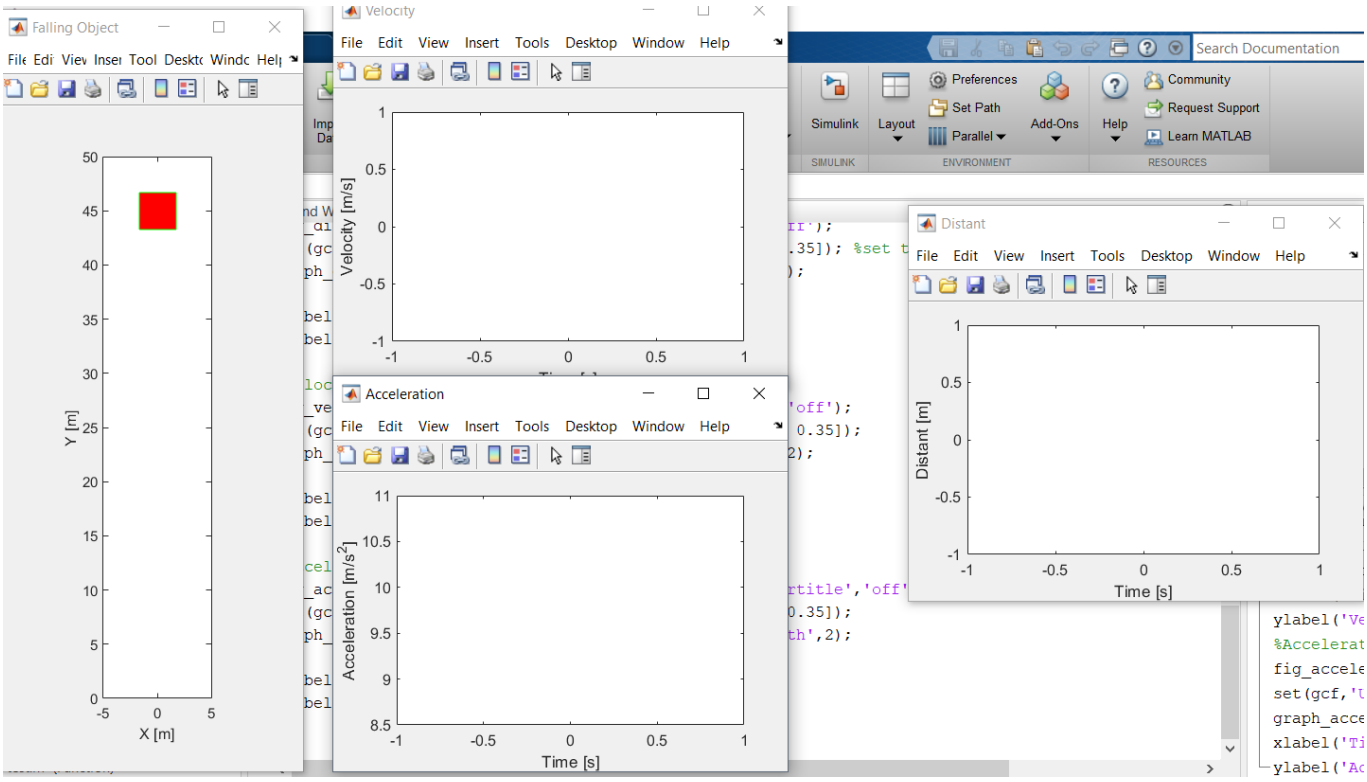

Figure 2 Figures from the beginning

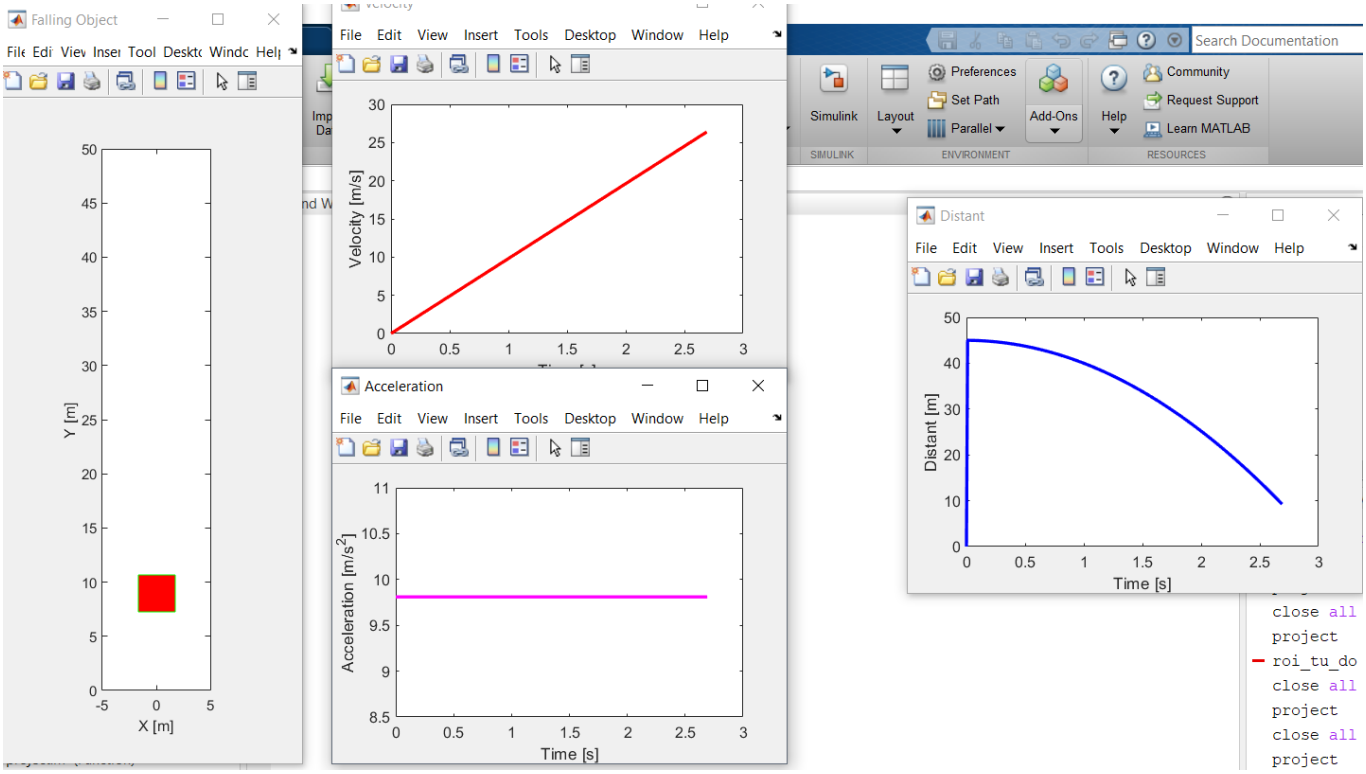

Figure 3 Figures when data reassigned

Third, it comes to the part of calculation.

I created the while loop in which the condition is y > 0 that means the survey will be limited only when the object is on the ground.

In this while loop I used calculations took from internet to perform the change in velocity, distance and acceleration while the object falling on matlab. We can consider these quantities with the very small change in the time.

Every time the changes happen the program will store the data into arrays and show it as the figures for each quantity considered when we rewrite the data to the graphs

In this survey we can see the acceleration won't change since with dt is small enough, the acceleration won't change much and it can be considered that the object is moving with constant acceleration.

After that, I used set function again to reassign the value of x and y to show the changes in figures. This is the key to creating movement after each while loop in which the coordinates x and y were recalculated. Pause is used to make the program calculates slow down line by line and so that I can see and track the movement.