

Projectile Motion

Introduction:

Projectile motion is a form of motion experienced by an object or particle I.e a projectile that is thrown near the Earth's Surface and moves along a curved path under the influence of gravity. The curved path was shown by Galileo to be a parabola. The study of such motion is called ballistics and such a trajectory is called ballistic trajectory. The gravity is the major force that influence the object downward thus making the object to accelerate downward. Due to the object's inertia there is no need of horizontal force to maintain the horizontal velocity. But, many other external forces like air resistance, friction, aerodynamic drag etc does affect and while also taking in account such forces further complicated analysis has to be done. Newton's law states that force is required to keep object in motion. But, in fact force is not required to object in motion. Force is only required to keep the object in acceleration. In the case of the projectile which is moving upward, there is a downward force and a downward acceleration. This means the object is moving upward due to initial velocity and is slowing down at the same time. This is how a projectile motion occurs.

Objective:

The main objective of the project is to demonstrate how a horizontal projectile motion occurs on different initial velocities and different horizontal angle from the ground. This will help visualize the ballistic trajectory traced out by the projectile.

Tools Used:

Atom IDE – Coding and Debugging

Terminal – Compiling Python Files

PyGL – OpenGL library on python

Mathematical Concepts:

The variables and mathematical formulas of projectile motion are:

Velocity: v_{in} = initial Velocity fired from ground

Acceleration: $a_x = 0$, $a_y = -g$ where, a_x , a_y is the velocity across x-axis and y-axis

Acceleration due to gravity on Earth: g

Horizontal angle made with X-axis: θ

Maximum height: $((v_{in})^2 * \sin^2(\theta))/2*g$

Range: Horizontal distance traveled by projectile = $(u^2*\sin(2\theta))/g$

Time of Flight: $(2*u*\sin(\theta))/g$

