



Rigid Body Dynamics Simulation Program

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Abstract

Nowadays, scientific progress is advancing rapidly, resulting in the emergence of countless educational media. While the educational media can greatly assist learners, they also come with limitations. This project aims to develop a single computer program to simulate the motion of 3-dimensional rigid body objects in classical mechanics. During testing, the team simulated 3 scenarios using the program to determine the precision and accuracy of the computed values. The tested parameters include the following: distance travelled in the Y-axis in free fall for 1 second, final velocity along the Y-axis during free fall after 1 second, and the mechanical energy with the reference level plane $Y = 0.5$ during seconds 0-1, with the downward acceleration due to gravity being at a constant 9.8100 meters per second squared without linear drag. The results reveal that the program-computed values correlate, but do not perfectly align with, the formula-computed ones. The distance travelled computed with the program depicts a constant 0.584 percent error, while the final velocity shows one of 0.01 percent. Furthermore, the mechanical energy diverges away from the formula-computed ones in the negative direction over time. This inconsistency with the incorrectly computed parameter may be caused by the limitations of using the Rigidbody Component in Unity to calculate. On the other hand, testing of the performance impact, which is carried out by evaluating the effects of the number of objects within a scene at a given time on the FPS value, shows a great capability to handle large amounts of game objects. Nevertheless, this project faces various obstacles during development. As an improvement, more variables should be introduced, along with the function to save and load user-generated scenes

Keywords : Rigid Body, Component, Program-computed Value, Formula-computed Value