Computer Simulation of Some Natural Sciences Problems in Virtual Lab

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In general, there are two categories of problems existing in nature: deterministic and probabilistic. Former category of problems is tackled through well-known numerical methods, whereas the latter kind of problems is solved through Monte Carlo simulation techniques. In both cases, the simulation is an integral part and requires the computational techniques using modern operating systems (OS) such as Linux, UNIX, Windows, and Mac OSX and prevalent application software. Main motive of this research work is to employ the latest version of Windows based OS and its compatible application software. Thus, MS Visual Studio.NET offers the most suitable Windows-based software system for current scholarly work. Recently, Singh and Siddiqui [Journal of Educational Technology Systems 37(4), 405-417 (2008-2009)] have simulated numerically the trajectory of a projectile in a frictionless environment. These authors also created random numbers using a simple random number generator for simulating the rolling of six dice. However, these authors used old MS Excel 2003 and 2007. Purpose of current research is to reproduce those results with latest MS Visual Studio.NET 2012/2013 framework using C# object oriented language and to modify the deterministic problem of projectile motion that includes effect of external variables, e.g., weather conditions, wind speed, barometric pressure or air density etc. To initiate the computations, we employed Euler's method for velocity and acceleration along each axis in 2D-space. Both velocity and acceleration are then rearranged and integrated under the action of constant gravity force, and subsequently these variables are modified depending on environmental conditions.

Keywords: Monte Carlo simulation, numerical methods, Windows OS, MS Visual Studio.NET framework, C#, deterministic/probabilistic problems