The motion, between real and virtual

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Abstract

The goal of this enterprise is the investigation of the variety of means by which the motion of objects can be described: from verbal representations, pictorial representations, numerical representations, and graphical representations (position-time graphs and velocity-time graphs) to the cinematic equations.

The free fall or following Galileo

The legend says that Galileo demonstrated his findings by dropping two cannon balls off the Leaning Tower of Pisa, nearly 400 years ago. So he discovered that all free falling objects fall at the same rate. Galileo conducted experiments using a ball on an inclined plane to determine the relationship between the time and distance traveled. He found that the distance depended on the square of the time and that the velocity increased as the ball moved down the incline. The relationship was the same regardless of the mass of the ball used in the experiment.

Our first goal was to register the free movement of a train down the inclined plane. We have used a data acquisition board NIDAQ-6013 connected to the inductors for the registration of the movement of the train. The magnet was fixed on the wagon, so the electromagnetic induction appeared and the difference of potential from the inductors was changed when the train passed near the coils.

In the case of the free-falling objects, they are falling under the sole influence of gravity, neglecting the air resistance. All free-falling objects (on Earth) accelerate downwards at a rate of approximately 9.8 m/s2. Our second goal was to simulate the free fall and other vertical movements of an apple using LabVIEW:

The cinematic equations of the free fall are: y=gt2/2, v=gt. So we can calculate the value for the gravitational acceleration: g=2y/t2. Another goal was to to register the free fall of a magnet through some inductors with data acquisition board NIDAQ-6013 connected to the inductors. The second kind of sensors we used were photodiode.

Sensor	No	t(s)	y(m)	g(m/s2)	gav(m/s2)
Induc tors	1	0,28	0,4	10.2	10,04
	2	0,4	0,8	10	
	3	0,49	1,2	9,99	
	4	0,6	1,8	10	
Photo diode	1	0,36	0,69	10,64	10,44
	2	0,265	0,36	10,25	

The third goal was to study the intersection of two cars or trains which are moving horizontally.