SIMULATION OF LAW OF THE MECHANICS USING GRAPHIC LIBRARY

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Abstract: *Have been implemented simulation of Trajectory of a launched projectile and of Newton's cradle. Simulation was done in two dimensions for ideal situations. Application was developed using C language and graphical library OpenGL.*

Key words: *C language, OpenGL, 2-D simulation, mechanics*

1. Introduction

It is well known that theory is always better understood by applying it in practice. In paper are presented two common examples for simulation of trajectory of projectile and of pendulum, using computational formulas and the power of OpenGL [1] and the C programming language [2].

2. Trajectory of a projectile

Nowadays, term of trajectory of projectile[3] is often encountered in computer games. Some of them are: the series Angry Birds, series Worms, in Golf and others. For simulations of trajectory was used the following formulas for coordinates (x, y) of projectile:

$$x = V_{0x}t \quad (1)$$

$$y = V_{0y}t - \frac{1}{2}gt^2 \quad (2)$$

where V_{0x}, V_{0y} are components of initial velocity of projectile on coordinates axes, g is downward acceleration and t is elapsed time. So, those formula, actually, redraw every time the flying object from one point to the next one after each iteration of variable t (fig.1).

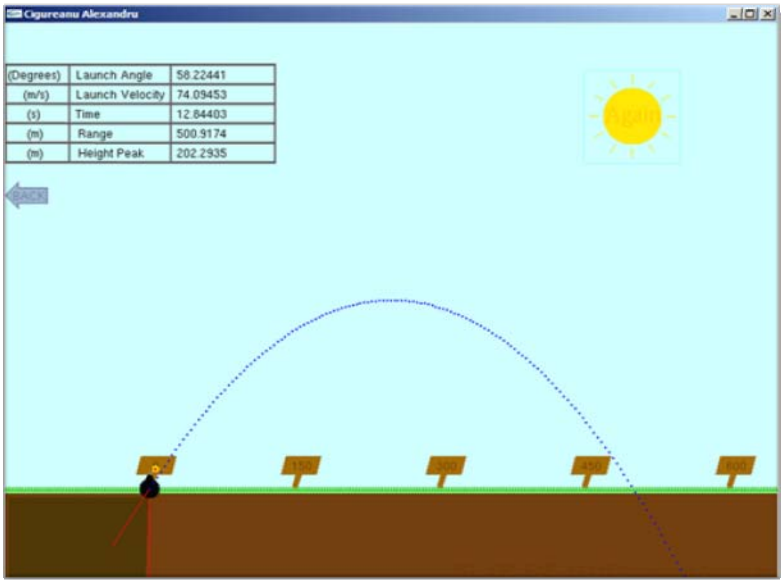

Fig.1 View of application for simulation of trajectory of launched projectile

3. Newton's Cradle

Newton's Cradle (fig. 2) consists of several equal pendulums [4], placed in a straight line (fig2). Two main notions are used for this simulations: oscillations and pendulum. So we should recall them. Computational formulas that describes the pendulum motion have been implemented as shown below:

```
dt =0;                              //initialization of variable of time
while(TRUE)                         // infinite cycle of time
```

```
{
        dw = -g * sin(a) * dt / l;          //the change of angular velocity
        w += dw;                    //new angular velocity
        da = w * dt;                        //the change of angle
        a += da;                    //the new angle
        dt += 0.1;
}
```
where *a* is angle formed with respect to vertical axis, *da* is the deviation of angle since last iteration of time, *dt* is the iterator of time, *g* is the downward acceleration, *w* is the angular velocity at certain moment, *dw* is the deviation of angular velocity from last iteration of time and *l* is length of pendulum. And one more important thing is the following, how we should proceed in order to simulate the clash of two or more spheres? The answer is simple. Since we use an ideal situation, just swap the angles of adjacent spheres and you're done.

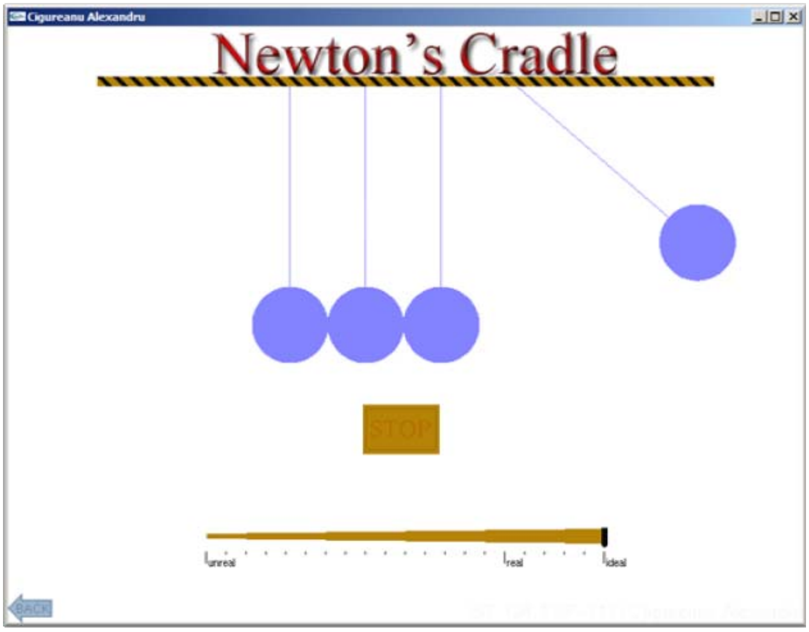

Fig. 2 View of application for Newton's Cradle

4. Conclusion

OpenGL is very simple in use. It is intuitively understandable. So, with some imagination interesting things can be done. Phisics become more funny when you use it for development of software that can teach somebody or put in practice the theory.

5. Bibliography

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4. http://en.wikipedia.org/wiki/Pendulum