

Simplify Understanding Physics Lessons for High School with Animation by E-Learning

FX Hendra Prasetya

Faculty of Computer Science, Soegijapranata Catholic University (SCU)
Semarang, Indonesia
hendrapraset@yahoo.com

T. Brenda Ch.

Faculty of Computer Science, Soegijapranata Catholic University (SCU)
Semarang, Indonesia
brenda_winarko@yahoo.com

Abstract - Physics lessons are lessons that require an understanding that can be proven scientifically / physical. To prove it scientifically we need a clear picture about what happened. Animation is a depiction of objects that seemed to move, with the help of animation, it is expected of school students can better understand the physical phenomena that exist in nature or understand the physics formulas well. Animation to be made using the flash, so it can later on upload to the internet and can be accessed by high school students over with ease. Animation in physics are presented in e-learning will be more easily understood without the presence of a teacher chaperone. This is caused by the visualization of a complete and interesting phenomenon.

Keywords - animation, e-learning, high school, physics lesson

I. INTRODUCTION

In about the year 1530, an Italian scientist, Tartaglia, trying to study the movement of shells fired. Tartaglia experimented by firing cannon balls with different tilt angles. From these experiments, he could only conclude that the cannonball will reach the farthest distance if the angle of the cannon with 45° . However, he can not explain why this could occur.

Answers to questions that arise from new Tartaglia experiment came when Galileo began to develop research on the movement. Galileo claimed without force, an object that

is moving will continue moving at a constant pace. He further stated that the falling objects, speed of object increased regularly. This could explain why the corner is the angle that produces 45° shots farthest. However, the concept of motion generated by Galileo is still very little. The concept of a more complete new movement emerged in 1687 when Isaac Newton published his book Principia.

Basically, the discussion of the motion can be divided into two major parts, namely kinematics and dynamics. Kinematics contains a discussion of the motion of bodies without consideration of the cause of the movement. While the dynamics contains a discussion on the motion of objects with respect to the cause of the movement, namely the force.

Which will be discussed in this paper is motion with move constan (GLB), uniformly accelerated motion, motion bullet (parabolic) which is a combination between GLB and uniformly accelerated motion (GLBB), and collision perfectly resilient

A. Uniform Straight Motion (GLB)

GLB is motion of an object through a straight line and moves with constant speed. An example is the car moving in a straight path with no obstacles and have a constant speed.

B. Uniformly Accelerated Motion (GLBB)

Uniformly accelerated motion (GLBB) is the movement of objects where the velocity will change uniformly, the faster or slower. However, the acceleration of the object is fixed. Some examples of uniformly

accelerated motion is the motion of falling objects and motion of the aircraft when it will take off or when it going to land

Consider an object that is moving uniformly straight with acceleration fixed a. Acceleration a is connected with the initial velocity and the velocity at time t by the equation

$$a = \frac{\Delta v}{\Delta t} = \frac{v-v_0}{t-t_0} \quad (1)$$

with v = velocity at t
 v₀ = start velocity
 t₀ = start time

if t₀ = 0, so from (1) get

$$a = \frac{\Delta v}{\Delta t} = \frac{v-v_0}{t} \text{ or } v = v_0 + at \quad (2)$$

While the distance the object can be calculated by

$$s = v_0t + \frac{1}{2}at^2 \quad (3)$$

C. MOMENTUM

Law of Conservation of Momentum In the event of collisions between two objects that do not involve external forces apply the law of conservation of momentum, which reads: Total momentum of the objects before the collision equals the sum momentum of the objects after the collision.

$$m_1v_1 + m_2v_2 = m_1v_1' + m_2v_2' \quad (4)$$

with v₁, v₂ is velocity before collision and v₁', v₂' is velocity after collision.

Law of conservation of momentum will be used in case of collision perfectly springy, resilient partial collision and collision are not resilient.

Both uniform straight motion, uniformly accelerated motion and momentum will be easier to learn without a teacher chaperone by providing simulated motion of bodies.

II. BASICS OF FLASH

Macromedia Flash is a professional program for creating animated logos, navigation controls, animations, websites, interactive CDs, etc.. This program is very flexible so that only the creativity of the restrictions on what we make.

A. Introduction to Flash

The first display when we open the Macromedia Flash Version 8 is:



Fig. 1 Early Macromedia Flash Picture Display

In general appearance Macromedia Flash 8 application program is divided into 3:

- Toolbox, located next to the far left. Contains icons for creating and manipulating objects.
- Stage, is the work area that will be used to display animations that will be displayed.
- Timeline, is an area where we will set the length of the animation that will be created.

B. Analogy

To facilitate understanding of the program this Macromedia Flash, will try to use analogy in Flash with everyday life. The terms in the Flash program can be analogous to a book. A book consists of several chapters, and each chapter consists of several pages. Likewise in this Flash program, similar to a book, movie or whatever the main program name to be generated by the Flash consisting of several scenes, and each scene consists of several frames are synonymous with the page.

C. Animation

Animation comes from the word animate meaning make something move as if alive. If we draw on a page in the book, then re-create the image on the next page by changing slowly until a few pages, then the image will appear to move when we opened it quickly, this is the principle of animation.

On Macromedia Flash ie there are 4 types of animation: frame by frame animation, motion tweened animation, shape animation and animation with the path.

1. Frame by Frame Animation

In the frame by frame animation, drawing little changed at each frame, so that when played, the image will appear to move. Example: In the frame by frame animation, the image changed a little bit on each frame, so that when played, the image will appear to move.

2. Motion Tween

Motion tween animation used to create animated movements such as the car moves, the ball rolling, and so on.

3. Shape Tween Animation

Shape tween is used to change the shape of an object slowly, for example :

- Open new sheet on macromedia flash
- Draw a box on stage
- Right click on frame 20 and click insert key frame
- Clear picture box in the later stage and later replace with a circles
- Click on frame 30 (or any) and open the Properties panel and change the combo box from none to shape tween. This will bring up an arrow with green background.
- Test the animation by pressing control, play

4. Animation with Path

How to make it ?

- Open new sheet
- Drawing circle on stage
- Click frame 1, then right click and create motion tween
- Click frame to frame 10 such purposes, then right-click and then insert key frames
- Create a guide layer by pressing the button add motion guide
- Draw a line that will be the trajectory of the object. Starting from the initial position of the object until the final position of objects, such as a half circle (parabolic)
- Move object to final line
- Test animation

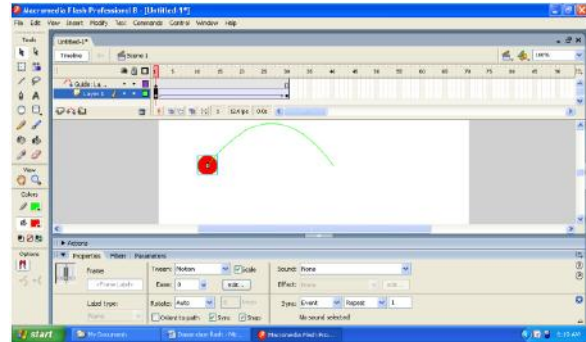


Fig. 2 Example of animation with the path.

III. PHYSIC ANIMATION WITH FLASH

Physics lesson that will be used as an example for the manufacture of animation among other uniform straight motion (GLB), uniformly accelerated motion (GLBB), motion bullet (parabola) and also a perfect collision resilient..

A. Uniform Straight Motion (GLB)

Making animation Rectilinear Regular (GLB) in two ways: the usual way and the way the script

The steps[1]:

- Draw a circle on the stage on frame 1 layer 1
- Right-click on frame 1 layer 1 and then click create motion tween
- Right click on the destination frame (eg frame 50) and then right click, insert frames
- Drag the circle object, place it on the last position of circle you want
- Run by pressing Ctrl + Enter

By script :

- Draw a circle on the stage
- Block the circle and then from the Insert menu and click the Convert to Symbol, a dialog box will appear
- Select Movie Clip and press OK
- Select the MC circle, then right click and select action
- In the action panel type the following script:

```
onClipEvent(enterFrame) {
    _x = _x + 2
}
```

- f. his script will govern the circle movieclip to increase horizontal position at all times. To accelerate the move objects please change the script as follows:

```
onClipEvent(enterFrame) {
    _x = _x + 5
}
```

- g. To change the direction of movement, so please change the script above becomes as follows:

```
onClipEvent(enterFrame) {
    _x = _x - 1
}
```

B. GLBB

Preparation of uniformly accelerated motion animation (uniformly accelerated motion) in two ways: the usual way and the way the script.

The steps are:

- Draw a car on the stage on frame 1 layer 1
- Right-click on frame 1 layer 1 and then click create motion tween
- Right click on the destination frame (eg frame 50) and then right click, insert frames
- Pull the car object, place it on the last position of the desired car
- Click on frame 10 and open the panel and set Easensya propertiesnya. Ease positive would slow motion while the opposite negative ease.
- Run by pressing Ctrl + Enter

By script :

- Draw a car on stage
- Block the car and then from the Insert menu and click the Convert to Symbol, a dialog box will appear
- Select Movie Clip and press OK
- Select the MC car, then right click and select action
- In the action panel type the following script

Draw a car on stage

- Block the car and then from the Insert menu and click the Convert to Symbol, a dialog box will appear
- Select Movie Clip and press OK

- d. Select the MC car, then right click and select action

- e. In the action panel type the following script:

```
onClipEvent(load) {
    a=15;
    t=0;
    v=23;
}
onClipEvent(enterFrame) {
    t++ //t terus bertambah
    _x+=v*t+a*t*t
}
```

- f. Movie clip script above ordered the car to increase its position at any time. To expedite the movement of objects please change the variable v, so the script becomes:

```
onClipEvent(load) {
    a=25;
    t=0;
    v=50;
}
onClipEvent(enterFrame) {
    t++ //t terus bertambah
    _x+=v*t+a*t*t
}
```

- g. To change the direction of movement please change the script above so that it becomes:

```
onClipEvent(load) {
    a=15;
    t=0;
    v=29;
}
onClipEvent(enterFrame) {
    t++ //t terus bertambah
    _y+=v*t+a*t*t
}
onClipEvent(enterFrame) {
    _x = _x - 1
}
```

C. Motion Parabolic

Parabolic motion in principle is the union between GLB and uniformly accelerated motion, a horizontal axis using the GLB while the vertical axis using a uniformly accelerated motion, where the acceleration is the force of gravity.

To make this dish motion animation could use a fourth animation is animated by using the path.

D. Resilience perfect collision

Animation perfect springy collision between two balls. The steps are [1] :

- a. Draw the ball (circle) on the left side of the stage (give red color)
- b. Right click on frame 1 and select create motion tween
- c. Right click on frame 30 and insert keyframe
- d. Pull the ball toward the middle of the stage.
- e. Insert a new layer (layer2) and make a blue colored balls in this layer to the right of the stage.
- f. Right-click on frame1 layer2 select create motion tween.
- g. Right-click on frame20 layer2 then insert a keyframe
- h. Drag the blue ball to the middle of the stage to collide with each other with a red ball.
- i. The next step right click on layer2 frame40 and click insert key frame
- j. Pull back the blue ball to its original position
- k. Perform the same steps for the red ball
- l. Test animation with Ctrl + Enter

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IV. CONCLUSIONS

In this paper has discussed making animation that is used for physics high school students to facilitate their understanding concepts of physics. Among other things straight Regular Motion (GLB), uniformly accelerated motion (GLBB), Motion Parabolic (combined between GLB and GLBB) and also a perfect collision resilient. Hopefully with this animation is easier for them to understand the physics lesson