Chapter 12
Acceleration

ABSTRACT

This part of the book provides an occasion to combine visual presentation of concepts related to speed, velocity, and acceleration with the real-life circumstances (such as car or horse races) and at the same time with artistic connotations about motion and artistic responses to it. The goal of this project is to show acceleration, speed, and velocity by producing an image that would look very dynamic. For example, dynamic changes of motion can be presented as a scene with racecars or horses. Connotations related to art may enhance both our knowledge about acceleration and a message it evokes.

INTRODUCTION

We can feel some laws of physics in our guts and acceleration is one of these. Acceleration evokes visceral reaction because our old brain is scanning for danger and noticing acceleration as such. In a practical setting the feeling of acceleration evokes our emotion. While the times change and living conditions improve, humans still fell in their old brain a need to enhance their survival skills by conquering their fear and strengthening their courage. Maybe for that reason toddlers enjoy greatly swings and slides, first graders take pleasure in carousels and go-carts, and the grown-ups like the extreme sports, fast cars and motorcycles, parachuting and bungee jumping, and also visits to the theme and amusement parks with thrill rides, Ferris and eccentric wheels, and roller coasters that provide occasions to feel acceleration and the emotion of speed. Acceleration has been accepted

a performance measure of cars and motorcycles, with the shortest time needed to achieve 60 mph (97 km/h) being about 2.4 seconds for a car (The Super Cars, 2012) and 1.75 seconds for a motorcycle (Top 10 fastest Bikes, 2012). Many events recorded by psychologists display a normal curve, which shows first positive acceleration (upward movement shown by a curve, e.g., of muscular power) and then negative acceleration (deceleration, e.g., resulting from age). Acceleration sensors of mobile devices support solutions applied for interactive visualizations. It is not very intuitive to manipulate objects visualized in 3-dimension by a mouse because a mouse can only move in 2-dimensional space. Mariko Sasakura, Akira Kotaki, & Junya Inada (2011) propose an interaction technique using a library for 3D acceleration sensors of mobile devices, which results in a 3D molecular visualization system to manipulate 3D objects, which displays a simulation of the molecular dynamics method. Users can rotate 3D objects by leaning a mobile device and change a viewing

Figure 1. Erick Weitkamp, Acceleration. (© 2005. E. Weitkamp. Used with permission)
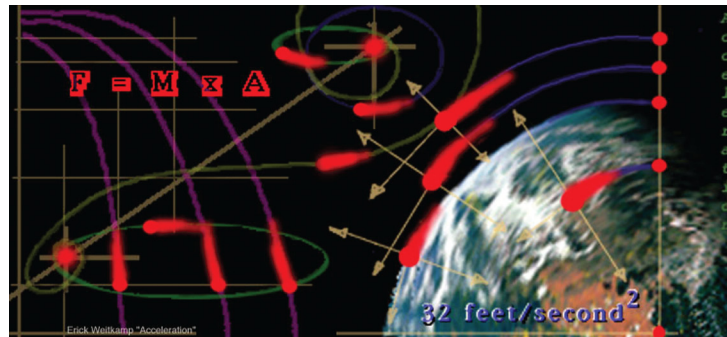
location. Visual interest about these scientific terms can be seen in works of art representing motion in various styles in art.

Figure 1 presents computer graphics created by a student from my Computer Art class.

The concept (and a project) allows discussing and solving visually the dynamic events in physics (acceleration of particles in nuclear fusion), geology (volcanoes, earthquakes), history of science (wheel, industrial revolution, electricity, computers), and human history (revolutions, declarations of independence). Kinematics, theoretical study about the motion of a body has been mostly applied to machinery, mechanisms, and robotics. It involves concepts of motion: change in position and orientation, whatever is its cause. Speed, velocity, and acceleration can be described with symbols and presented as graphs. Visual computing enables us to form a clear impression of these connections. It may also motivate one to create one's individual solution while creating computer graphics. Thus, the goal of this project is to show acceleration, speed, and velocity by producing an image that would look very dynamic. For example, dynamic changes of motion can be presented as a scene with racecars or horses.

Motion can be experienced as a continuous change of position in time. However, ancient Greek philosophers generally questioned the concept of change. Zeno of Elea (c. 490-430 BC)

devised the paradox of the arrow: a body occupying a space equal to its volume is at rest; a flying arrow occupies, at any moment, a space equal to its volume. Thus, at any moment, the arrow is at rest; therefore it is at rest all the time. This paradox was not resolved until the development of calculus enabled mathematicians to distinguish changes from zero, which were earlier too small to be calculated.

Figure 2 presents another computer graphics created by a student from my Computer Art class. The idea of blurriness caused by a sudden change of velocity reminded this student of an abstract composition. As we accelerate, the reality changes, pretty much like in non-representational work, where the artist can depict own experiences, and a perceiver interpret them in one's own private way.

Figure 2. Jenny Wise, Acceleration. (© 2001. J. Wise. Used with permission)
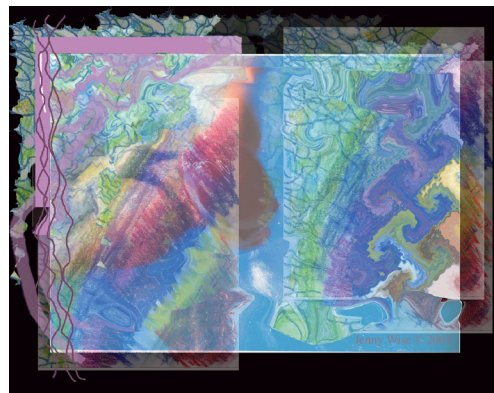
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