GRAPHICS DESIGN IN GAMES

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Abstract

As we already knew, the game industry has been developed significantly since the idea of human interacting with machines for entertainment was first explored in the early 50s. Along with many improvements in the intuition of the game devices, the impressive music and sounds in each game etc, the modern spectacular graphic design easily catches people's attentions.

If we take a look at the history, for example, in 1976, the game namely Night Driver was produced by Atari Company as a sit-down first person vision game. Back then, they staged the game at night to reduce the complexity of the graphical design as they thus only needed to represent the left and right boundaries of the driving surface by using two sets of white blocks, and the car itself. Even though this sounds very poor designed nowadays but it was amazing at that time.

Here we are in the 21st century, benefiting from the recent developments in computer/game console hardware, software and data storing (using DVDs instead of cartridges like the early systems), the graphic now is much more attractive than it has ever been with the real looking 3D animation and even the effects such as how badly one character gets injured based on how hard (s)he was hit are well taken care of. All of these factors allow the latest games to achieve a better 'look and feel' that surpasses the retro ones.

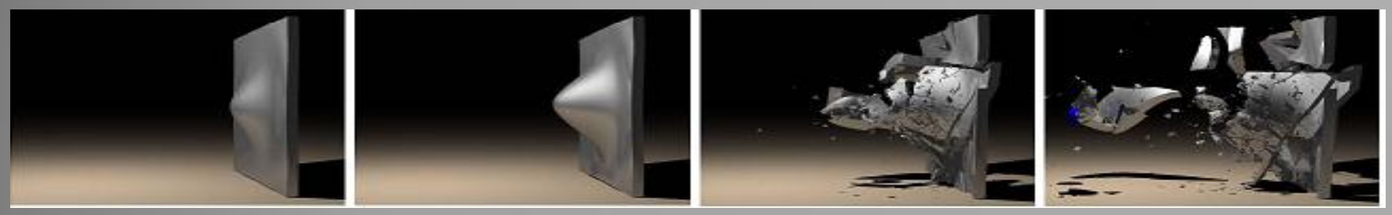
Introduction

In this project, we will have a closer look at the factors that contribute to the success of the modern graphical design in games in particular and computer-based graphics and vision in general.

From hardware viewpoint, as an example, the development of VGA (abbreviation of Video Graphics Accelerator) boots up the graphical performance level significantly. In addition, VGA is an adapter which has its own processors in order to handle the graphical computations. In general, such processors work more efficiently with these kind of jobs than the CPU of our computer. Besides, it frees up the CPU to execute other commands in parallel to reduce the consumed time. These benefits make VGA become an absolute necessity in most of the contemporary computers.

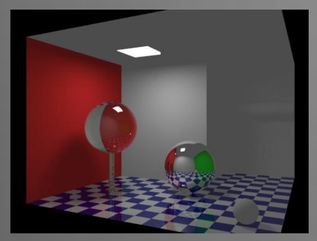
From software viewpoint, some of the old techniques (one clear example could be how colors were represented) have been overtaken whereas the others are extended to form the new ones. Because of the limited space, we will only take into account Physic-based Modeling Technique and Global Illumination Algorithms, two of which have the most fundamental influences on the current games' animation.

Physic-based Modeling and Simulation

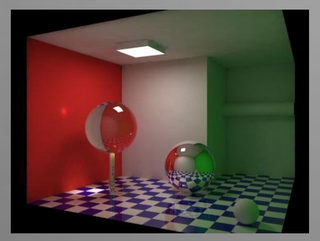


Most conventional methods for graphics modeling are based on kinematics, by which the objects are drawn given a numerous of pre-defined geometric/algebraic primitives and operations. Thus, these models neither automatically interact with each other nor the external forces. In contrast, physic-based modeling technique allows us to create such objects which can be as real as we might expect from the living, physical ones. More precisely, they can react to the applied forces (like how the metal board is broken as illustrated above [1]), to the impact of the surrounding environment…in a natural and predictable way. In this approach, the animations of the dynamic objects are computed based upon the laws of physics. Therefore, the programmers only need to supply the initial state of the model but not to worry about the low level detail of movements such as their underlying mathematical formulations [2].

Global Illumination



Scene uses local illumination. Objects lying outside the direct light source (i.e. the ceiling lamp) lack definition.[3]



Scene uses global illumination.. The glass sphere on the left creates a caustic on the red wall. And light from the ceiling lamp is reflected by surfaces whilst its' color is transferred from one surface to another .[3]

Global Illumination refers to a number of algorithms used in 3D computer graphics for adding more realistic effects on lighting to the design. In local illumination, only a single vertex is considered in each lighting computation whereas the rest of the scene is ignored. On the other hand, global rendering takes care of every objects as a whole when performing lighting computation for a more accurate and real looking environment. As a result, each surface reflects not only the direct light source(s) but also the indirect light ray(s) coming from other surfaces in reflection to the same light source(s).

In practice, the images rendered using such algorithms are more expensive and take more time to generate. However, one or more algorithms such as Radiosity, Ray tracing, Path tracing… could be used together to achieve a faster but still accurate solution.

Conclusion

As being discussed above, we have introduced two of the factors that play the key roles in the revolution of graphics in current entertaining games. The former factor improves the intuition of the human–machine interaction as well as produces a much more logical and natural animations to the games' characters. The latter one allows the surfaces and objects to have a more realistic appearance by simulating the reflections, shadows, refractions and caustics of each objects in relation with the others in response to the supplied light sources. Therefore, these two approaches have contributed significantly to the fantastic 'look and feel' of the game softwares.

References

[1] Dr. Xiaohu Gou, *The Physic-based modeling illustrated picture*, University of Texas, Dallas.

[2] Hong Qin, *Physics-Based Modeling Framework for Graphics, Computer-Aided Design, and Visualization*, University of New York.

[3] Wikipedia website, The Global illumination pictures.