

Application of Computer Graphics Technique to Computer System

Assembling

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Abstract

Computer graphics is the representation and manipulation of image data by a computer using various technology to create and manipulate images (Shirley et.al., 2005). The development of computer graphics has made computer easier to interact with, and better for understanding and interpreting different types of data. Three-Dimensional (3D) computer graphics represent geometric data that is stored in the computer for the purpose of performing calculations and rendering 2D images which may be for lateral display or for real-time viewing. In this work, 3D computer graphic software is used to produce a model of a real - life assembling of computer devices into a full-blown desktop computer. The work is presented in a video viewing format tat will facilitate independent coupling of systems through a 'watch-and-fix' paradigm.

Keywords: 2D, 3D, IDE, Assembling, Photo-realistic, Data-visualization, Rasterization.

1. Introduction

It is pertinent to discuss Information Communication and Technology development as it serves as a tool in which everyone get updates about everything happening in the environment. Information gets to us through various means which may be text oriented, visual or object- oriented. From observation, people tend to get and understand a message sent out through a visual means than with text or sound, because not everybody can read or hear but everyone can understood and interpret what they see. as a picture speaks more than one million words. Following this observation, there is the need to develop a tool that will give meaning or interpretation to information in form of visual means rather than text. Hence, the need to study and implement events using graphics. This research work attempts to discuss the importance of computer graphics and implement one of its applications relating to computer science and engineering viz-a-viz assembling a personal system unit using computer graphics software firstly by modelling all peripherals to be used and then animating it so that all the peripherals would be brought together to form a complete system unit.

2. Background of Study

Computer graphics is the representation and manipulation of image data by a computer using various technologies to create and manipulate images (Shirley et al, 2005). The development of computer graphics has made computer easier to interact with, and better for understanding and interpreting many types of data. Computer graphics is used mostly in the creation of an image that looks like a photograph from a real life, but portrays something that could not actually be taken as a picture. Also it may be desired to create an animation for a movie that portrays an alien creature or creating an architectural rendering to get an idea of what the final building will look like; it is called photo-realistic. The main problem in computer graphics is how to create desired images, time available to create these images, creating a series of image very quickly hopefully 30 per second or more that responds to their inputs; it is referred to as real-time or interactive graphics (Slater et al, 2002). The study of Computer graphics covers a wide range of areas and it is being implemented in data visualization, computer art, entertainment, developing a graphical user interface, virtual reality environment, simulators and graphical display, computer graphics, graphs and charts, computer animation, computer vision, computer modeling, graphics presentation, computer aided design, image processing, manipulation and storage of geometric objects and rendering, converting a scene to an image, shading and illumination of objects, motion capture, medical imaging, photorealistic image synthesis (Yu et. al., 2009).

The aforementioned applications can only be achieved when some techniques are mixed and matched. One of the techniques is to begin by attempting to understand the concepts of pixels and how computer represent colors, which is the format for what computer graphics algorithms output. The other is how to represent input data in programs run

by the computer, i.e., the 3D object that get rendered (Parslow et. al., 2007). 3D modelers allow users to create and alter models via their 3 mesh. Users can add, subtract, stretch and otherwise change the mesh to their desire. Models can be viewed from a variety of angles, usually simultaneously. Models can be rotated and the view can be zoomed in and out. 3D modelers can export their models to files, which can then be imported into other applications as long as the metadata is compatible. Many modelers allow importers and exporters to be plugged in, so they can read and write data in the native formats of other applications (Farin, 2005).

Computer animation is the art of creating, moving images with the use of computers. It is created by means of 3D computer graphics, though 2D computer graphics are still widely used for stylistic, low bandwidth, fast real-time rendering needs. It is essentially a digital successor to the art of stop motion animation of 3D models and frame by frame animation of 3D illustrations. For 3D animations, objects which are models are built on the computer so that the differences between key frames are automatically calculated by the computer in a process known as tweening or morphing and then the animation is rendered (Yu et. al, 2009).

Computer animation uses different techniques to produce animations. Most frequently, sophisticated mathematics is used to manipulate complex three dimensional polygons, apply textures, lighting and other effects to the polygons and finally rendering the complete image. A sophisticated graphical user interface may be used to create the animation (Wayne, 2003).

The term computer graphics has been used in a broad sense to describe everything on computer that is not text or sound (Shirley et al, 2005). Typically, the term computer graphics refers to several different things.

- The representations and manipulation of image data by a computer
- The various technologies used to create and manipulate images
- The images so produced, and the subfield of computer science which studies methods for digitally synthesizing and manipulating visual content.

Computer graphics is the discipline of producing picture or images using a computer which includes modelling – creation, manipulation and storage of geometric objects and rendering – converting a scene to an image, or the process of transformations, rasterization, shading, illumination and animation of the image. Computer graphics has been widely used in areas such as graphics presentation, paint systems, computer-aided design, image processing. Another use of computer graphics is the creation of images very quickly so that they can be used in an interactive animation; this is situation where user controls their characters to create a series of images quickly that respond to their inputs. Also, its importance is found in automating complex picture, medical imaging and visualization systems (Slater et al, 2002).

The use of and relevance of computer graphics has blossomed in many areas in the past 20 years, ranging from the studio arts to new mathematical disciplines such as computational geometry. The areas in which graphics have arguably had the most impact—and certainly the most visibility—can loosely be categorized as entertainment and advertising, scientific visualization, and industrial design, the development of Computer Aided Design (CAD). CAD is the use of computer technology for the design of objects, real or virtual. It may be used to design curves and figures in 2D space or curves, surfaces and solids in 3D objects (Lewell, 1985).

This research work is about using graphics computers. Computer graphics created using computers and more generally, the representation and manipulation of image data by a computer. The development of computer graphics has made computers easier to interact with and better to understand and interpret many types of data. Developments in computer graphics have had a profound impact on many types of media and have revolutionized the animation and video industry. Most powerful tools have been developed to visualize data. Computer generated imagery can be categorized into several different types: 2D, 3D and animated graphics. As technology has improved, 3D computer graphics have become more common, but 2D computer graphics are still widely used. Computer graphics has emerged as a field of computer science which studies methods for digitally synthesizing and manipulating visual content. Over the past decades, specialized fields have been developed like information visualization and scientific visualization more concerned with the visualization of three dimensional (Yu et al, 2009).

There is a need to know what computer science and engineering is so as to know how to match or relate the application of computer graphics to computer science and engineering. Computer engineering is the design and prototyping of computer devices and systems. Computer engineering concentrates its effort on the ways in which computing ideas mapped into working physical systems. Computer science is the study of the theoretical foundations

of information and computation and of practical techniques for their implementation and application in computer systems.

3. Methodology

To accomplish the designing and construction of system models, developing interactive, real-time rendering application which illustrates the use of 3D viewing models, the following procedures were utilized.

1. The use of 3D computer graphics software, Sketch-up and SU animate. The software were used to create models of all peripherals to be used and finally animating these peripherals together so that one can have a complete system unit.
2. It was designed in such a way that it is interactive to the user. It is also timed to give smooth understanding between the user and the computer.
3. To make it clear, the components that make up a complete system unit is first modelled together using sketch-up software and finally animating them together using graphics software, 3Ds Max, SU animate.

Modelling, Assembling and Animation

A way of integrating discrete-event simulation and animation is proposed using procedural animation blocks. This approach allows the use of complex animation software for displaying results of simulation. The trend toward animation in simulation yields interesting and exciting new techniques for simulation modelling. The aim of this work is to assemble a complete system unit. This, will be achieved using computer graphics software. A pre-knowledge of assembling a system unit is needed so as to know how to go about the whole process.

The first step in the assembling of a complete system unit is to identify the motherboard components. Thereafter, install a central processing unit (Processor), CPU fan, install one or more system memory modules and make sure all jumpers and switches are set correctly. After the aforementioned had being done, the Motherboard will be installed into the system's chassis i.e, the computer case. After this has been done, there is need to power the motherboard, hence, the 24-pin connector from the power pack is connected to its alternate slot on the motherboard. The hard disk drive connector, power connector from the system case will also be connected to the alternate slot on the motherboard. Finally, two IDE cables are used to connect the IDE devices; the hard disk drive and the DVD-ROM drives among others.

The above procedure is the conventional way of installing the motherboard and assembling a complete system unit. These steps will be followed using 3-Dimensional models for all the components and then animating all together.

Perspective(Views)/Format: The 3D models are being processed in sketch-up which means any model that is not in .skp format will not open in the sketch-up environment which further implies that nothing can be done on these models.

Connection/Interface: All models must show point of connection. For example, the DVD ROM 3D model should show the IDE cable link between the motherboard and the alternate slot at the back of the DVD-ROM, the power connector should also be shown, likewise all other system peripherals must be interfaced appropriately.

Alignment of models: Most models obtained may not fit into the parent model probably as a result of different download source from which the models were obtained therefore, there is need for resizing, realignment of models to achieve.

Picking and dropping: Models should be clearly picked and dropped in respective slots and differently rendered. The process of rendering should at least show four scenes of different views. The overall process involved in the implementation of this work could be broken into four main categories which is represented in the block diagram below.

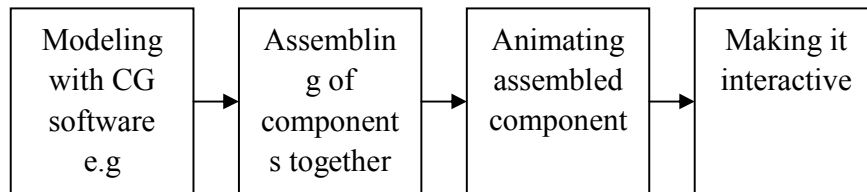


Figure 1: Block diagram showing the work details

Publishing and Exporting: The procedure for publishing and exporting is done when one is ready to deliver the movie to an audience; one must publish or export the sketch-up .SKP file to another format for playback.

Creating Animation: The logic behind animation is by changing the content of successive frames. An object can be made to move across the stage, increase or decrease in size, rotate, change colour, fade in or out, or change shape. Changes can occur independently of, or in concert with, other changes. For example, one can make an object rotate and fade in as it moves across the stage. In frame-by-frame animation image can be created in every frame. Animation varies the object's size, rotation, colour, or other attributes evenly between the starting and ending frames to create the appearance of movement.

4. Implementation

Various steps are followed during the implementation of this project. The steps are broadly categorized into animation steps and assembling steps. The steps are discussed below in detail.

Animation Steps

The animation steps entails using SU Animate to utilize components in animations along a path.



Figure 2: Diagram showing the SU Animate Toolbar

Make Scenes :This tool creates the actual scenes in SketchUp in order to export the animation as a video file, or to render the scenes with Podium. A prompt to enter the number of scenes will be created.

User Interface. The interface makes assigning groups or camera or both to paths, easy. Just put in the number of frames and SU Animate divides the path for you. Now, there is also an arrow indicating the direction of the path that will appear when the animation path window opens. Also targets can be assigned to each path from the User Interface.

Delay :With the Delay feature, a delay variable can be assigned to each path. The delay is measured in a number of scenes. So a delay of 10 would mean a delay of 10 scenes. If one path is assigned a delay of 10, this means that the path's animation will not run until frame or scene 10.

Repeat: Repeat allows the user to set a path to repeat itself. The path and associated group will continue to animate until all the frames or scenes in the entire animation are completed.

Assembling Steps

The assembling steps entails bringing all the components into a full blown system. In this case, scenes were created to show how a PC is assembled from different views.

Figure 3 shows the pictorial view of the components during assembling process,

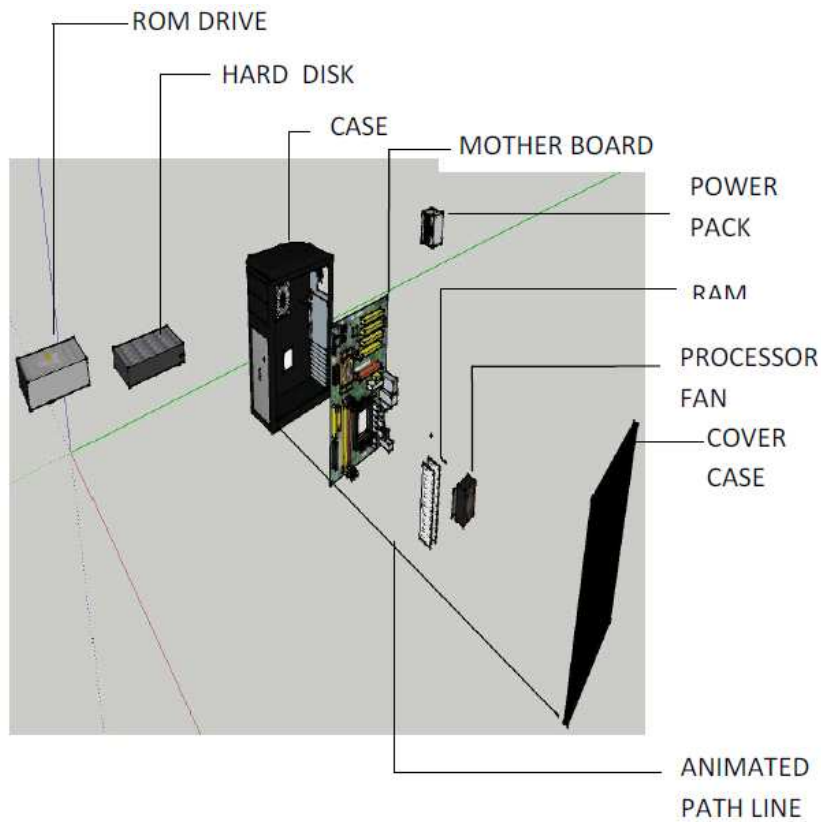


Figure 3: Annotated diagram of system components

The last process involved the conversion of the whole process from sketch-up .skp format into video clip .avi format so that it can run on every PC without having sketchup installed on it. The video converted format is as shown in Figure 4.

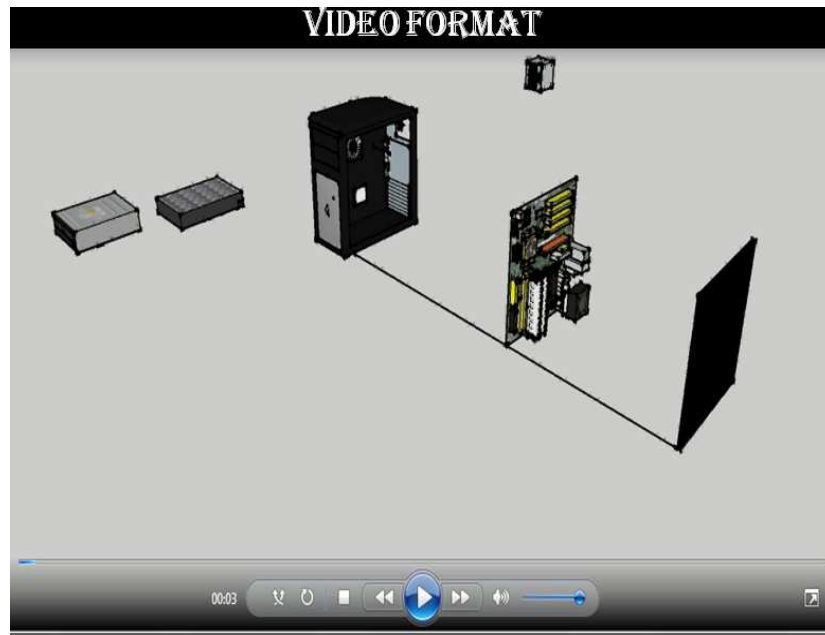


Figure 4 shows the video format of the assembling process.

5. Conclusion

The assembling of a complete desktop computer system was done using computer graphics animation. The work lent a credence to the relevance of computer graphics to computer science and engineering though streamlined only to modelling, assembling and animating 3D computer components. A video playable format of the system assembly steps is also provided for the system unit (desktop) in three-dimensional viewing angle.

6 Recommendation

Computer graphics software packages allow users to create and alter model via 3D mesh and this have been a tremendous achievement to the world of computer science and engineering as a whole. However, it recommended that further work be done to model, assemble and animate 3D components into a full blown laptop since technology is becoming miniaturized. It is also recommended that further research be done in developing tools that will make modelling, assembling and animating easier, faster and more flexible.

7. References

- [1] Shirley P, Ashikhmin M.,Gleicher M., Marschner S.R., Reinhard E., Reinhard K., Thompson W. B., Willemsen P. (2005). Fundamentals of Computer Graphics. Peters A.K., Ltd . 2nd edition.
- [2] Slater, M. A. Steed, Y. Chrysantho (2002). Computer Graphics and Virtual Environment from Realism to Real- time. Addison Wesley Pub. Co.
- [3] Yu J., Mcmillian L., Sturm P. (2009). "Multi-perspective Modelling, Rendering and Imaging" Computer Graphics forum,29(1).
- [4] Parslows, R. W. Prowse, Richard Elliot Green (2007). Computer Graphics: Techniques and Application. Brunel University.
- [5] Farin, G. A. (2005) History of Curves and Surfaces in CAGD, Handbook of Computer Aided Geometric Design.
- [6] Wayne Carlson (2003). A Critical History of Computer Graphics and Animation. The Ohio State University.
- [7] Lewell John (1985) "Computer Graphics: a survey of current Techniques and Applications" Computer and information Science.

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