A Prototype to Improve Ever Faster Execution of Multimedia Program

Bala Dhandayuthapani Veerasamy
Mekelle University, Department of Computing, Mekelle, Ethiopia
dhanssoft@gmail.com

Abstract— **Multimedia is a mixture of text, graphics, art, sound, animation and video with links and tools that let the person to watch, navigate, interact, and communicate with the computer. While executing multimedia data over standalone or networked computer, it may take time to respond or performance may be getting slow. This paper describes the prototype for fast execution of multimedia program using concurrency technique.**

Index Terms—**Multimedia, Task, Concurrent, Parallel, Distributed, Single Environment, Multiple Environment**

I. INTRODUCTION

Multimedia [1] is the field concerned with the computer controlled integration of text, graphics, drawings, video, animation, audio, and any other media where every type of information can be represented, stored, transmitted and processed digitally. 'Multi' refers to the multiple file usages used in the multimedia product [2], such as sound, animation, graphics, video, and text. A multimedia application uses a collection of multiple media sources or data e.g. text, graphics, images, sound/audio, animation and/or video. Multimedia system is capable of processing multimedia data and applications. A Multimedia System is characterized by the processing, storage, generation, manipulation and rendition of multimedia information or data.

Traditionally, software has been written for serial computation. It is to be run on a single computer having a single Central Processing Unit (CPU) [3]. A problem is broken into a discrete series of instructions. Instructions are executed one after another. Only one instruction may execute at any moment in time. In the simplest sense, parallel computing is the simultaneous use of multiple compute resources to solve a computational problem. It is to be run using multiple CPUs. A problem is broken into discrete parts (tasks) [4] that can be solved concurrently. Each part is further broken down to a series of instructions. Instructions from each part execute simultaneously on different CPUs. Task is a logically discrete section of computational work. A task is typically a program or program-like set of instructions that is executed by a processor. A parallel Task is a task that can be executed by multiple processors safely.

Concurrency techniques [5] are used to allow a computer program to do more work over the same time period or time interval. Rather than designing the program to do one task at a time, the program is broken down in such a way that some of the tasks can be executed concurrently. Tasks that exist at the same time and perform in the same time period are concurrent. Parallel programming and distributed programming are two basic approaches for achieving concurrency with a piece of software. They are two different programming paradigms that sometimes intersect. Parallel programming techniques assign the work a program has to do to two or more processors within a single physical or a single virtual computer. Whereas, distributed programming techniques assign the work a program has to do to two or more processes where the processes may or may not exist on the same computer. Concurrency techniques are nowadays allowed in programming languages such as Java, C++, and C.

II. COMPONENTS OF MULTIMEDIA

A. Textual Information

All multimedia productions contain some amount of text, and even some might contain a large amount of textual matter. The text can have various types of fonts and type sizes to suit the professional presentation of the multimedia software. The standard software interface which is now a day's provided on multimedia is the windows interface. This interface allow large amount of fonts to be stored in multimedia.

B. Images

Another important and interesting component of multimedia is images [6]. One of the basic facts in multimedia production is that, people do not like reading large amount of textual matter on the screen. Also, it is a myth about human nature that a subject is better explained to them when represented in pictorial or graphical form; instead of textual matter i.e. images are used more often than text to explain a concept, present background information etc. These are two different ways in which graphs or images can be described, Bitmap and Vectors. Bitmap images are assumes an image to consist of two dimensional squares which are called the pixel or dots on the screen. Vector images is an image, is formed as a set of straight or curved lines instead of dots. A line can be represented by a mathematical equation, whose number can be stored as a set of binary codes.

C. Animation

Animation also plays vital part in the multimedia program. The dedicated hardware and software built into

the system increases the animation speed. An animation is just a continuous series of still images that are displayed in a sequence. There are mainly two types of animation used in multimedia, namely 2D and 3D animation. 2D animation, also known as cell (pixel based) animation, is the most common kind of animation, where flat images are drawn one frame at a time.

In 3-D animation mathematical model of 3-D object is created to realistically portray with depth. Now it has become a common media element in film, video and multimedia packages. In a 2-D animation an object can move up (called Y axis) and sideways (called X axis). But in the case of a 3-D model, a third axis is used; depth or the Z axis. Once an object is created along these three axes, color, shading and light source can be added to the image to make it more realistic.

In the second phase, the 3-D images are moved along a motion path, which is defined using key frames of the animation sequence. These key frames are used to create the in-between frames in the sequence automatically.

And in the final stage, the entire sequence is rendered to create a 3-D animation. Blending texture maps into the model to add realism causes one of the main slowdowns during rendering. A texture map is a wall paper for 3-D models, in which a graphics image is wrapped over the surface of a model. When a 3-D animation program renders an images, it mix up intimately all the color, texture maps, light source and surface attributes in each frame of the 3-D animation sequence. The rendering process is computationally intensive step.

D. Digital Audio

The most common reason for using digital audio [6] in computer is to be able to use multimedia in its full potential. The most common requirement is to be able to input sound such as a spoken commentary on an image or a document. The sound is a repeated pattern of pressure in the air and a microphone converts a sound wave into an electrical wave. The shape and frequency of the electrical wave is identical to the shape and frequency of the sound wave and the clarity of what we hear is entirely dependent on the shape and frequency of the sound wave. Sound can also be recorded and reproduced using digital signals and the errors can be reducing drastically in digital recording of the sound. Audio has to be converted into digital form to produce digital audio in order to use it in the multimedia. And the digital audio system will then reconvert the entire digitized audio into analog form, which can be heard on the speaker. This two way transformation of audio is known as analog-to-digital conversion and digital to analog conversion respectively. But the storage space required for digital audio is huge, somewhere around more than 1 MB for one minute of audio. The entire process of digitization is a simple process of converting analog or electrical signal of audio to computer data file in the digital format. A Digital signal processor is always embedded in the sound card to provide additional capabilities without affecting the CPU. A simple recording of digital sound can be done and may be compressed if desired.

E. Digital Video

Digitized video [6] is one of the many technologies used in the development of interactive multimedia. It is one of the ways to play back and record video in multimedia program. It offers a wide range of flexibility as compared to standard video signal. Unlike regular video, quality of image would not degrade from copy to copy as digital video is made up of a digital code and not an electrical analog signal. However the final output depends on how the video images are converted to digital form during the development phase. Video signal comes from an external source such as TV or VCR or camera to the video-digitizer card inside the system. Some systems use a digitizer card which has dual function for both audio and video conversion. The process of converting analog video signal to digital format is called sampling. Using this process the converter card in the system converts the analog video signals into digital data streams so that these signals can be stored in the binary data structure format of 1s and 0s.

III. MULTIMEDIA PROGRAM EXECUTION

The primary reasons for using parallel computing is to save time, wall clock time, solve larger problems, and provide concurrency. Other reasons might include taking advantage of non-local resources using available computer resources on a wide area network, or even the Internet when local computer resources are scarce. It is using multiple computing resources instead of paying for time on a supercomputer. The overcoming memory constraints in single computers have very limited memory resources. For large problems, using the memories of multiple computers may overcome this obstacle.

Concurrent tasks can execute in a single processing [5] or multiprocessing environment [5]. In a single processing environment only one CPU will be present (see Figure 1). It executes concurrent tasks exist at the same time and execute within the same time period by context switching. Context switching is just a time limit applied to each and every task. Multimedia program have to divide as several tasks such as Text Task, Image Task, Audio Task, and Video Task. According to the time limit or context switching, tasks will be executing on the processor. In a multiprocessor environment more than

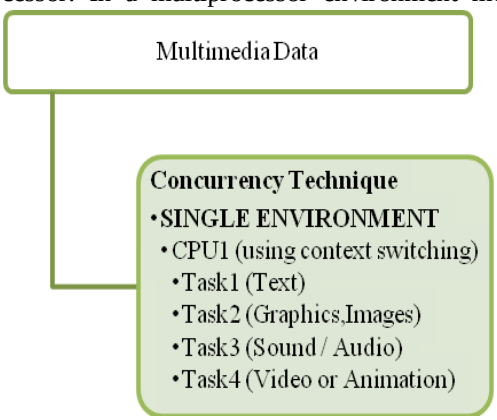

Figure 1. Multimedia program execution on Single Environment

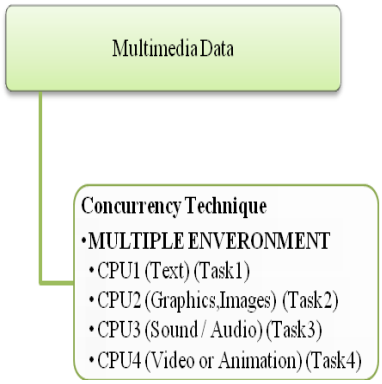

Figure 2. Multimedia program execution on Multi Environment

one processor will be present (see Figure 2). If enough processors (CPUs) are free, concurrent tasks may execute at the same instant over the same time period. Here each and every CPU will have different task such as Text Task, Image Task, Audio Task, and Video Task. The determining factor for what makes an acceptable time period for concurrency is relative to the application or programs. The "Fig.1" shows the prototype on multimedia program executions.

CONCLUSION

Multimedia is flourishing a field of computer. But executing multimedia programs in serial computer will offer low performance. There are limitations on increasing the power of serial computing, which brings both physical and practical reasons pose significant constraints to build ever faster serial computers. They are transmission speeds, limits to miniaturization, economic limitations. Serial execution of multimedia programs will never offer best performance. This paper recommended executing multimedia programs with concurrency technique either by using context switching in single processor or by using multiprocessing environment.

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