B.E.

Fourth Semester Examination, Dec-2009

MULTIMEDIA TECHNOLOGIES (MT)

Before ***answering the question, candidates should ensure that they have been supplied the correct*** *and complete question* ***paper.*** *No* ***complaint in this regard, will he entertainment after examination.***

Note: ***Attempt*** *any five* ***questions. All questions carry equal marks.***

Q. I. What is multimedia? Give various classifications of multimedia. Describe various multimedia applications in detail.

Ans. Multimedia is any combination of text, graphic art, sound, animation, and video delivered to you by computer or other electric means. When you weave together the sensual elements of multimedia-dazzling pictures and animations, engaging sounds, compelling video clips, and raw textual inf. you can electrify the thought and action centres of people's minds. When you give them interactive control of the process, they tun be enhanted. Multimedia excites eyes, ears, fingertips and most importantly the heads.

Classification:

Multimedia is, woven combinations of text, graphic art, sound, animation and video elements. When you allow an end user the viewer of a multimedia project to control. What and when the elements are delivered, it is interactive multimedia. When you provide a structure of linked elements through which the user can navigate, interactive multimedia becomes hypermedia.

The people who weave multimedia into meaningful tapestries are multimedia developers.

The s/w vehicle, the messages, and the content presented on a computer or television screen together constitute a multimedia project. If the project will be shipped or sold to consumers or end users, typically in a box or sleeve or on the internet, with or without instructions, it is a multimedia title. Your project may also be a page or site on the world side web, where you can weave the elements of multimedia into HTML or DHTML documents and use plug-ins to display our multimedia work using a browser application such as Internet Explorer or Netscape Navigator.

A multimedia project need n't be interactive to be called multimedia, users can sit back and watch it just as they do a movie or the television. In such case a project is linear, starting at a beginning and running through to an end. When users are given navigational control and can wander through the content at will multimedia becomes non-linear and interactive, and is a powerful personal gateway to information.

Applications:

1. Entertainment: Growing interacting and group participation:

The use of interactive media for entertainment is no new phenomenon, yet the scale and sophistication of games and movies will dramatically advance in three stages. First, the amount ofproiramming available to audiences will increase in a drive to video-on-demand services, second, the use of tne television facilities for V ideo-on-demand will make it possible to incorporate will move from a highly controlled audience mode to open-ended group collaboration and teaming, from many-to-many to many.

Video on Demand

Interactive Cinema

Collaborative Computer-Supported Games

2. Home Shopping:

Home shopping is currently a 2 $ billion industry. It offers greater convenience. In another type of home shopping, touchscreens kiosks have entered the business of residential real estate sales. Developed by a company in Denmark, Home-vision allows buyers to interactively browse a photo database of homes, seeing diff. views and the rooms of the property.

cruc.ial advantage of multimedia technology a is the shift to a visually oriented interface. The Home-visio.. system is one illustration of this.

Multimedia Communications for Healthcare:

l,i a recent multi year Media Broadband Services (MBS) study involving four Bosten-area hospitals, the regional Bell Operating System NYNEX provided broadband interconnections to field test the benefits of high-bandwidth communications. NYNEX and the hospitals also collaborated on developing application s/w needed for medical specialists to perform workstation based video conferencing and image retrieval.

4. Geographical Information Systems:

The 'management of facilities such as building, roads, power lines, and **railroad tracks** is **a problem that** concerns government offices, utilities, and many industries. Specially designed computer **database management** systems called geographic information system (GIS) are available to provide on-line support for **these types** of operations. Such systems typically offer a storage model for spatially organized data so that queries based on area or location can be quickly answered.

5. Education:

Multimedia is now plays an important role in education. The projectors with computer makes student to easily understand the things. Multimedia is also efficient for a teacher to teach to a large no. of students effectively.

6. Multimedia Communications:

An Enabling Technology **for concurrent engineering and manufacturing** :

Engineering and manufacturing groups rely increasingly **on** CAD and **CAM** s/w **to** design; manufacture and maintain their products. Together **with technical publishing** s/w, **these tools permit design specifications** and technical documentation to be **created and** accessed **on-line. The second enabling role of multimedia** technology is to supplement these **existing tools with a richer inf. processing environment.**

7. The Impact of Ubiquitous Multimedia Services:

There is an impressive range **of applications of multimedia technology, some of which may not have** been conceived of yet. **Independently, each one offers testimony to the potential benefits of multimedia** systems.

Q. 2. (a) Why is n't it always best to use the highest sampling rate and highest resolution when recording should files? Justify.

Ans> Preparing digital audio is fairly straight forward if you have analog source materials music or sound effects that you have recorded on analog **media such as cassette tapes the first step is to digitize the analog** material by recording it onto **computer readable digital media. We want to focus on two crucial aspects of** preparing digital audio files.

1. Balancing the need for sound **quality** against **your available RAM and hard disc resources.**

2. Setting proper recording levels to get a good, clean recording.

The three sampling frequencies most often used in multimedia are co-quality **44.1 kHz, 22.05 kHz, and** 11.025 kHz. Sample sizes are **either 8** bits **or 16 bits. The larger the sample size, the better the data describes the** recorded sound for 8 bit sample size **provides 256 equal units to describe the dynamic range of amplitude.**

Sampling at higher rates more accurately captures the high frequency content of our sound.

Audio resolution determines the accuracy with which a sound can be digitized. Using more bits for the sample size yields a recording **that sounds more like its original.**

Sampling rate.is measured in kHz, or thousand samples per second, so to convert for kHz to a whole number, you **must multiply by 6000. Resolution is measured in bits per sample. Since there are 8 bits in a byte,** we have to divide **the bit** resolution **by 8.**

Q. 2. (b) What are the main advantages of digital system over analog systems? Describe encoding and **quantization in detail.**

Ans. Accurate, high quality sound reproduction is possible-with both analog and digital systems. Excellent, expensive analog systems **may outperform digital systems and vice versa. One of the most limiting** aspects of analogy technology is the **sensitivity of analog media to minor physical degradation, however,**

when the degradation is more pronounced.

The principle advantage that digital systems have are very uniform source fidelity, in expensive media duplication costs, and direct use of the digital 'signal' in today's popular portable storage and playback devices. Analog recordings by comparison requires comparatively bulky, high-quality playback equipment to capture the signal from the media as accurately as digital.

Encoding and Quantization:

In computer technology encoding is the process of putting a sequence of characters into a special format for transmission or storage purposes. The term used to reference to the processes of analog-to-digital conversion and can be used in the context of any type of data such as text, image, audio, video or multimedia.

Quantization is a process in which the continuous range of values of an analog signal is sampled and divided into non-overlapping subranges, and are discrete, unique values is assigned to each subrange. An application of quantization is its use in pulse-code modulation. If the sampled signal value falls within a given subrange, the sample is assigned the corresponding discrete value for purposes of modulation **and** transmission.

Q. 3. (a) Explain how authoring **tools and presentation tools helps in making multimedia projects?**

Ans. Authoring s/w provides an integrated environment for binding together the content and functions of our project. Authoring systems typically include the ability to create, edit and import specific types of data, assemble raw data into a playback sequence or cut sheet, and provide a structured method or language for responding to user input. With multimedia authoring s/w, we can make

(i) Video productions

(ii) Animations

(iii) Games

(iv) Interactive web sites

(v) Demo disks and guided tours

(vi) Presentations

The various Authoring tools for this are :

1. Card-or-page based tools
2. Icon-based, event-driven tools
3. Time-based and presentation tools

Presentation tools was originally developed to computerize the creation and delivery of presentations to audiences and conferences as printed output that could be distributed on paper on shown on large screens by overhead projector, or digitally produced as 35 mm colour slides. As direct connections from computer monitor outputs to projectors became commonplace, these same tools became useful for live computer-driven presentations with or without printed handouts.

Presentation s/w might, indeed by considered multimedia authoring s/w, because the publishers of these tools have made their products multimedia capable. On the other hand, the features of dedicated presentation s/w are being incorporated into the three core office products word processor, spread sheet and database.

Q. 3. (b) What is DVI technology.

Ans. DVI Technology:

DVI also known as "Indeo", is a proprietary, programmable compression/decompression technology based on the Intel i750 chipset. This hardware consists of two VLSI (Very Large Scale Integrated) chips separate the image processing and display functions. Two levels of compression and decompression are provided by DVI: Production Level Video (PLV) and Real Time Video (RTV). PLV is a proprietary asymmetrical compression technique for encoding full-motion colour video, it requires that compression be performed by Intel as its facilities or at licensed encoding facilities set up by Intel. RTV provides image quality compression to prime rate JPEG and uses a symmetrical, variable rate compression. PLV and RTV both uses variable rate compression.

DVI algorithms can compress video images at ratios between 80:1 and 160:1. DVI will play back video in full-frame size and in full colour at 30 frames per second, whereas JPEG provides only an acceptable image in a small picture window on the computer screen.

Q. **4. (a) What** is **the difference between lossy and loss less Compression? What are the advantages and** disadvantages of each?

Ans. Lossy and Loss Less Compression Schemes:

Compression is either lossy or loss less. Lossy schemes ignore picture information the viewer may not miss, but that means the picture information is in fact lost even after decompression. And as more and more information is removed during compression, image quality decreases. Loss less schemes preserve the original data precisely an important consideration in medical imaging, for example. The compression ratio typically affects picture quality because, usually, the higher the compression ratio, the lower the quality of the

decompressed image.

Q. 4. (b) What is animation? Discuss various animation techniques.

Ans. Animation:

Animation adds visual impact to our multimedia projects and web pages. Many multimedia applications for both **macintosh and windows provide animation tools. Animation is an object actually moving across or** into or out of the screen, a spinning **globe of our earth, a car driving along a line art highway.**

Animation is possible because **of** a **biological phenomenon known as persistence of vision and a** physchological phenomenon **called phi. An object seen by the human eye chemically mapped on the eye's** retina lor a brief time after viewing. *>

Animation Techniques:

When you create an **animation,** organize **its execution into a series of logical steps. First, gather up in** your mind all the activities your wish **to provide in the animation, if it is complicated, you may wish to create** a written script with a list of activities **and required objects. Then choose the best animation tool.**

Celt Animation:

The term cell drives from the **clean celluloid sheets that were used for drawing each frame, which have** been replaced today by acetate or plastic **cell animation artwork begins with key frames. The series of frames** in between the key frames are **drawn in a process called tweening.**

Computer Animation:

Computer animation programs **typically employ the same logic and procedural concepts as cell animation,** using layer, keyframe and tweening techniques, **a even borrowing from the vocabulary of classic animators.**

Kinematics:

Kinematics is the study of the **movement and motion of structures that have joints.**

Morphing:

Morphing is a popular effect in which one image transforms into another. Morphing applications and other modelling tools that offers effect can transition not only between still images but often between moving images as well.

Q. 5. Discuss JPEG standard for image compression **with its DOT encoding and Quantization, Predictive** loss less coding and its performance.

Ans. JPEG Image Compression Standard:

!t is joint photographic expert group. The objective of this are :

i. To be at or near the state of the art for degree of compression versus image quality.

2. To be parameterizable so that the user can select the desired compression versus quality trade off.

3 To be applicable to practically any kind of source image, without regard to dimensions, image content and aspect ratio etc

4 To have computational requirements that are reasonable for both h/w or s/w implementation.

5. To support from diff. modes of operation :

(i) Sequential encoding, where each image component is encoded in the same order that it was scanned.

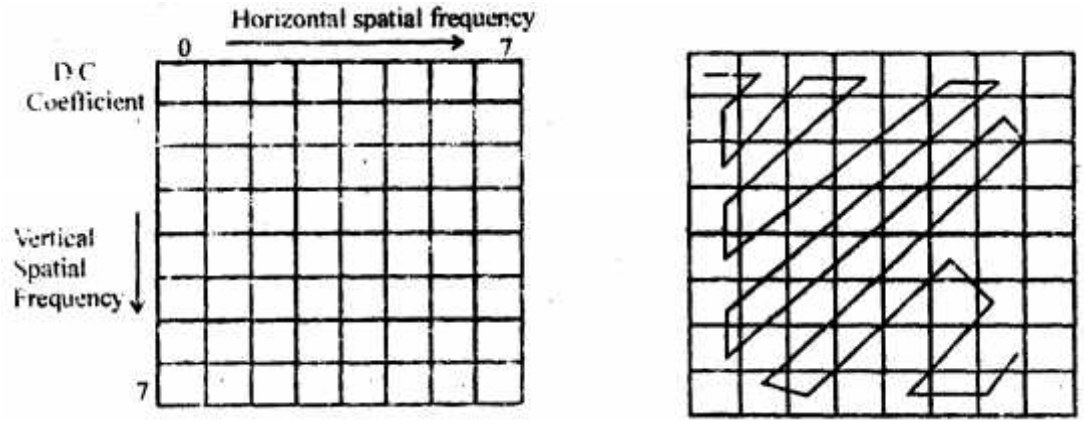
(ii) Progressive encoding, where each image in encoded in multiple passes so that a coarse image is presented rapidly, followed by repeated images showing greater and greater detail.

(iii) Lossless encoding : Where the encoding guarantees exact reproduction of all the data in me source image.

(iv) Hierarchical encoding, where the image is encoded at multiple resolutions.

OCT Encoding and Quantization:

The i;;iipui of the DCT encoder is shown in fig. as a 2-D array with the DC coefficient in the upper left corner and the AC coefficients arranged with increasing spatial frequency horizontally and vertically. These component are quantized acc. to a 64 entry tabic, which must be specified to the encoder by the application. The qnantization table has 8 bits per entry and specifics the step size of quantizing for each DCT coefficient.



After quantization, the DC coefficient is treated differently from the AC coefficients. Because these is usually a strong correlation between coefficients of adjacent 8 * 8 blocks, the DC coefficients is encoded as the difference from the previous block in the encoding sequence.

In order to create a bitstream where coefficients that are more likely to be non-zero (low-frequency ones) arc placed before coefficients that are by fig. (b) is used to read the coefficients into die bitstream. The result is that all the zero-value coefficients tend to be togedier at the end of the block and can be transmitted with very few bits using a simple rurvlength code.

Predictive Lossless Coding:

The lossless compression option, doesn't use DCT. Instead, a simple predictor is used, but these is a choice of seven different kinds of prediction available. The different predictor choices specifies how many and which adjacent pixels are used to predict the next pixel. The statistical coding in die lossless mode can use either of the two methods specified for the DC modes, and is similar So what is specified for die DC coefficient of the DCT modes.

The lossless compression wilt work with source images having from 2 to 16 bpp, and typically deliver around 2 : 1 compression for photographic colour image.

Performance:

Compression performance is best specified by relating image quality to bits per pixel in the compression data stream. This relationship depends to some degree on the characteristics of the source image-some images are harder to compress successfully man others, with this in mind, here are some figures for typical "source image":

0.025-0.5 bpp : moderate to good quality sufficient for some applications.

0.5-0.75 bpp: good to very good quality, sufficient for many applications.

0.75-1.5 bpp: excellent quality, sufficient for most applications.

1.5-2.0 bpp: undistinguishable from the original, sufficient for the most demanding applications.

Q. 6. (a) **What are the key parameters to be considered for evaluating a compression system? Discuss** various video techniques.

Ans. Image compression algorithms are critical to the delivery of motion video and audio on both **the** macintosh and PC platforms .without compression, these is simply not enough bandwidth on the macintosh or PC to transfer the massive amounts of data involved in displaying a new screen image every 1/30 of a second.

To understand compression, consider three basic concepts :

I.Compression Ratio:

The compression ratio represents the size of the original image divided by the size of the compressed image that is, how much the data is actually compressed. Some compression schemes yield ratio that are dependent on the image content : a busy image of a field of multicoloured tulips may yield a very small compression ratio, and an image of b/w ocean and sky mog yield a very high compression ratio video compression typically manages only the part of an image that changes from image to image.

2. **Image Quality**:

Compression is either lossy is lossless lossy schemes ignore picture inf. tne viewer may not miss, **but** that means the picture inf. is in fact lost-even after decompression lossless schemes pressure the original data precisely an important consideration in medical imaging, for example, the compression ratio typically affects picture quality because, usually, the higher th'e compression ratio, the lower the quality of decompressed image.

.3. Compression/Decompression Speed:

We will prefer a fast compression time while developing our project users, on the other hand, will appreciate a fast decompression time to increase display performances.

Various video techniques are :

I. MPEG:

The M PEG standard has been developed by the Moving Picture Experts Group, a working group convened by the International Standards Organization (ISO) and the International Electro-Technical Commission (IEC).

2.DVI/Video:

DV1 is a **proprietary, programmable compression/decompression technology based on the Intel i750** chip set. This hardware consists of **two VLSIC (Very Large Scale Integrated) chips to separate the image** processing and display function.

Q. 6. (b) What is animation? Discuss the principles of animation.

Ans. Animation:

Animation **adds** visual **impact to are multimedia projects and web pages. Many multimedia applications** for both **macintosh and Windows provide animation tools, but we should first understand the principles of** how the eye **interprets** the **changes its sees as motion animation is an object actually moving across or into or** out of the screen, **a** spinning globe **of our earth, a car driving alone a line-art highway.**

Principles of Animation:

Animation is possible because of a biological phenomenon known as persistence of vision and a psychological phenomenon **called phi. An object seen by the human eye remains chemically mapped on the** eye's retina for a brief time after viewing **combined with the human mind's need to conceptually complete a** perceived action, this makes it possible **for a** series **of images that are changed very slightly and very rapidly,** one after the other, to seemingly **blend together into a visual illusion of movement. Television video 30 entire** frames or pictures every second, **the** speed **with which each frame is replaced by the next one makes the** images appear to **blend** smoothly **into movement. On some projector each frame is shown 3 times before the** pull-down claw moves to the **next farme, for** a **total of 72 flickers per second, which helps to eliminate the** flicker effect, the more interruptions **per second, the more continuous the beam of light appears. Quickly** changing the viewed image is the **principle of an animatic, a flip-book, or a zoetrope. To make an object travel** across the screen while it changes **its shape, just change the shape and also move or translate it a few pixels** for each frame. Then, when you play **he frames back at a faster speed, the changes blend together and you** have motion and animation.

Q. 7. **(a) What do you mean by Virtual reality? Discuss its areas of application.**

Ans. Virtual Reality:

V irtual reality requires terrific computing horsepower to be realistic. In VR our cyberspace is made up of many thousands of geometric **objects plotted in three dimensional space, the more objects and the more** points that describe **the** objects, **the higher the resolution and the more realistic our view.**

On the world wide web, standards for transmitting virtual reality worlds or "scenes" in VRML (Virtual Reality **Modelling** Language) **documents have been developed Intel and s/w makers such as macromedia and** Adobe have **announced support for new 3-D technologies.**

VR is an extension of multimedia **it** uses **the basic multimedia elements of imaginary, sound and animation.** Because it requires instrumented **feedback from a wired-up person, VR is perhaps interactive multimedia at its** fullest extension.

The VR nave produced systems that allows a user to interact with a simulated 3-D environment using computer systems that sense the user's position via cameras, body hacking devices. 3-D modelling s/w, the authoring system for these environments, allows a developer to create the behaviour rules for the natural envi-onment.

Specialized public game arcades have been built recently to offer VR combat and flying experiences ibr a price.

Q. 7. *(b)* **What** are **intelligent VR software systems? Discus* the requirements of visually coupled** systems.

Ans. Virtual reality systems are designed to produce in the participant the cognitive effects of feeling immersed in the environment created by a computer using sensory inputs such as vision, hearing, feeling and sensation. A variety of body movement tracking devices are used to return feedback from the user to the computer The feedback may be to the perceptions of the current scene or the participant movement of after the direction and progress of the scene we will give here key design issues that developers must consider why they design virtual reality systems :

1. Color, Brightness, Shading
2. Object Recognition
3. Navigation
4. Motion Processing
5. Depth Perception
6. Log
7. Visual Effects

Virtual reality is created by combining a number of components including sound and graphics, into sound and visual effects. Other inputs can include the sensation of heat, surface texture, pain and changes in pressure.

Visual effects are created by combining video clips, graphics, and light effects. Visual effects create a sense of realism by giving the perception of reality through a synthesis of synchronized sound and image. A real challenge in recreating computer-generated visual effects is timing. The timing for synchronizing multiple sound inputs with video clips is crucial for the visual effect to have a real impact.

Q. 8. Write short notes on :

(a) Video on demand

(b) MPEG

Ans. (a) Video On Demand:

The first stage is developing as an effort by the cable television industry, the telephone industry, and broadcasts to provide greater flexibility in what programming it shown when. The video on demand model takes advantages of some form of two-way communication between the home and the video source, which could be a low-bandwidth back channel on a CATV path or a phone line with sufficient bandwidth to carry a compressed video signal. The home may be furnished with a low-cost box, which accepts signals from a hand-held control and which transmits the appropriate status to the video control centre. The viewer uses the hand-held control to navigate a selection menu and choose a program shortly after the selection is made, the program begins playing. During the course of the movie the viewer is able to pause, reposition and use other VCR-like controls.

Video-on-demand is an anticipated next generation service to be offered by cable television and other telecommunication vendors. Subscribers access a remote video-on-demand server through **a** menu interface controlled by a hand-held device. The server stress a large number of digital compressed videos, which can be transmitted to a subscriber on request. The server is designed to act as a remote VCR player for each subscriber.

Ans. (b) MPEG Motion **Video Compression Standard**:

As within the JPEG standard, the MPEG standard [4] is intended to be generic, meaning that it will support the needs of many applications. As such, it can be considered as a motion video compression toolkit, from which a user selects the particular features that best suit his application. The specific objective are :

1. The standard will deliver acceptable video quality at compressed data rates between 1.0 and 1.5 mbps.
2. It will support either symmetric or asymmetric compress/decompress applications.
3. When compression takes it into account, random access playback is possible to any specified degree.
4. Similarly, when compression takes it into account, fast-forward, fast-reverse, or normal-reverse playbnek modes can be made available in addition to normal playback.
5. Audio V uko synchronization will be maintained.
6. When it is required, compression-decompression delay can be controlled.
7. I ditability should be available when required by the application.
8. The processing requirements should not preclude the development of low-cost chipset which are capable of encoding in real time.