

Q2 (a) Discuss briefly the various software tools available for carrying out tasks in multimedia.

Answer

The categories of software tools are as follows:

- (i) Music sequencing and notation
- (ii) Digital audio
- (iii) Graphics and image editing
- (iv) Video editing
- (v) Animation
- (vi) Multimedia authorizing

For brief explanation of these tools, Please refer page number 14 of Text book I

Q2 (b) Most common data types for graphics and image file formats are: 24-bit color and 8-bit color. Discuss them briefly.

Answer

24 bit-color images: In a color 24-bit image, each pixel is represented by three bytes, usually representing RGB. Since each value is the range 0-255, this format supports $256 \times 256 \times 256$ or a total of 16, 777, 216 possible combined colors. How, much a large flexibility does result in a storage penalty: a 640×480 24-bit color image would require approx. 921.6 KB of storage without any sort of compression. An important point to note here is that many 24-bit color images are actually stored as 32-bit images, with extra byte of data for each pixel storing an α (alpha) value representing special-effect information.

8-bit color images: If space is a concern, reasonably accurate color images can be obtained by quantizing the color information to collapse it. Many systems can make use of only 8-bits of color information (The so-called “256 colors”) in producing a seven image. Even if a system has the electronics to actually use 24 bit of information, backward compatibility demands that we understand 8-bit color image files. Such image files use the concept of lookup table to store color information. Basically the image stores not color but instead just a set of bytes, each of which is an index into a table with 3-bytes values that specify the color for a pixel with that lookup table index. It should be noted here that the great saving in space for 8-bit images over 24-bit ones: a 640×480 8-bit color image requires only 300 kb of storage, compared to 921.6 kb for a color image, again without any compression applied.

Q3 (a) Write a brief note on channel and formant vocoder.

Answer

Vocoders are specifically voice coders. As much, they cannot be usually applied when other analog signals, such as modem signals are in use. Vocoders are concerned with modeling speech, so that the salient features are captured in as few bites as possible. Now for explaining channel vocoder and format vocoder.

Please refer page number 378 & 380 of Textbook I

Q3 (b) Discuss briefly the important properties of Huffman coding.

Answer Page Number 175-176 Textbook I

Q3 (c) Compare discrete cosine transform (DCT), and discrete Fourier Transform (DFT).

Answer

The Discrete Cosine Transform (DCT) is a close counterpart to the Discrete Fourier Transform (DFT) and in the world of signal processing; the latter is likely the more common. We have started off with the DCT instead because it is simpler and is also much used in multimedia. Never the less, we should not entirely ignore the DFT.

Q4 (a) Write down the salient difference between conventional T.V. and High Definition TV (HDTV) and also highlight the various advantages of digital representation for video.

Answer

The salient difference between conventional TV and HDTV is that the latter has a much wider aspect ratio of 16:9 instead of 4:3 (Actually, it works out to be exactly one – third wider than current TV). Another feature of HDTV is its move toward progressive scan. The rational is that interlacing introduces serrated edges to moving objects and flickers along horizontal edges.

Various advantages of digital representation for video are:

- Storing video on digital devices or in memory, ready to be processed (noise removal, cut and paste and so on) and integrated into various multimedia applications.
- Direct access, which makes nonlinear video editing simple.
- Repeated recording without degradation of image quality.
- Ease of encryption and better tolerance to channels noise.

Q4 (b) Video signals can be organised in three different ways. Discuss them briefly.

Answer

Video signals can be organized in following different ways:

- (i) Component video
- (ii) Composite video
- (iii) S-video

Q5 (a) Describe briefly about (Any TWO)

- (i) MIDI as a scripting language
- (ii) Hardware aspects of MIDI
- (iii) Structure of MIDI messages

Answer

- (i) **MIDI:** It is a scripting language. It codes “events” that stand for the production of certain sounds. Therefore, MIDI files are generally very small. For example, a MIDI event might include values for the pitch of a single note, its duration and its volume.

Q5 (b) Discuss briefly about Karhunen – Loeve Transform (KLT).

Answer Article 8.5.2 of Textbook I

Q6 (a) JPEG standard supports four different modes which are commonly used. Explain each one of them briefly.**Answer**

The JPEG standard supports numerous modes. Some of the commonly used ones are:

- (i) Sequential mode
- (ii) Progressive mode
- (iii) Hierarchical mode
- (iv) Lossless mode

Sequential Mode: This is the default JPEG mode. Each gray-level image or color image component is encoded in a single left-to-right, top-to-bottom scan. We implicitly assumed this mode in the discussion so far. The “Motion JPEG” video codec uses Baseline Sequential JPEG, applied to each image frame in this video.

Progressive Mode: Progressive JPEG delivers low-quality versions of the image quickly, followed by higher-quality passes, and has become widely supported in web-browsers. Such multiple scans of images are of course most useful when the speed of the communication line is low. In progressive mode, the first few scans carry only a few bits and deliver a rough picture of what is to follow. After each additional scan, more data is received and image quality is slowly enhanced. The advantage is that the user-end has a choice whether to continue receiving image data after the first scan.

Hierarchical mode: As its name suggests, Hierarchical JPEG encodes the image in a hierarchy of several different resolutions. The encoded image at the lowest resolution is basically a compressed low-Pass-filtered image, whereas the images at successively higher resolutions provide additional details. Similar to progressive JPEG, Hierarchical JPEG images can be transmitted in multiple passes with progressively improving quality.

Lossless Mode: Lossless JPEG is a very special case of JPEG which indeed has no loss in its image quality. It employs only a simple differential coding method, involving no transform coding. It is rarely used, since its compression ratio is very low compared to other, lossy modes. On the other hand, it meets a special need, and the newly developed JPEG-LS standard is specifically aimed at lossless image compression.

Q6 (b) Discuss four common negotiable coding options specified in H.263.

Answer

Four common negotiable coding options specified in H.263 are:

- (i) Unrestricted motion vector mode
- (ii) Syntax-based arithmetic coding mode
- (iii) Advanced prediction mode
- (iv) PB-frames mode

Q7 (a) Define MPEG-21 and its various key elements.**Answer**

MPEG-21: As we stepped into the new century (and millennium), multimedia had seen its ubiquitous use in almost all areas, An ever-increasing number of content creators and content consumers emerge daily in society. However, there is no uniform way to define, identify, describe, manage and protect multimedia frame work to enable transparent and augmented use of multimedia resources across a wide range of networks and devices used by different communities.

Its seven key elements are:

- (i) Digital item declaration, to establish a uniform and flexible abstraction and interoperable schema for declaring digital items.
- (ii) Digital item identification and description, to establish a frame work for standardized identification and description of digital items, regardless of their origin, type or granularity.
- (iii) Content management and usage, to provide an interface and protocol that facilitate management and use of the content.
- (iv) Intellectuals' property management and protection (IPMP), to enable contents to be reliably managed and protected.
- (v) Terminals and networks, to provide interoperable and transparent access to content with quality of service (CEOS) across a wide range of networks and terminals.
- (vi) Content representation, to represent content in a adequate way to pursuing the objective of MPEG-21, namely "content any time anywhere"
- (vii) Event reporting, to establish metrics and interfaces for reporting events, so as to understand performance and alternatives.

Q7 (b) Write a brief note on MPEG Layers.

Answer Article 14.2.1 of Textbook I

Q8 (a) What is Internet telephony? Write down its main advantages over POTS.

Answer

The Public Switched Telephone Network (PSTN) relies on copper wires carrying analog voice signals. It provides reliable and low-cost voice and facsimile services. In the 80s and 90s, modems were a popular means of “data over voice networks” In fact; they were predominant before the introduction of ADSL and cable modems.

As PCs and internet became readily available and more and more voice and data communications became digital (e.g., in ISDN), “Voice over data networks” especially voice over IP (VOIP) started to attract a great deal of interest in research and user communities. With ever-increasing network bandwidth and the over-improving quality of multimedia data compression, Internet telephony has become a reality. Increasingly, it is not restricted to voice (VOIP) - It is about integrated voice, video and data services.

Its advantages over POTS (Plain Old Telephone Services) are:

- It provides great flexibility and extensibility in accommodating integrated services such as voice mail, audio and video conferences, and mobile phone and so on.
- It uses packet switching: hence network usage is much more efficient.
- With the technologies of multicast or multipoint communication, multiparty calls are not much more difficult than two party calls.
- With advanced multimedia data-compression techniques, various degrees of QoS can be supported and dynamically adjusted according to the network traffic, an improvement over the “all or none” service is POTS.
- Good graphics user interfaces can be developed to show available features and services, monitor call status and progress and so on.

Q8 (b) Describe briefly five different modes of predictions defined in MPEG-2.**Answer**

Five modes of predictions are:

- (i) Frame prediction for frame- pictures
- (ii) Field prediction for field- pictures
- (iii) Field prediction for frame-pictures
- (iv) 16×8 MC for field-pictures
- (v) Due-prime for P-pictures.

For further explanation refer page number 321 and 322 Textbook I

Q8 (c) Describe briefly motion compensation in MPEG-1.**Answer**

The MPEG-1 audio/video digital compression standard was approved by ISO/IEC MPEG group in November 1991 for coding of moving pictures and Associated Audio for Digital storage media at up to about 1.5 mbit/s. Common Digital storage media include CDs and VCDs. Out of the specified 1.5 mbps, 1.2 mbps is intended for coded video and 256 kbps

can be used for stereo audio. This yields a picture quality comparable to VHS cassettes and a sound quality equal to CD audio.

In general, MPEG-1 adopts the CCIR 601 digital TV format; also known as Source Input Format (SIF). MPEG-1 supports only non interlaced video. Normally; its picture resolution is 352×240 for NTSC video at 30 fps, or 352×288 for PAL video at 25 fps. It uses 4:2:0 chroma sub sampling

Q9 (a) Onion skinning, adding sound and morphing are some specialized techniques of animation. Discuss each one of them briefly.

Answer Page Number 337, 348-352 of Textbook II

Q9 (b) Write brief notes on any TWO of following:

(ii) CD formats

(iii) Laser Disc working principal

Answer

CD Interface: The most common interface used in modem CD-ROM driver is the AT attachment packet Interface, more commonly called just ATAPI. This is a Special protocol that was developed to allow devices like CD-ROM drives and tape drives to attach to regular IDE controllers normally used for hard disks. CD –ROM drives that use ATAPI are often called ‘IDE CD-ROM’s’ but this terminology is not strictly correct.

The ATAPI interface is a derivative of the standard IDE interface; regular IDE commands cannot be used properly for CD-ROM driver, so a modified command structure was created. CD- ROM drives generally require two pieces of software in order to function properly. There are driver, and a file system extension. The driver is responsible for controlling access to the CD-ROM drive. The file system extension is what allows the CD-ROM drive to appear to the system as regular file system volume, with directions and files, etc. virtually all CD-ROM driver come with the software driver designed for the drive. The driver is loaded in the CNFIG. SYS system file when the PC using DOS boots up. IN most cases, these drivers are unique to the drive and cannot be interchanged with a different one: if you install a new CD-ROM you need to installation program copies the driver to the hard disk and insert the ‘DEVICE=’ Command into your CONFIG. SYS file for you. There are two common file system extensions used to enable CD-ROMs to work on the PC. The first is ‘MSCDEX. EXE’ the second common file system extensions the one built into window 95.

Text Books

1. Fundamentals of Multimedia, Ze-Nian Li and Mark S. Drew, Pentice Hall, Edition – 2007.

2. Principles of Multimedia, Ranjan Parekh, Tata McGraw-Hill, Edition 2006.