

CHAPTER – 1

Introduction:

Multimedia:

Multi means: - many, much, multiple

Medium means: - An intervening substance through which something is transmitted or carried on. A means of mass communication such as news paper, Television and so on.

- Multimedia is woven combination of text, graphics, art, sound, animation, video and other kinds of elements.
- Multimedia is an inter-disciplinary subject because it involves a variety of different theories and skills.

These includes –

- Computer Technology, Hardware and software
- Art and design, literature and presentation skills.
- Application domain knowledge
- Multimedia means from the user's perspective, that computer information can be represented through audio and/or video, in addition to text, image, graphics and animation.
- The integration of these media into the computer provides additional possibilities for the use of computational power currently available (example, for interactive presentation of huge amount of information). Further more, these data can be transmitted through computer telecommunication networks, which implies applications in the area of information distribution and cooperative work.

Application:

- Education
- Training
- Entertainment
- Advertisement
- Presentation
- Image Processing

Medium:

In general, one describes medium as means for distribution and presentation of information. Example, text, graphics, speed and music

We can classify media according to –

- Perception
- Representation
- Presentation
- Storage
- Transmission
- Information Exchange

The Perception Medium:

- Perception media help humans to sense their environment.
- The perception of information occurs mostly through seeing or hearing the information.
- There is a primary difference between seeing or hearing information when using a computer. For the perception of information through seeing, the visual media such as text, image and video are used. For the perception of information through hearing, auditory media such as music, noise and speech are relevant.

The Representation of Medium:

- Representation media are characterized by internal computer representation of information.
- Various formats are used to represent media information in a computer. Example, A text is character is coded in ASCII or EBCDIC code.
- Graphics are coded according to CEPT or CAPTAIN video text standard.
- An audio stream can be represented using a sample PCM (Pulse Code Modulation).
- An image can be coded as a facsimile or in JPEG format.
- A combination of audio/video sequence can be coded in different standard formats. (Example, PAL, SECAM, NTSC) and stored in the computer using MPEG format.

The Presentation Medium:

- Presentation media refer to the tools and devices for the input and output information.
- The media Example, paper, printer and screen are used to deliver the information by the computer (output media) keyboard; mouse, camera and microphone are the input media.

The Storage Medium:

- Storage media refers to a data carrier, which enables storage of information. However, the storage of data is not limited only to the available components of a computer.
- Microfilms, floppy disk, hard disk, pen drive, CD-ROM, DVD, zip disk are examples of storage media.

The Transmission Medium:

- The transmission medium characterizes different information carries that enable continuous data transmission.
- Information is transmitted over networks, which use wire and cable transmitted, such as coaxial cable, fiber optic as well as free air space transmission, which is used for wireless traffic (example, satellite, microwave, Radio link and so on).

The Information Exchange Medium:

- The information exchange medium includes all information carrier for transmission i.e. all storage and transmission media.
- Information can flow through intermediate storage media, where the storage medium is transported outside of computer networks to the destination,

through direct transmission using computer networks or through combined usage storage and transmission media (example, electronic mailing system).

Representation values and Representation space:

The media appeal to the human senses. Each medium defines representation values and representation spaces, which involve the five senses.

- Examples of visual representation spaces are paper or screen. During a computer-controlled slide show with simultaneous projection of the computer screen content, the whole movie counts as a representation space.
- Representation values determine the information representation of different media: while the text medium visually represents as a sentence through a sequence of characters, this sentence will be represented by the speech medium in the form of pressure wave. Some representation values are self-confined by their media. Example temperature, taste and smell
- Representation values can be considered as a continuous or a sequence of discrete values.
- Characters of a text and audio sample values in electronic form are sequences of discrete values.

Representation Dimensions:

- Each representation spaces consist of one or more representation dimensions. A computer screen has two spatial dimensions, holography and stereophony.
- Time can occur inside each representation, space as an additional dimension.
- Media are divided into two types with respect to time in their representation space.
 - (1) Some media, such as text and graphics are time-dependent. Information in these media consist exclusively of a sequence of individual elements or a continuous without a time component. Such media are known as time-independent (or discrete).
 - (2) The values of the other media such as sound and full motion video change overtime.

Main properties of a Multimedia System:

Multimedia System (Definition):

A multimedia system is any system, which supports more than a single kind of media. A multimedia system distinguishes itself from other systems through several properties. The main properties are:

- (1) Combination of media
- (2) Media-Independent
- (3) Computer Control and Integration

Combination of media:

- A sample text-processing program with incorporated images is often called a multimedia application because two media are processed through one program. In multimedia both continuous and discrete media are utilized.

Media-Independent:

- An important aspect of different media is their level of independence from each other. In general, there is a request for independent of different media, but multimedia may require levels of independence.

- On the one hand, a computer controlled video recorder stores audio and video information, but there is an inherently tight connection between the two types of media. Both media of the tape.
- On the other hand, for the purpose of presentations, the combination of DAT (Digital Audio Tape) recorder signals and computer available text satisfies the request for media-independent.

Computer Supported Integration:

- The media-independence pre-requisite provides the possibility of combining media in arbitrary forms. Computers are ideal tool for this purpose.
- The system should be capable of computer controlled media processing. Moreover, the system should be programmable by a system programmer or even a user.
- Simple i/p or o/p of different media through one system (example, A video recorder) does not satisfy the requirement for a computer-controlled solution.
- Computer controlled data of independent media can be integrated to accomplish certain functions. Example timing, spatial and semantic synchronization will be included.
- An integrated multimedia system i.e. simply put in such systems, everything can be presented with video and sound that is presented with text and graphics today.

Multimedia and Personalized Computing:

In 1967, Nicholas Negroponte formed Architecture Machine Group in the Architecture department at MIT. Although the initial goal was to use computers for Architectural design; a new focus developed that of making computers easier to use.

The major uses are:

- (i) Spatial Data Management System (SDMS)
- (ii) Movie, Maps and Surrogate travel
- (iii) The Electronic Book
- (iv) Formation of MIT lab
 - i. Electronic Publishing
 - ii. Film and video
 - iii. Visual language workshop
 - iv. Electronic music
 - v. Spatial imaging and photography
 - vi. Learning and Epistemology ← (destructive)
 - vii. Movies for future
 - viii. Advanced Television Research
 - ix. Speech Processing
 - x. Human – Machine Interface Group

Data Stream Characteristics:

In distributed multimedia systems, data of discrete and continuous media are transmitted and information exchanges take place. Moreover, in each digital system, transmitted information is divided into individual units (in general, packets) and subsequently sent away from one system (source) to another system (Destination).

- The source and destination can be located at either on the same computer or on different machines.

- A sequence of individual packets transmitted in a time-dependent fashion is called data stream.
- Packets can carry information of either continuous or discrete media.

Transmission of information carrying different media leads to data stream with very different features. The attributes of asynchronous, synchronous and isochronous data transmission come from the field of computer communication and switching.

Asynchronous Transmission Mode:

- The asynchronous transmission mode provides for communication with no timely restrictions. Packets reach the receiver as fast as possible.
- All information of discrete media can be transmitted as an asynchronous data stream.
- If an asynchronous mode is chosen for transmission of continuous media, additional techniques must be applied to provide the time restrictions.

Synchronous Transmission Mode:

The synchronous transmission mode defines a maximum end-to-end delay for each packet of a data stream. This upper bound will never be violated. Moreover, a packet can reach the receiver at any arbitrary earlier time. Thus, an important claim of multimedia application is satisfied: a maximum end-to-end delay can be guaranteed.

Isochronous Transmission Mode:

This isochronous transmission mode defines besides a maximum end-to-end delay for each packet of a data stream, a minimum end-to-end delay. This means that the delay jitter of individual packets is bounded.

In this case, the necessary storage of video data at the receiver would be strongly reduced. These demands on intermediate storage must be considered in all components along the data route between source and destination.

Data Stream characteristics for continuous Media:

1. The time interval between a complete transmission of consecutive Packets.

This first property relates to the time interval between a complete transmission of consecutive packets. Based on the availability of packets, we distinguish among the following possibilities.

- A. If the time interval between two consecutive packets is constant, a data stream is called strongly periodic.

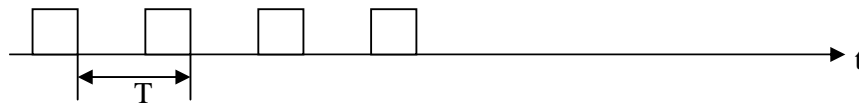


Figure: - Strongly Periodic Stream, (T-time limit between two consecutive packets), i.e. time intervals are of the same length between two consecutive packets.

Example, PCM-coded speech in traditional telephone switching system

- B. The duration of the time interval between two consecutive packets can be described through a periodical function with finite period, but the time interval between consecutive packets is not constant. The data stream is called Weakly Periodic.

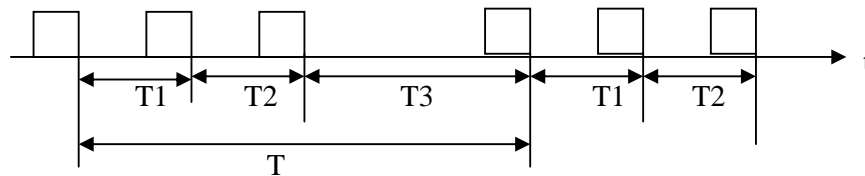


Figure: - Weakly Periodic Stream (i.e. Time intervals between consecutive packets are of periodic nature)

C. All other possibilities of transmission with respect to time interval are known as a periodic data streams.

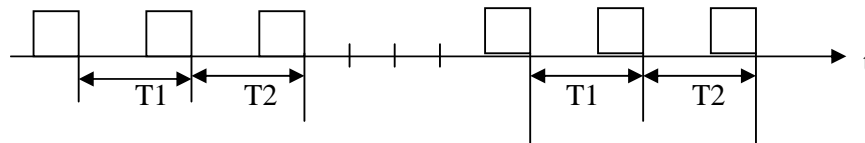


Figure: - A periodic stream (i.e. the sequence of time intervals is neither strongly nor weakly periodic)

2. Variation of Consecutive Packet Amount

- A second characteristic of data streams is the variation of the amount of consecutive packets.

(i) Strongly regular:

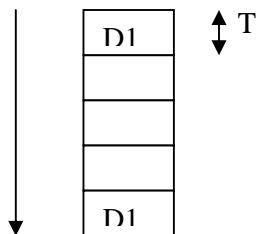


Figure: - Strongly regular stream i.e. constant data size of all packets

- If the amount of data stays constant during the life time of a data stream, one calls the data stream strongly regular. This feature is typically for uncompressed digital data transmission.

(ii) Weakly Regular:

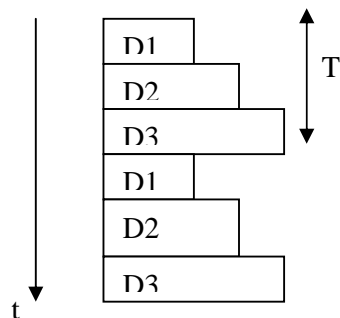


Figure: - Weakly Regular i.e. data size of packets changes periodically

- Data streams are weakly regular, if the amount of data varies periodically.
- An example of a weakly regular data stream is a compressed video stream which uses a compression method as follows –

Individual images are coded and compressed as an individual, whole unit, which represents a relatively large packet inside the data stream. Packets will be periodically transmitted. Example, every two seconds

In between the two seconds periods additional packets will be sent which include the information about the difference of the two consecutive packets.

(iii) Irregular data stream:

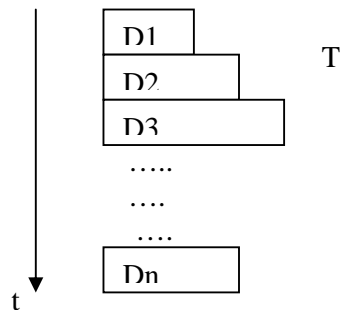


Figure: - Irregular data stream i.e. data size of the packets is neither constant nor changing periodically

- Data streams are irregular if the amount of data is neither constant nor changes according to periodic function. Transmission and processing is more complicated in this case.
- In this case when a compression method is applied to the data stream, the data stream has a variable bit rate and the size of an individual packet is determined from the content of the previous changed image. The size of the created information unit is therefore dependent on the video sequence and the data stream is irregular.

3. Contiguous Packets:

- A third property characterizes continuity or the connection between consecutive packets. Are consecutive packets transmitted directly one after another or is there a gap between the processes! This can be seen as utilization of a certain system resource, such as a network.

(i) Continuous Stream:

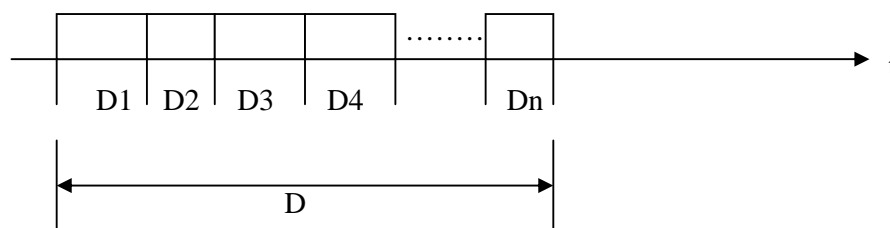


Figure: - Continuous stream i.e. the packets are transmitted without intermediate gap.

In continuous stream, all packets are transmitted successfully without a gap. Necessary additional information (example, error control codes) of the data is considered. In this case, the considered system resource is 100% utilized.

(ii) Discrete Stream:

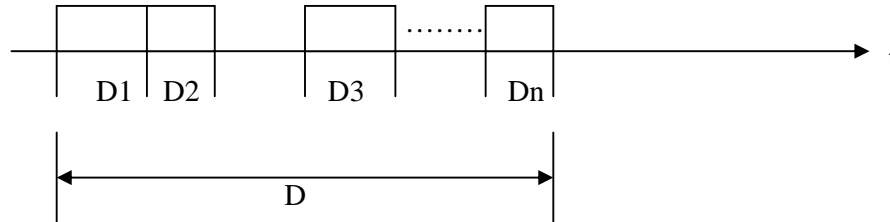


Figure: - Discrete stream i.e. gaps exist among the packets

- A data stream with gaps between information units (packets) is called discrete (an unconnected) data stream.
- In discrete stream, it is not important if gaps exist among all packets or if the duration of the gaps varies.

Information Units:

- Continuous media consists of a time-dependent sequence of individual information units. Such as information unit is called a Logical Data Unit (LDU), which is close to Protocol Data Unit (PDU).

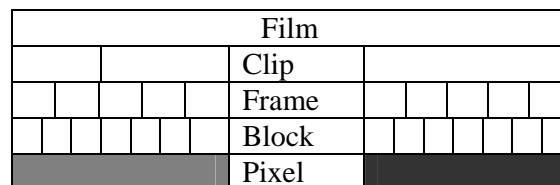


Figure: - The notion of granularity characterizes the hierarchical division of audio or video data streams into their components.

