

Multimedia: Media and Data Streams

Multimedia

One way of defining multimedia can be found in the meaning of the composed word.

- *Multi-* [lat.: much] many; much; multiple.
- *Medium* [lat.: middle] An intervening substance through which something is transmitted or carried on; A means of mass communication such as newspaper, magazine, or television (from American Heritage Electronic Dictionary, 1991).

Medium

In general, one describes medium as **a means for distribution and presentation of information**. Examples of a medium are text, graphics, speech and music.

Media can be classified with respect to different criteria. We classify media according to perception, representation, presentation, storage, transmission, and information exchange.

The Perception Medium

Perception media help humans to sense their environment. The central question is: *How do human perceive information in a computer environment?*

The answer is that the perception of information occurs mostly **through seeing or hearing the information**.

- 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 Medium

Representation media are characterized by internal computer representations of information.

The central question is: *How is the computer information coded?*

The answer is the **various formats** are used to represent media information in a computer.

For example:

- A text character is coded in ASCII code.
- An audio stream can be represented using a simple PCM (Pulse Coding Method) with a linear quantization of 16 bits per sample.
- An image can be coded as a facsimile (the group 3 according to the ISO Standard Specification) or in JPEG format.
- A combined audio/video sequence can be coded in different TV standard formats (e.g., PAL, SECAM, NTSC), and stored in the computer using MFEG format.

The Presentation Medium

Presentation media refer to the **tools and devices for the input and output of information**.

The central question is: *Through which medium is information delivered by the computer, or introduced into the computer?*

The media, e.g. paper, screen, and speaker 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 refer 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. Therefore, paper is also a storage medium.

The central question is: *Where will the information be stored?*

Floppy disk, hard disk, and CD-ROM are examples of storage media.

The transmission Medium

The transmission medium characterizes different information carriers, that enable continuous data transmission.

The central question is: *Over what will the information be transmitted?*

The answer is that information is transmitted over networks, which use wire and cable transmission, such as coaxial cable and fiber optics, as well as free air space transmission.

The Information Exchange Medium

The information exchange medium includes all information carriers for transmission, i.e. **all storage and transmission media**.

The central question is: *Which information carrier will be used for information exchange between different places?*

Answer is: **storage and transmission media**

Representation Values and Representation Spaces

The description of perception medium comes closest to our notion of a medium: *the media appeal to the human senses*.

Each medium defines, representation values and representation spaces which involve the five senses.

Example of visual representation spaces are paper or screen.

Each representation space consist of one or more representation dimensions. A computer screen has two spatial dimensions; holography and stereophony require an additional spatial dimension.

Media are divided into two types with respect to time in their representations pace: time-dependent and time-independent.

Multimedia system and properties

Multimedia system

Combination of Media

Independence

Computer-supported Integration

Communication Systems

A multimedia system is characterized by computer-controlled, integrated production, manipulation, presentation, storage and communication of independent information, which is encoded at least through a continuous (time-dependent) and a discrete (time-independent) medium.

Data Streams Characteristics

A sequence of individual packets transmitted in a time-dependent fashion is called a data stream ("data flow").

Packets can carry information of either continuous or discrete media. An example of a continuous media data stream is the transmission of speech in a telephone system. The retrieval of a document from a database can be seen as setting up a discrete media data stream.

Transmission of information carrying different media leads to data streams with very different features.

The attributes of **asynchronous, synchronous, and isochronous data transmission** come from the fields of computer communication and switching.

The asynchronous transmission mode provides for communication with no timely restrictions. Packets reach the receiver as fast as possible.

The synchronous transmission mode defines a **maximum end-to-end delay** for each packet of a data stream.

The isochronous transmission mode- defines, besides a maximum end-to-end delay for each packet of a data stream, a **minimum end-to-end delay**.

Data stream characteristics for continuous Media

The time interval between a complete transmission of consecutive packets

- If the time interval between two consecutive packets is constant, a data stream is called *strongly periodic*. Therefore, in an ideal case, jitter has the value zero. Figure 2.1 shows such a data stream. An example is PCM-coded speech in



Figure 2.1: *Strongly periodic stream, (T -time limit between two consecutive packets), i.e., time intervals are of the same length between two consecutive packets.*

traditional telephone switching systems.

- 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 (otherwise it would be a strongly periodic data stream). The data stream is called *weakly periodic*. This case is shown in Figure 2.2.

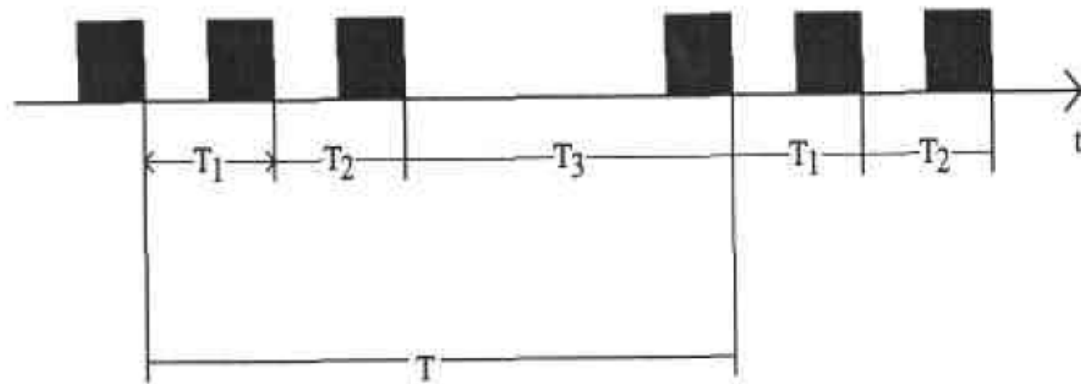


Figure 2.2: *Weakly periodic stream, i.e., time intervals between consecutive packets are of periodic nature.*

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- All other possibilities of transmission with respect to time interval are known as *aperiodic data streams*. Figure 2.3 shows such a data stream.



Figure 2.3: *Aperiodic stream, i.e., the sequence of time intervals is neither strongly nor weakly periodic.*

Variation of Consecutive Packet Amount

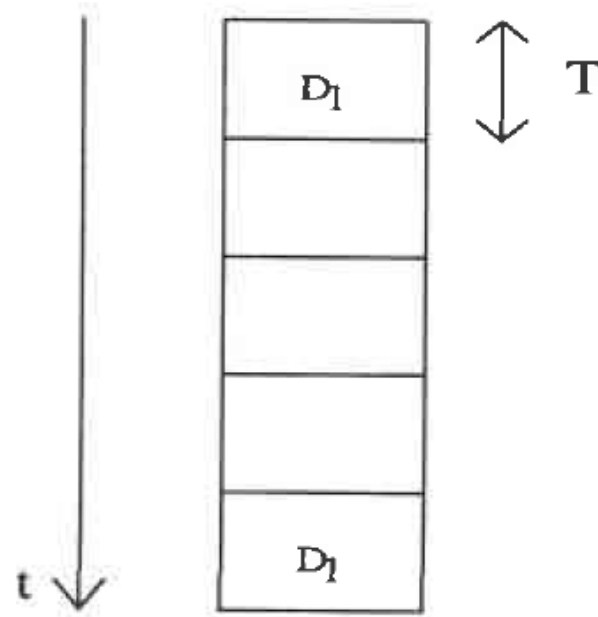


Figure 2.4: *Strongly regular stream, i.e., constant data size of all packets.*

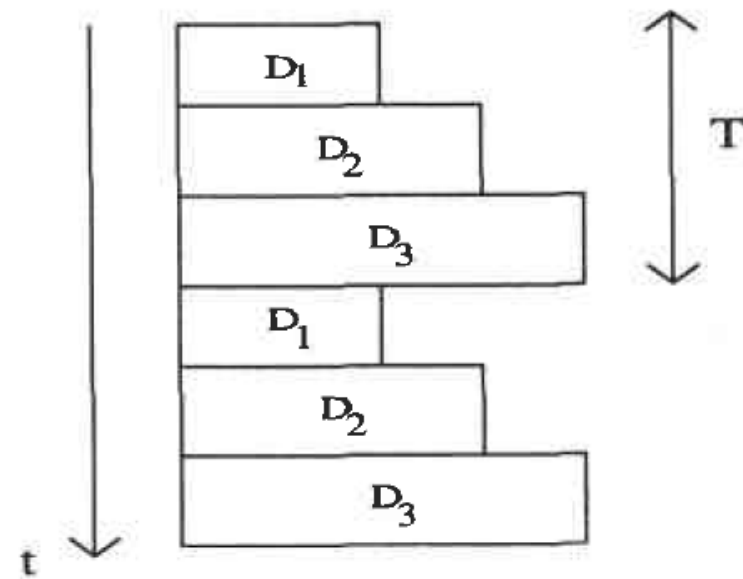


Figure 2.5: *Weakly regular stream, i.e., data size of the packets changes periodically.*

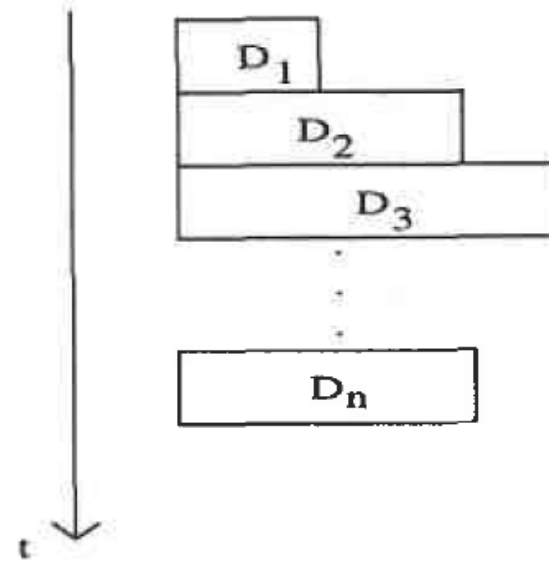


Figure 2.6: *Irregular data stream, i.e., data size of the packets is neither constant nor changing periodically.*

Contiguous Packets

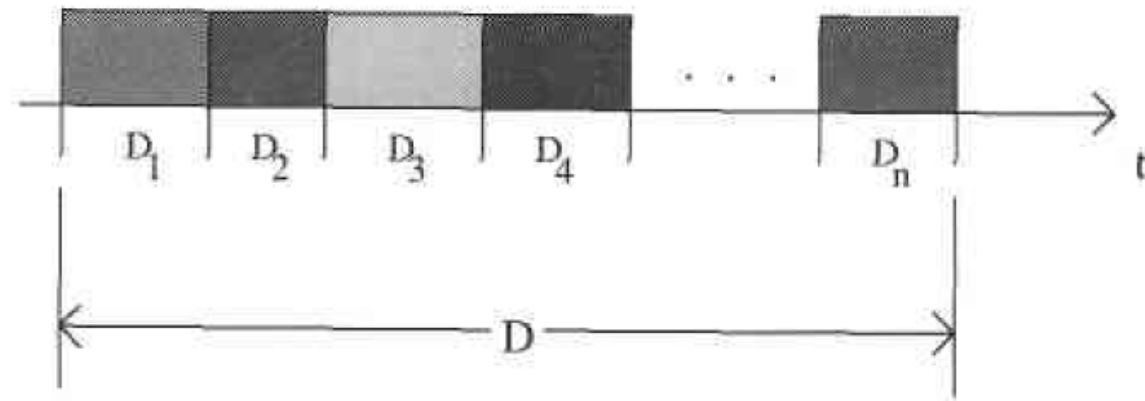


Figure 2.7: *Continuous stream, i.e., the packets are transmitted without intermediate gaps.*

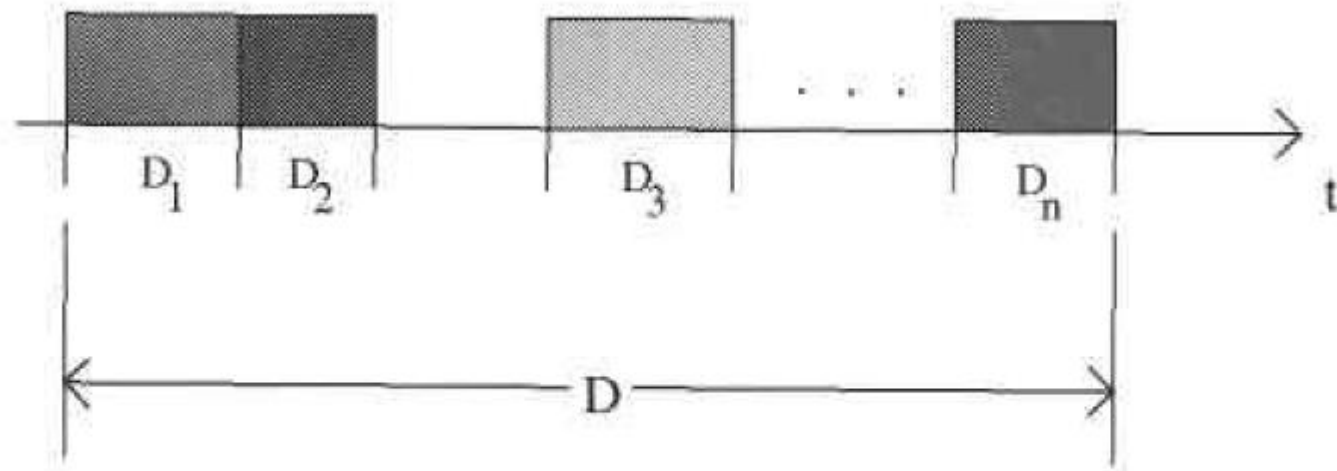


Figure 2.8: *Discrete stream, i.e., gaps exist among the packets.*

Information Units

Continuous media consist of a time-dependent sequence of individual information. Such an information unit is called a Logical data unit (LDU).

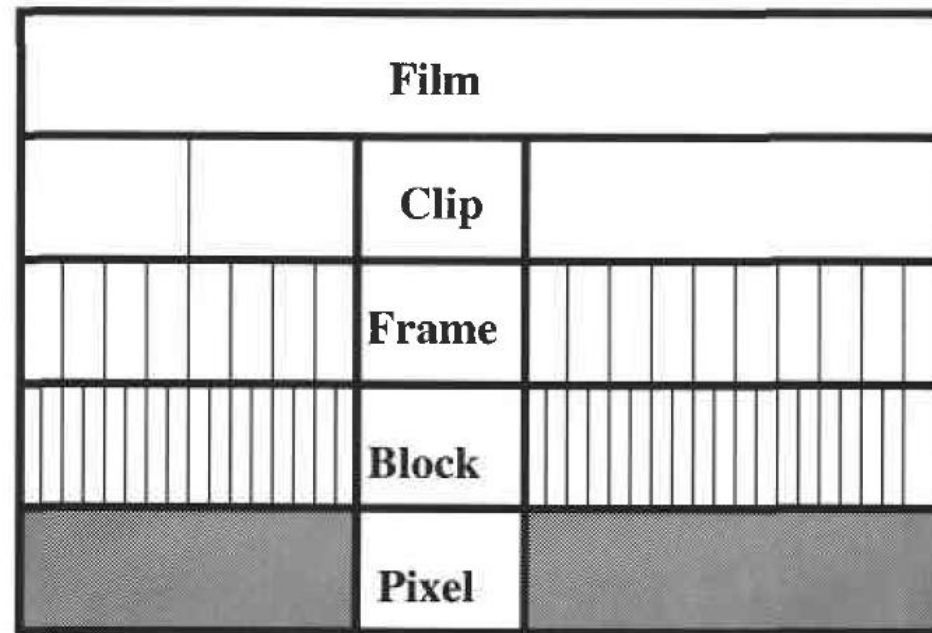


Figure 2.9: *Granularity of a motion picture sequence.*

For further information visit: <http://ce.sharif.ir/courses/84-85/2/ce342/resources/root/BOOK/Multimedia/215814-%20Chapter%202.pdf>