MULTIMEDIA TECHNOLOGY AND ITS APPLICATION MID TERM SOLUTION

1. (a) Which of the following are characteristics of multimedia system.

→ (iii) Both (i) and (ii)

(b) MPEG stands for

→ (iii) Motion picture expert group

(c) MIDI stands for

→ (i) Musical instrument digital interface.

(d) Raster images are also known as

→ (i) Bitmap images

(e) List any two application of multimedia.

→ (i) In education, as a source of information
(ii) In scientific and mathematic

research multimedia is used for simulation and modelling.

In which area multimedia components are used :-

(I) In medicinal area
(II) In educational area.

2.(a) Characteristics of a multimedia System :-
A multimedia system has four basic characteristics :
i) Multimedia system must be computer controlled.
ii) Multimedia systems are integrated.
iii) The information that they handle must be represented digitally.
iv) The interface to the final presentation of media is usually interactive.

i) Computer Controlled :-

→ producing the content of the information - ex: by using the authoring tools, image editor, sound and video editor.

→ Storing the information - providing large and shared capacity for

multimedia information.

→ Transmitting the information - through the network.

→ Presenting the information to the end user - make direct use of computer peripheral such as display device (monitor) or sound generator (speaker).

ii) Integrated :

→ All multimedia components (audio, video, text, graphics) used in the system must be somehow integrated.

→ Every device, such as microphone and camera is connected to and controlled by a single computer.

→ A single type of digital storage is used for all media type.

→ Video sequences are shown on computer screen instead of TV monitor

iii) Interactivity :-

→ Levels : Interactivity strictly on information delivery. User select the time at which the presentation starts, the order, the speed and the

form of the presentation itself.

→ Level 2 : Users can modify or enrich the content of the information, and this modification is recorded.

→ Level 3 : Actual processing of user input and the computer generate genuine result based on the user input.

iv) Digitally Represented :

- Digitization - Process involved in transforming an analog signal to digital signal.

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(2) Multimedia Applications :

→ Multimedia finds its application in various areas including :-

i) Books and magzines
ii) Movies
iii) News and weather report
iv) Education
v) Maps
vi) Entertainment
vii) Science and Technology
viii) Advertigement
ix) Scientific research
x) Multimedia is used for advertising and selling product on the internet.
xi) Some business use Multimedia for training where as CDROM or line tutorial allows staff to learn.

- **Books and magzines :-**
  Multimedia is used for interactive pictures or graphical image to increase the attractiveness of Books and magzines. Because peoples are generally attracted towards attractive page and they read it with interest.

- **Movies :**
  Multimedia is heavily used in

the entertainment industry, especially to develop special effects in movies and animations (VFX, 3D animation etc).

- News and weather Reports :

→ Multimedia is used for Graphical image and animation to make news and weather reports attractive and more easier to understand.

- Education :

→ In education, multimedia can be used as source of information. Teachers can use multimedia to make lesson more interesting by using animation to highlight or demonstrate key point.

- Maps :

Multimedia is a potentially powerful tool for geographical representation. And multimedia is also used in maps.

- Entertainment :-

→ Multimedia is heavily used in the entertainment industry, especially to develop special effects in movies and animations.

Multimedia games are a popular pastime and are software programs

Sound digitization process :-

→ Sound is one of the major elements of multimedia. Adding appropriate sound can make multimedia or web page powerful. For example : linking text or image with sound in a meaningful way facilitates learning with multimedia.

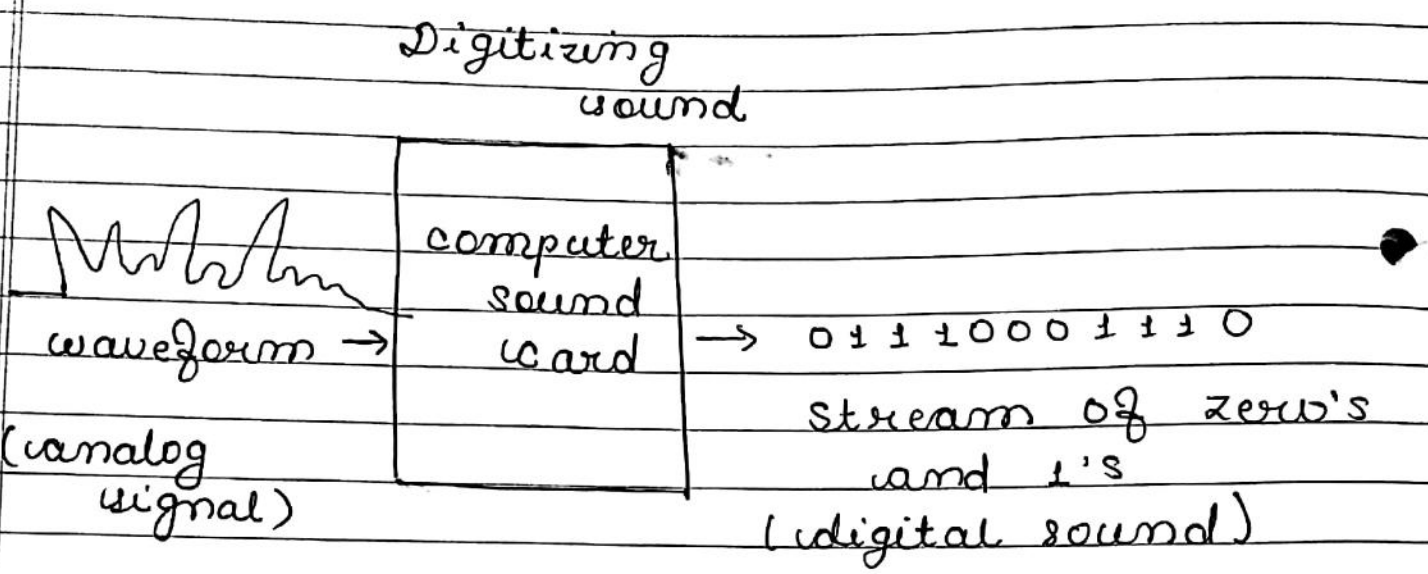
A multimedia designer can use sound files that are available on the net. However, when sound files are unavailable on the net, a designer should create his/her own sound files.

We can say that sound is stored by waves. When the sound is needed to be use in any computer application, we need to converts the air vibrations of sound into an electrical signal, which is called digital signal - a stream of 0's and 1's.

The process of conversion of analog signal into digital signal is called digitization.

When we digitize sound, we need to consider some parameters that determines the amount of information stored in a file and the quality of the digital sounds.

These are sampling rate, Bits per sample etc.



→ sound can be recorded using a microphone, which converts the air vibrations of sound into an electrical signal.

This signal can then be quantified - but the digitization must include quantifying (loudness) and time.

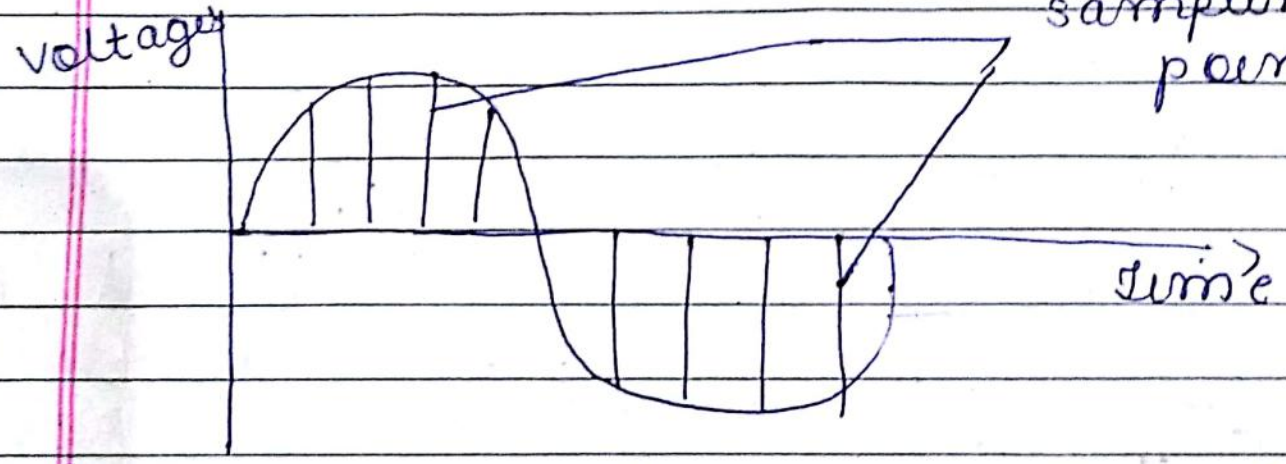
- Sampling :-

→ The term sampling refers to take samples.

→ We digitize x-axis in sampling.

→ It is done on independent variable.
In case of equation $y = \sin(x)$, it is done on x-variable.

→ It is further divided into two parts, up sampling and down sampling



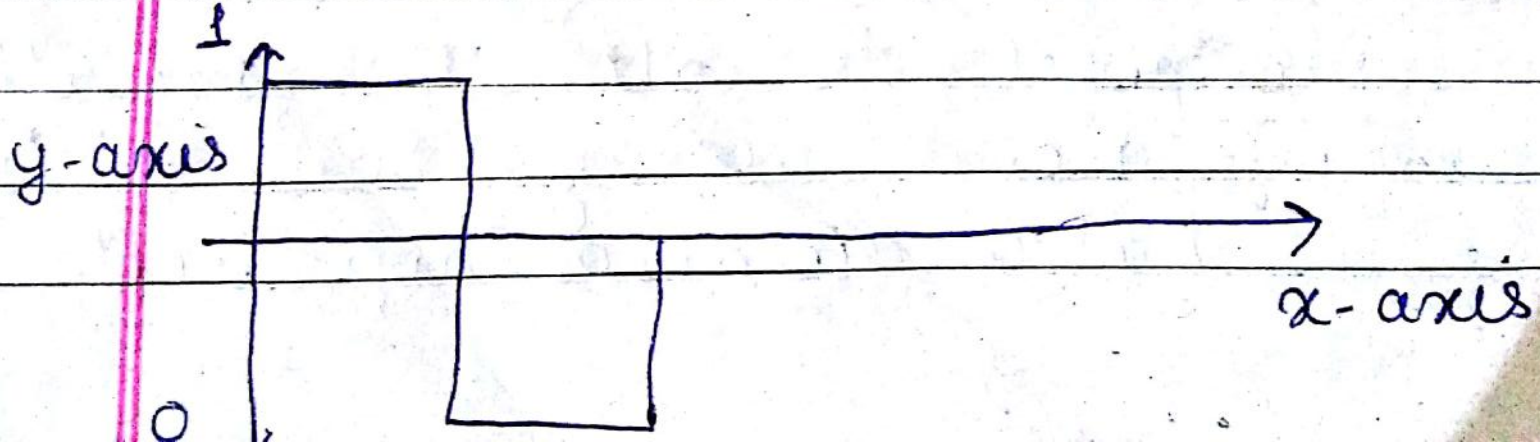
If you will look at the above figure, you will see that there are some random variations in the signal.
These variations are due to noise. In sampling we reduce this noise by taking samples. It is obvious that more samples are take, the quality of image would be more better, the noise will be removed more.

iv) Quantization :-

→ Quantization is opposite to sampling. It is done on y-axis. When you are quantizing an image, we are actually dividing a signal into quanta (partitions).

On the x-axis of the signal, are the coordinate values, and on the y axis, we have amplitudes. So, digitizing the amplitudes is known as Quantization.

Here how it is done,



3 (a) Three major groups of audio file formats:

i) uncompressed audio format
ii) lossless compressed audio format
iii) lossy compressed audio format.

i) → uncompressed audio is exactly what it sounds like: real sound waves that have been captured and converted to digital format without any further processing.

→ As a result, uncompressed audio files tend to be the most accurate but take up a lot of disk space

Examples for uncompressed audio format :

WAV (Waveform Audio file format)
AIFF (Audio Interchange file format)
Raw header - less PCM

WAV :-
- It is a standard that was developed by Microsoft and IBM back in 1991.
- Most WAV files contains uncompressed audio in PCM format

AIFF :-
- AIFF is a format that was developed by Apple for MAC system back in 1988.
- AIFF files can contains multiple kinds of audio

ii) Lossless compressed audio file format :-

→ Lossless compression is a method that reduces file size without any loss in quality between the original source file and the resulting file.

→ The downside is that lossless compression is not as efficient as lossy

compression, meaning equivalent files can be 2x to 5x larger.

Examples:
WMA (Windows Media Audio)
ALAC (Apple Lossless Audio Codec)

WMA :-
Microsoft's own proprietary form similar to MP3 or AAC. It does not really offer any advantage over the other formats, and it's also not as well supported.

) Lossy compressed audio format :-

→ A form of compression that loses data during the compression process.

In the context of audio, that means sacrificing quality and fidelity for smaller file size.

The good news is that, in most of the cases, we won't be able to hear the differences.

Examples for lossy compressed audio format

MP3, AAC, WMA

MPEG-1 Audio layer 3 (or MP3)

→ It was released back in 1993 and quickly exploded in popularity, eventually becoming the most popular audio formats in the world for music files.

AAC (Advance audio coding)

→ The compression algorithm used by AAC is much more advanced and technical than MP3, so when we compare a particular recording in MP3 and AAC formats at the same bitrate, the AAC one will generally have better sound quality.

WMA (Windows Media Audio)

→ Not unlike AAC and OGG, WMA was meant to address some of the flaws in the MP3 compression method - and as such, WMA's

4 (b) Write short notes on MIDI ?
Explain the differences between MIDI and Digital audio.

→ MIDI stands for Musical instrument digital interface

MIDI is a connectivity standard for transferring digital instrument data. It is primarily used by computers, synthesizers and electronic keyboards.

The MIDI data can be played back by sending the recorded MIDI notes to the keyboard, which outputs them as audio samples, such as a piano or strings.

The Musical Instrument Digital Interface (MIDI) protocol provides a standarized and efficient means of conveying musical performance information as electronic data. MIDI information is transmitted in "MIDI messages" which can be thought of as instructions which tell a music synthesizer how to play a piece of music.

The synthesizer receiving the MIDI data must generate the actual sounds.

Difference

	Digital audio	MIDI
1) Device?	Device undependent	device dependent
2) File size	Big	Small
3) Website load	Slow	Load and play quickly
4) playback spoken dialog	can do so with ease	difficult
5) playback quality	consistent	Not consistent
6) knowledge in music theory	no	yes

→ MIDI is analogous to structured or vector graphics, while digitized audio is analogous to bitmapped images.

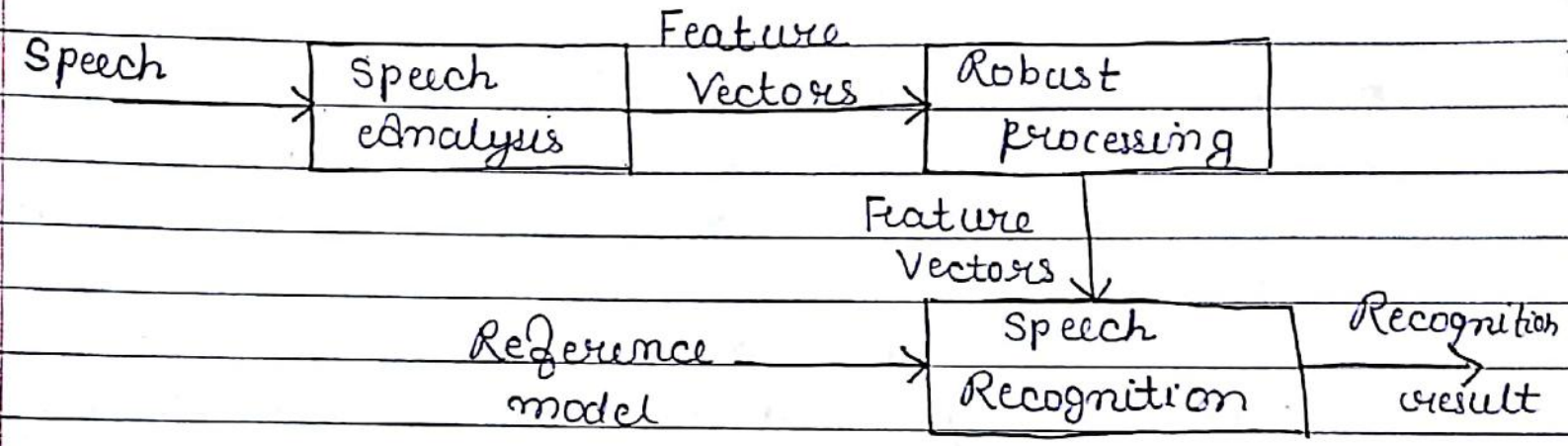
→ MIDI is device dependent while digitized audio is device undependent.

→ MIDI files are much smaller than digitized audio.

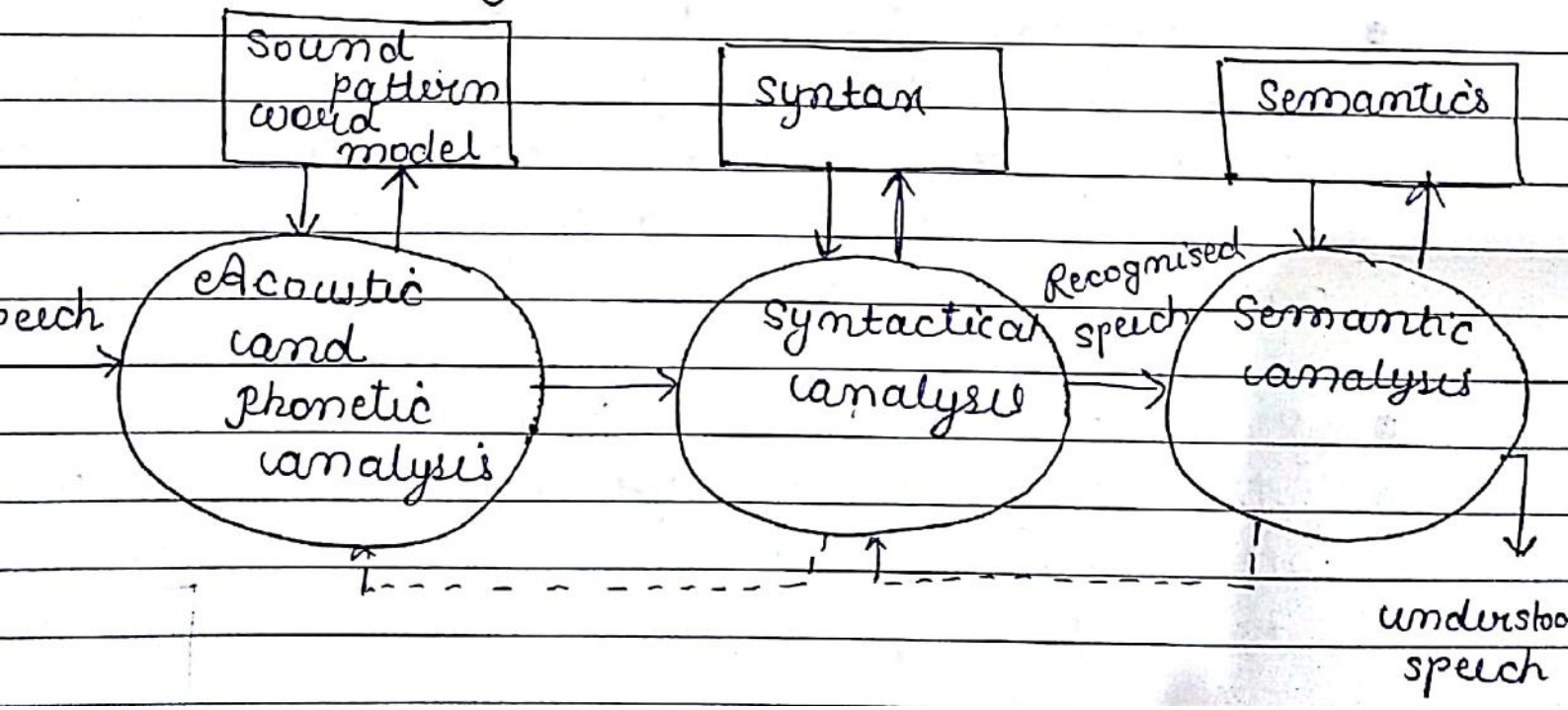
Components of speech Recognition System

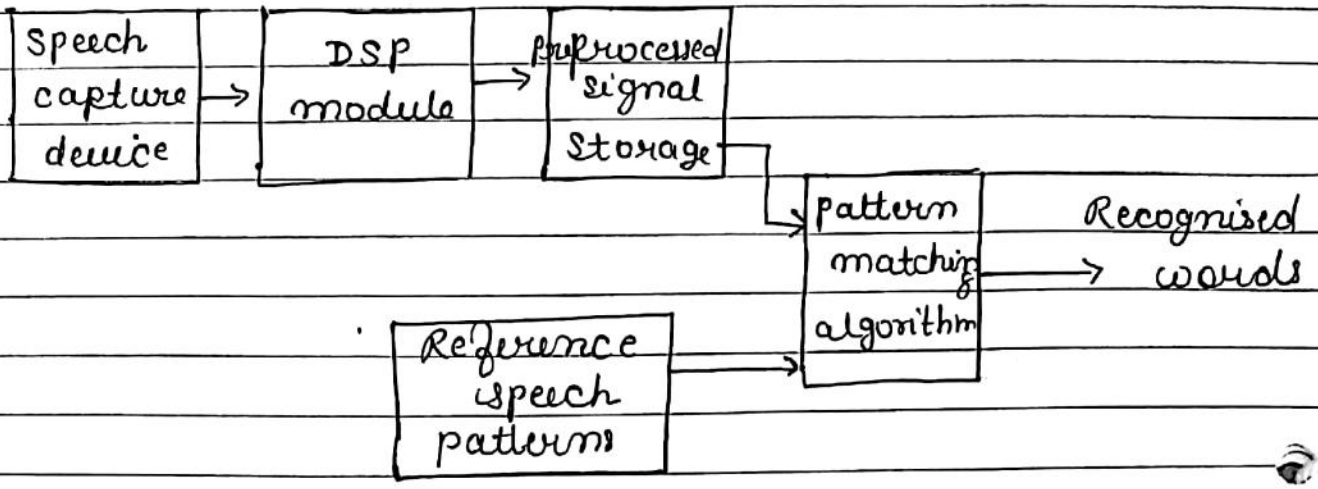
Speech recognition is the ability of a machine or program to identify words and phrases in spoken language and convert them into machine readable format.

Flowchart for speech Recognition system :



Components of speech recognition and understanding :-





- A speech capture device :
  → It consists of a microphone, which converts the sound wave signals into electrical signals.
  and an analog to digital converter which samples and digitizes the analog signal to obtain discrete data that the computer can understand.

- A digital Signal Module or a processor:
  → It performs processing on the raw speech signal like frequency domain conversion, restoring only the required information etc.

- preprocessed signal Storage :-
→ The preprocessed speech is stored in the memory to carry out further task of speech recognition.

- Reference Speech pattern :
  → The computer or the system consists of predefined speech patterns or templates already stored in the memory, to be used as the reference for matching.

- pattern matching algorithm :
  → The unknown speech signal is compared with the reference speech pattern to determine the actual words or the pattern of words.

- Image formats :-

→ Image file formats are standardized means of storing and organising digital images.

	Extension	Color	Compression	common use
1)	JPG, JPEG	24-bit	lossy	photos, web pics
2)	GIF	8-bit	lossless	web graphics - buttons, icons etc
3)	PNG	up to 24 bit	lossless	web - replacement for GIF
4)	TIF, TIFF	24 bit	lossless	professional photos

GIF stands for Graphic Interchange format
PNG stands for portable Network Graphics
JPEG stands for joint photograph expert group.

10) Advantage and Disadvantage of Multimedia.

→ Advantages :-

- Increasing learning effectiveness.
- Gains and holds attention
- More appealing
- Reduce training cost
- Easy to use
- Give information to individuals
- Provide high quality of presentation
- Integrated and interactive
- Can be used as wide variety of audience
- Entertaining and educational

Disadvantages :-

- Expensive
- Not always ready to configure
- Requires special hardware
- Not alway compatible
- Takes time to compile
- Information overload
- Misuse and/or overmisuse
- Limitations of technology.