006:

GAME STANDARDS, FREQUENCY RESPONSES, SAMPLING, 8BIT Vs 16BIT, THE CD-ROM CONNECTION

TuK

Bachelor Information Technology/Communications and Computing
Networks Year 4 Semester 1

MULTIMEDIA APPLICATIONS / SYSTEMS AND APPLICATIONS

SUBJECT CODE: ECCI/ECII 4102

OVERVIEW

1. Introduction & Attendance Registration

2. Lecture Aims & Objectives

3. Lecture Outline

4. Chapter from Recommended Reading List

5. Lecture 6 Topic

6. Q&A

LECTURE
AIMS & OBJECTIVES

1) To introduce students to Game theories.

2) To equip students with the knowledge to develop and use game skills

3) To develop students' expertise in the area of game creation tools and techniques

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LECTURE OUTLINE

6. Games AND Animation

1. Game standards (Design, Development and production of gaming software and multimedia content creation)
2. Frequency response
3. Sampling
4. 8bit Vs 16bit
5. The CD-ROM connection

CHAPTER FROM RECOMMENDED READING LIST

CHAPTER 19. "Cloud Computing for Multimedia Services",

from "Fundamentals of Multimedia"

Li, Ze-Nian; Drew, Mark S; Liu, Jiangchuan

GAMES AND ANIMATION:STANDARDS, FREQUENCY RESPONSE

SAMPLING,

8 bit Vs 16 bit

&

THE CD-ROM CONNECTION

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ANIMATION

DEFINITION

- The process of **generating animated moving images** using computer graphics.

- **Exploiting the persistence of vision** makes a series of images look **animated.**

- The process includes **designing, drawing, creating layouts** and **preparing photographic sequences**

- **'**computer generated imagery**'** encompasses **static scenes** and **dynamic images,**

APPLICATIONS
- Films

TYPES

- Cell based

- Path based

- 2D & 3D

- Morphing

- Warping

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DISNEY ANIMATORS 12 PRINCIPLES OF ANIMATION

• **Squash and stretch** - give weight and volume to your characters as they move

• **Anticipation** - let the audience know about major action that's going to happen

• **Staging** - express the clear intention of your characters through every pose or action

• **Straight ahead action and pose to pose** - choose one of the techniques of creating animation: draw the key poses then add the transitional ones, or create every single scene one after another

· **Follow through and overlapping action** - pay attention to the movements of the characters; some parts move faster than the others. When the character stops, some of the body parts still keep moving.

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DISNEY ANIMATORS 12 PRINCIPLES OF ANIMATION

- **Slow in and slow out** - to make the actions more realistic, draw more frames at the beginning and end of the action and fewer frames in the middle.

- **Arc** - add slightly circular motions to the actions of the characters

- **Secondary action** - to emphasize the main action, use secondary actions that add more liveliness to it

- **Timing** - adjust the timing of the scenes by making them slower or faster

- **Exaggeration** - using exaggerations in movements also helps to emphasize some points and ideas

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## DISNEY ANIMATORS 12 PRINCIPLES OF ANIMATION

- **Solid drawing** - even though the characters are drawn in two-dimensional space, they

  must look like their forms have some weight

- **Appeal** - make sure to create appealing characters, so that the audience will be interested

  in watching them

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ANIMATION

2D ANIMATION

- A 2D shape is a figure/object with two dimensions i.e. length, and height.

- All 2D shapes fall under the category of plain shapes or plain figures.

- This is because they have an area, but they don't have any volume as they lie on a flat surface

- In mathematical terms, 2D and 3D are geometric settings requiring two or three values in order to know an element's exact position.
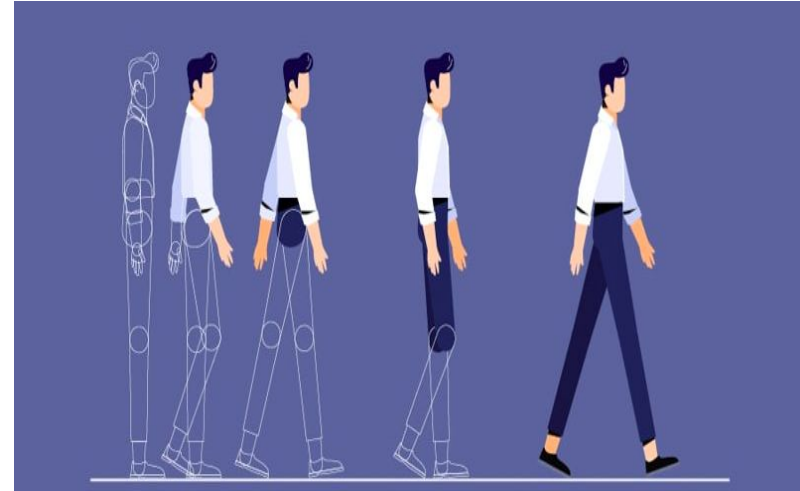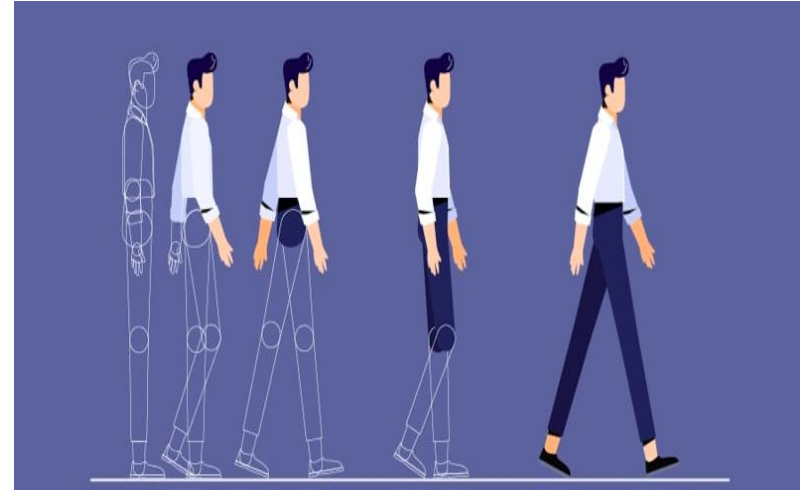
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ANIMATION

2D ANIMATION

- Process of creating and moving objects and characters with only width and height to work in two-dimensional space.

- Motion created by putting together frames in which drawings follow one another slightly different from the first.

- Every second includes 24 frames.

- Process consists of production pipeline:
  - Pre-production
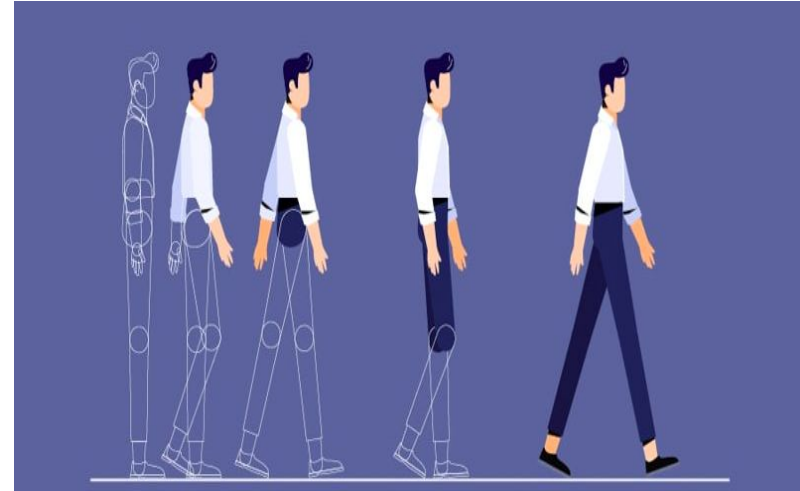 - Production
  - Post-production

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ANIMATION

2D ANIMATION

- Key aspects of 2D animation services include:-
  - ■ Sketching designs

  - ■ Designing characters

  - ■ Developing storyboards

  - ■ Creating special effects

  - ■ Animating Scenes

  - ■ Transitioning backgrounds

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ANIMATION

3D ANIMATION

- 3D animation is more realistic as it details an objects

  with regards to height, depth, and width.

- 3D objects have their own surface and can be

  measured by length, depth, width, and height.

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ANIMATION

2D ANIMATION MAKERS

- Main criteria for choosing animation software:
  - Skills
  - Budget

- Examples of 2D animation software:-
  - Pencil 2D
  - Creatoon
  - Blender
  - RenderForest
- It's also possible to use online animation maker tools that that allow you to:-
  - Choose a ready made animation template
  - Add your script
  - Auto generate your animation

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ANIMATION

CELL-BASED ANIMATION

- **Creating individual images in cells (frames)** which when played **produce motion**

- similar frames placed in sequential order.

- create movement by showing 24 fps

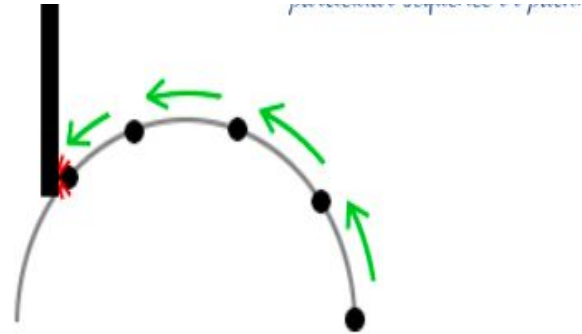- This type is traditional (good image quality but bigger file format)
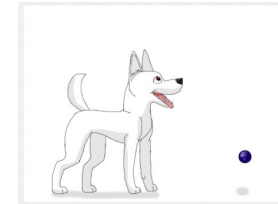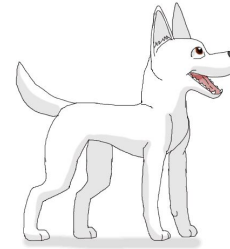
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ANIMATION

PATH-BASED ANIMATION

- Similar to **cell-based animation**

- Difference is there are **frames in-between** the **start**/**end frames (**aka **key frames)**

- The **path for the object to follow** from one frame to another is defined by **vectors(**tweening**)**

- Background remains **fixed**

- Saves **memory** and **processing time** especially if image is **an object**

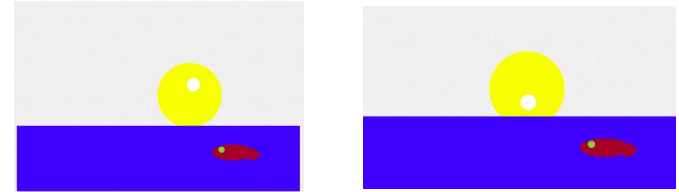Notice that the object's path hits the edge of the wall. with the background still with the ball moving

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ANIMATION

3D ANIMATION

- Si It is the process of generating three-dimensional moving images in a digital environment. Careful manipulation of 3D models or objects is carried out within 3D software for exporting picture sequences giving them the illusion of animation or movement.

3D Animation has 3 main sections:

- Layouts –The process of layout is used in the positioning of objects.
- Modeling – Generating process of 3D objects.
- Rendering – Completed 3D Animation output creating process

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INTERACTIVE CLOUD GAMING:-

UNDER 100-200ms

- Player issues command to local thin client

- Command traverses Internet to cloud server where game is running

- Game logic processes command

- Processing unit renders the command

- Video encoder compresses the output

- Output is streamed back to the player

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INTERACTIVE CLOUD GAMING:-

TYPES OF GAMES:

- First Person Perspective (FPS),

- Role Playing Game (RPG),

- Real time strategy (RTS) –Played in Omni-present view (top-down view looking at many controllable entities)

- Massively Multi-Player Games

- Games played in first person perspective become noticeably less playable when actions are delayed by as little as 100 ms.

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INTERACTIVE CLOUD GAMING:-

- Such low delay tolerance is because first person games tend to be action-based, and players with a higher delay tend to have a disadvantage

- The outcome of definitive game changing actions such as who "pulled the trigger" first can be extremely sensitive to the delay in an action-based *First Person Shooter* (FPS) game

- Third person games (*Role Playing Games*- RPG), and many massively

- multiplayer games can often have a higher delay tolerance of up to 500 ms.

- A player's commands in such games, (e.g. use item, cast spell, or heal character etc.) are generally executed by the player's avatar;

- Therefore there is an invocation phase (e.g. chanting magic words before a spell is cast, etc.) and hence the player does not expect the action to be instantaneous

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INTERACTIVE CLOUD GAMING:-

- Actions must still be registered in a timely manner (to avoid user frustration if the interaction delay causes them a negative outcome e.g. healing before an enemy attack but still dying because their commands were not registered by the game in time)

- For RTS games delays of up to 1000ms can be acceptable to these styles of games

- The player often controls many entities and issues many individual commands, which often take seconds or even minutes to complete.

- In a typical RTS game, a delay of up to 1000ms for a build unit action that takes over a minute will hardly be noticed by the player.

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INTERACTIVE CLOUD GAMING:-

- Focus is on multi-platform cloud games (PC/mobile/dedicated console-machine games)

- Cloud gaming can be defined as rendering an interactive gaming application remotely in the cloud and streaming the scenes as a video sequence

- Characteristics of Cloud Gaming:
  - Diverse user determined h/w & s/w
  - Capacity for video i/o/p
  - External (Online) Vs Internal (disks e.g. Hard disks, CD-ROM) storage based

- PC Games is the third largest sector, after console games (2nd largest) and mobile games (Largest)

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INTERACTIVE CLOUD GAMING:-HIGH LEVEL ARCHITECTURAL VIEW WITH THIN CLIENT AND CLOUD BASED RENDERING

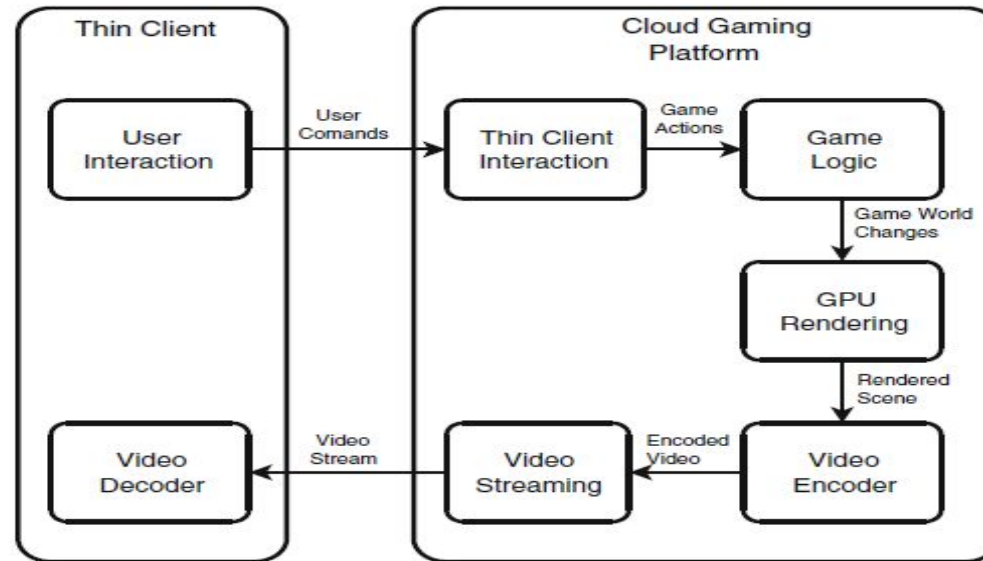### 19.5   Interactive Cloud Gaming   665

Fig. 19.15 A generic framework of cloud gaming

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INTERACTIVE CLOUD GAMING:-

ARCHITECTURE:

- Cloud Gamers interact with the application through a thin client

- Thin client is responsible for:
  - Displaying the video from the cloud rendering server
  - Collecting player's commands
  - Sending interactions back to the cloud

- A player's commands are sent over the Internet from its thin client to the cloud gaming platform.

- Once the commands reach the remote cloud they are converted into appropriate in-game actions,

- Game actions are interpreted by the game logic into changes in the game world.

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INTERACTIVE CLOUD GAMING:-

ARCHITECTURE:

- The game world changes are processed by the cloud system's GPU into a rendered scene.

- The rendered scene is compressed by the video encoder and sent to a video streaming module

- Video streaming module delivers the video stream back to the thin client.

- Finally thin client decodes the video and displays the video frames to the player

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INTERACTIVE CLOUD GAMING:-

BENEFITS

- Expand user base to vast number of less-powerful devices that support thin clients only (i.e. smartphones and tablets)

- Mobile users can enjoy high-quality video games without performing computation intensive image rendering locally

- Masks discrepancy among different Oss through such standard web development tools as HTML 5, flash, JavaScript

- Reduces customer support costs (computational h/w is under gaming provider's full control, with better Digital Rights Management DRM and codes are not directly executed on a customer's local device)

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INTERACTIVE CLOUD GAMING:-
CHALLENGES

- To ensure interactivity, all of these serial operations must happen in the order of milliseconds.

- This amount of time is defined as the interaction delay,

- I.D. must be short as possible in order to provide a rich experience to the cloud game players.

- Trade-off: the shorter the player's tolerance for interaction delay, the less time the system has to perform such critical operations (i.e. scene rendering and video compression)

- The lower this time threshold is, the more likely a higher network latency can negatively affect a player's experience of interaction.

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INTERACTIVE CLOUD GAMING

INTERACTION DELAY TOLERANCE

- Different styles of games have different thresholds for maximum tolerable delay (maximum delay that an average player can tolerate before the Quality-of-Experience (QoE)begins to degrade)

EXAMPLE GAME TYPE	PERSPECTIVE	DELAY THRESHOLDS (ms)
First Person Shooter (FPS)	First person	100
Role-playing game (RPG)	Third-person	500
Real-time strategy (RTS)	Omnipresent	1000

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INTERACTIVE CLOUD GAMING

- Mobile game category is considered to include smartphone and tablet devices, while PC games is synonymous with IBM PC compatible systems

- Gaming technology is divided into 4 parts:-
  - Hardware (sound and graphics and touch)
  - Software (architecture, aesthetics, culture, balance)
  - Video Streaming and Encoding (experience)

HARDWARE

- Minimum requirements: -dual core CPU over 2.4Ghz, 2GB RAM, 20Gb storage space, 512MB RAM graphics card (NVIDIA GEFORCE GTX 560/ATI RADEON 6950)-what does this mean for smartphones and tablets?(limits of h/w size and thermal control, architecture

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INTERACTIVE CLOUD GAMING

HARDWARE

- Lower memory frequency and bandwidth, limited battery capacities

- Fast multi-core hyper-threading CPU's can simultaneously process multiple tasks allowing use of more complex graphics, A.I., in-game physics

- Also require a powerful GPU which can accelerate the process of drawing complex scenes in real time.

- A 3D audio sound card is also needed to provide audio enhancement

- Lastly PPU (physics processing units) are needed to accelerate physics simulations by allowing computers to process more complex interactions among objects

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INTERACTIVE CLOUD GAMING

HARDWARE

- PPUs allow players to potentially have greater control over the world in games designed to use card.

- Other common gaming peripherals include keyboard, mouse, headsets, joysticks, steering wheels and game pads

SOFTWARE

- ARM rather than x86 for CPU

- APIs provide an interface between the game and the OS and the sound and graphics card, which simplifies game design e.g. Microsoft DirectX

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INTERACTIVE CLOUD GAMING

SOFTWARE

- Software also includes game architecture which includes game physics

Video Streaming and Encoding

- Cloud gaming's video streaming requirements are quite similar to live video streaming.

- Must quickly encode/compress incoming video and distribute it to end users.

- Only a small set of the most recent video frames are of interest, and there is no need or possibility to access future frames before they are produced, implying encoding must be done with respect to very few frames.

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INTERACTIVE CLOUD GAMING

Video Streaming and Encoding

- Cloud gaming has virtually no capacity to buffer video frames on the client side.

- The sensitive real-time encoding needs of cloud gaming make the choice of video encoder of paramount importance for any cloud gaming provider.

- Currently, major cloud gaming providers use versions of the H.264/MPEG-4 AVC encoder.

- The choice of the H.264/MPEG-4 AVC encoder is motivated by the fact that the encoder not only has a very high compression ratio but also it can be configured to work well with stringent real-time demands

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INTERACTIVE CLOUD GAMING

Video Streaming and Encoding (Interaction processing and cloud overhead)

- The processing time is the amount of interaction delay caused by the game logic, GPU rendering, video encoding, etc.

- It is the components of the interaction delay not explained by the network latency.

- The cloud overhead is the delay not caused by the core game logic or network latency, including the amount of delay caused by the video encoder and streaming system used

- Although the cloud, powered by data centers, is principally more powerful than any local console, the current implementation is not very efficient.

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INTERACTIVE CLOUD GAMING

Video Streaming and Encoding (Interaction processing and cloud overhead)

- To reach the optimal interaction delay threshold, better implementations in terms of game logic, video encoders, and streaming software remain expected for cloud gaming.

- Cloud gaming is a rapidly evolving technology, with many exciting possibilities.

- Besides software and service providers, hardware manufacturers have also shown strong interests in cloud gaming, and have begun working on dedicated hardware solutions to address such prominent issues as fast and concurrent rendering and encoding of game scenes

INTERACTIVE CLOUD GAMING

TRADITIONAL GAMING (INTERACTION DELAY TOLERANCE)	CLOUD GAMING (INTERACTION DELAY TOLERANCE)
Only an issue for multi-player online gaming systems not for single player games	All games are rendered remotely and streamed back to the player's thin client-concerns interaction delay even for single player games
Hide the effects of interaction delay by rendering the action on a player's local system before it ever reaches the gaming server	Cloud gaming offloads its rendering to the cloud, thin client no longer has ability to hide the interaction delay from the player
Require less than 100ms interaction delays in order not to affect the player's QoE	Maximum interaction delay for all games hosted in a cloud gaming context should be no more than 200ms.

QUESTION AND ANSWER SESSION

ANY

QUESTIONS

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