Animation

Animating is moving something that cannot move on its own.

Animation types

1) **Traditional animation** – Hand drawn animation
2) **Stop motion animation** – Claymation/cut-outs
   The illusion of movement achieved by moving a figure in tiny increments between each photographed frame.
3) **Motion graphics** – animated logo/typography
   It's the art of creatively moving graphic elements or texts, usually for commercial or promotional purposes.
4) **Computer animation** – 2D animation/3D animation
   The motion here can be controlled by vectors rather than pixels.

3D animation

3 steps.

1) Modeling – The process of creating objects and scenes
2) Animation – The process of defining the object's motion.
3) Rendering – The final step in creating 3D animation.

Animation techniques

1) **Key frames** – A storyboard is laid out and the artists draw the major frames of the animation.
2) **Rotoscope** – Animators use to trace over motion picture footage, frame by frame, to produce realistic action.
3) **Motion capture/performance capture/Mo-cap** - Blends real life & animation. Film someone live and transfer them into computerized form.
4) **Simulation** – Uses the laws of physics to generate.

Animation Principles - 12

1) **Squash and stretch**
   A ball hits the ground - The force of the motion squashes the ball flat, but because an object needs to maintain its volume, it also widens on impact.
2) **Anticipation**
   Anticipation is the preparation for the main action. The player striking the soccer ball would be the main action, and the follow-through of the leg is well… the follow through.
3) **Staging**
   Directs the audience's attention toward the most important elements in a scene in a way that effectively advances the story.

4) **Straight-ahead action and pose-to-pose**
   These are two ways of drawing animation. Straight ahead action is where you draw each frame of an action one after another as you go along. With pose-to-pose, you draw the extremes – that is, the beginning and end drawings of action – then you go on to the middle frame, and start to fill in the frames in-between.
5) **Follow through and overlapping action**
   When a moving object such as a person comes to a stop, parts might continue to move in the same direction because of the force of forward momentum. These parts might be hair, clothing, jowls, or jiggling flesh of an overweight person.
6) **Slow in and slow out**
   Carefully controlling the changing speeds of objects creates an animation that has a superior believability.
7) **Arc**
   Life doesn't move in straight lines, and neither should animation. Most living beings – including humans – move in circular paths called arcs.
8) **Secondary action**
   Support the main action to add more dimensions to character animation. They can give more personality and insight to what the character is doing or thinking.
9) **Timing**
   Timing is about where on a timeline you put each frame of action.
   Less drawing = fast | More drawing = slow
10) **Exaggeration**
    Sometimes more is more. Exaggeration presents a character's features and actions in an extreme form for comedic or dramatic effect. This can include distortions in facial features, body types, and expressions, but also the character's movement.
11) **Solid drawing**
    Solid drawing is all about making sure that animated forms feel like they're in three-dimensional space.
12) **Appeal**
    People remember real, interesting, and engaging characters. Animated characters should be pleasing to look at and have a charismatic aspect to them; this even applies to the antagonists of the story.

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Understanding film techniques

Cinematographic techniques - influence the structure and meaning of a film.

1) Choice of shot
2) Camera movement

Sequences

A sequence is created when 2 or more shots are put together to build a 'narrative'. They help to ensure that the viewer understands the action which is occurring within the film. The most important factor for a sequence - Continuity

Shot Types and Reasons

1) **Distance of shot:** the use of different shots can influence the meaning which an audience will interpret
2) **Extreme close-up:** Focuses on a single facial feature, such as lips and eyes.
3) **Close Ups:** Often used to emphasis emotions or show the characters' faces during a conversation.
4) **Reaction shot:** A person's reaction to the previous action, eg: nodding, surprise, terror
5) **Medium Close-ups, Medium Long shots, Long shots:** Used to create variety in showing the action taking place in its setting
6) **Establishing shot:** Mainly used at a new location to give the audience a sense of locality

Camera Movement:

1) **Pan:** Generally used to help establish a setting, or to follow action
2) **Tilt:** A vertical pan that is often used to show a subject's superiority or power (by starting at ground level and titling up to the top)
3) **Zoom:** The zoom lens allows the camera operator to start with a wide angle (extreme long or long shot) and 'go in tight' to a narrow angle (close up or extreme close up)

Camera Angles:

Used extensively to communicate meaning and emotion about characters

1) **Low angle shot:** Looking up at a character or object(taller/powerful)
2) **Straight angle shot:** Looking at an eye-level angle to a character or object, giving a sense of equality between subject and audience
3) **High angle shot:** Looking down on a character, often to show vulnerability or weakness;
4) **POV (Point of View) shot:** The view of a scene or person as a character sees it
5) **Over the shoulder shot:** Often used in dialogue scenes to highlight faces

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THE BASICS OF PHOTOGRAPHY

Getting the exposure right - the picture is neither too dark nor too light.

What controls exposure?

1) **The aperture -** controls the depth of field
   Small f number = big opening = shallow depth of field = less of the picture in focus
   Large f number = small opening = greater depth of field = more of the picture in focus

2) **The shutter speed -** controls movement in the picture
   Shutter speed controls the 'movement' in a picture.
   1. you have to try and hold the camera steady when you take a picture
   2. you need to think about whether the subject itself is moving

   A faster shutter speed is normally selected to freeze movement and capture fast action
3) **The setting of the ISO -** the 'noise' the picture displays
   The ISO number refers to how sensitive the sensor reacts to light.
   1. Good lighting conditions = Low ISO speeds = 100 ISO or 200 ISO
   2. Overcast or cloudy conditions = Medium ISO speeds = 400 ISO or 800 ISO
   3. Poor light or floodlight conditions = Fast ISO speeds = 1600 ISO to 6400 ISO

The rule of thirds

This describes a basic compositional structure of a **photograph**. Taking any image, you can split it into 9 segments by using 3 vertical and 3 horizontal lines. The **rule of thirds** involves splitting an image up into 9 segments.

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Design Elements

1) **Point**
   A point is the smallest and most basic element of design and it can be used alone or as a unit in a group. It has position, but no extension
2) **Line**
   Emphasis something (an outline on a character, underline)
   To divide components in a composition (column line)
   To create a figure (lines in an observational sketch)

3) **Color**
   Colors are used to generate emotions, define hierarchy, and create interest.
   3 properties:
   1. **Hue:** is the color name.
   2. **Value:** it refers to the lightness or darkness, to how close to black or white the Hue is.
   3. **Saturation:** It refers to the intensity of a hue; the less gray a color has in it, the more Chroma it has.
   4.

   Warm & cool colors
   1. **Primary Colors:** Red / Yellow / Blue
   2. **Secondary Colors:** Orange / Green / Violet
   3. **Tertiary Colors:** made by mixing a primary color with a neighboring secondary color

Color harmonies

In **color** theory, **color harmony** refers to the property that certain aesthetically pleasing **color** combinations have.

1. **Complementary colors - Two colors** on the opposite side of the **color** wheel.
2. **Analogous colors – Four colors** next to each other on a **color** wheel.
3. **Monochromatic colors - A color scheme** based on only one, single **color** tint. It uses only variations (shades) of a single hue.
4. **Triadic colors -** Comprised of three **colors** evenly spaced on the **color** wheel(triangle)
5. **Split complementary colors -** a primary **color** is used with the two **analogous colors**
6. **Tetradic colors -** a combination of four **colors** that consist of two sets of complementary **colors** (rectangle)
7. **Square colors -** combination of four **colors** equally spaced around the **color** wheel

4) **Shape**

Shape is an element defined by its perimeter, a closed contour. It is the area that is contained within implied line and it has have two dimensions: height and width

5) **Form**

The Form is derived from the combination of point, line and shape. A form describes volume, it can be viewed from any angle (a cube, a sphere, etc.), it has width, height and depth.

6) **Texture**

Texture is the surface quality (simulated and/or actual) that can be seen and felt, can be rough or smooth, soft or hard.

7) **Space**

It is the area between and around objects.
Positive space is the area or part of the composition
Negative space is that empty or open space that surrounds an object.

8) **Value**

It is defined as the relative lightness or darkness, which suggests the depth or volume of a particular object or area.

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User Experience Design

The user experience is how a user interacts with and experiences a product, system or service. It includes a person's perceptions of utility, ease of use, and efficiency.

The 5 elements of user experience design

1. Strategy: user needs, where it all begins
2. Scope: what features includes
3. Structure: How it behaves
4. Skeleton: makes the structure concrete
5. Surface: the visual

The 3 core UX attributes
Vision /Feedback/Culture

User experience 5 principles
Hierarchy/Consistency/Confirmation/User Control/Accessibility

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User Interface

In the industrial design field of human–computer interaction, a user interface is the space where interactions between humans and machines occur.

Design Methodology

Analyze / Formalize / Synthesize / Evaluate / Implement / Test

Direct Manipulation

Direct Manipulation interfaces provide visual metaphors for commands

Pros	Cons
Less time required of user to learn command syntax	Some action commands seem awkward or impossible
Visually appealing and enjoyable	In some cases, consumes more system resources
Novices can learn the system relatively quickly	Visually impaired or disabled may have more difficulty with the interface

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Graphics Cards and Uses

What are graphics cards used for?

1. Animation
2. Gaming – both PC and console
3. Design/Drafting • Special effects creation/editing • Medical Instruments
4. And other purposes where fast rendering and high resolutions are needed

Graphics Processing Unit (GPU): perform calculations for rendering and figure out what to do with each pixel
Video Memory: storing images and information about each pixel

3d effect: Mip-Mapping
• Pre-calculated images of target image
• Target image, may have several copies which is ¼ the size of previous image
• Makes rendering faster when the output is moving toward and further away from a target image

3d effect: Z-buffering

• Each pixel is part of a 2d coordinate (x-y coordinates)
• Depth is z-coordinate
• When a new object that is rendered wants to take a pixel, Zbuffering checks which pixel is closer to the observer, the old pixel or the new pixel based on the z-coordinate
• If new pixel is closer, the new pixel is buffered and replaces old pixel

3d effect: Anti-aliasing

• When trying to represent high resolutions signal at lower resolutions.
• Smoothest out edges to the human eye by blending of colors
• Anisotropic filtering: creating crisper images

Used by users to get rid of jaggies that form on the screen

Tessellation

Tessellation: The filling of a plane with polygons such that there is no overlap or gap.
A method of breaking down polygons into finer pieces.
Tessellation only improves realism
The solution is to use on-the-card tessellation to increase the physical detail in the meshes

Why Tessellate?

• In software tessellation provides an interesting way of enhancing detail
• In hardware tessellation allows a simple mesh to be sent down to the GPU, converted to a complex mesh, and then displayed
• Decrease memory to the card
• Increase rendering performance by decreasing the number of polygons through the full pipeline

CUDA

CUDA is a parallel computing platform and programming model that makes using a **GPU** for general purpose computing **simple** and elegant.
Used to accelerate non-graphical applications in computational biology, cryptography and other fields by an order of magnitude or more.

OpenCL

A new framework for writing programs that execute in parallel on different compute devices (such as CPUs and GPUs) from different vendors.
Using the OpenCL API, developers can launch compute kernels written using a limited subset of the C programming language on a GPU.

***User-centered design* (*UCD*)**

Iterative design process in which designers focus on the users and their needs in each phase of the design process.

Logline

A brief (one to two sentence) summary of a movie, tv show, etc. that hooks the reader in and describes the central conflict of the story.

Jumping cut

An editing technique that cuts between two sequential shots.

Movie synopsis

A brief description summary of a completed screenplay's core concept, major plot points.

Montage

Series of shots are sequences to condense space, time, and information.

Kuleshov effect

It is a film editing effect. IN this effect the idea that two shots in a sequence are more impactful than a single shot by itself.

Uses: Close-up/Point-of-view/Reaction

Cel animation

Based on changes that occur from one frame to the next. The art of making 2D animation with the help of transparent plastic sheets called 'cels'. The background remains fixed as the images changes.

GUI vs CLI

GUI	**CLI**
CLI is difficult to use.	Whereas it is easy to use.
It consumes low memory.	While consumes more memory.
CLI is faster	GUI is slower

Shot vs scene

A shot consists of a single take, which can be several seconds or several minutes long. A scene is composed of several shots, while a sequence is composed of scenes.

Dutch Angle

A type of camera shot that has a noticeable tilt on the camera's "x-axis".

Continuity editing

The process, in **film** and video creation, of combining more-or-less related shots, or different components cut from a single shot, into a sequence to direct the viewer's attention to a pre-existing consistency of story across both time and physical location.