CNM 190
Advanced Digital Animation

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Pixar Production Pipeline

Story-driven process

- Pixar filmmaking process is story-driven
  - use traditional skills like storytelling, drawing, painting and sculpture
    - allows the work to be easily shared, keeps it informal and encourages experimentation
  - Technology serves the needs of the story
    - Story determines what to put in the film and technology responds

World, Character, Story

- The story process is moved forward by designs for the world & characters of the film
  - The world has its own rules, that limit what the characters can do
    - Building unique worlds is at the heart of animation
  - The characters have things they want and need, that push the limits of the world
    - Characters should feel like they live beyond the frame of the film

Design

- Everything is design
  - alternate cycles of planning and implementation
    - avoid 'waterfall design' where all design is complete before implementation begins
  - don't do any manufacturing
    - that happens at Technicolor after print is finished

Timeline & Departments

- four year design process
  - Planning — all four years
    - Story, Art, Editorial
  - Implementation — the last two years
    - Editorial
    - Modeling, Articulation, Shading, Digital Paint
    - Layout, Set Dressing, Animation, Lighting
    - Rendering

Story, Art & Editorial

- Three departments are the focus of design
  - Story creates storyboards
    - Drawings that are a comic strip version of the film's important moments
  - Art creates inspirational images, character and set designs, colorscripts and lighting pastels
    - Refined images that establish the look and feel of the film
  - Editorial creates story reels
    - A rough draft form of the film made using the storyboard drawings, scratch dialog and borrowed music
- The goal of the planning process is a solid story reel

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Objects & Shots

- The implementation of the film is split between making objects and using those objects to make shots
  - Everything in the film (every character, prop and location) must be created first
    - Nothing is free; if it is in the film, it must be imagined and built
  - Shots are created by populating each scene in the story with the correct objects
    - Only once the cast is on the set with their props can we begin the visual storytelling

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Objects

- The shape and shading are created separately for every object
  - Modeling and Articulation deals with shape and how the shape moves
    - These are primarily 3D skills
  - Shading and Painting works on surface
    - These are primarily 2D skills

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Modeling & Articulation

- Modeling & Articulation handles the shape of the objects, and how they can be moved
  - Modeling is like sculpture, inside the computer — it creates the static shape of the object
    - The model does not bend
  - Articulation or rigging provides the 'hinges/joints' in the model that allow it to be positioned
    - The rigged model can be posed (… and in the hands of an animator, can act)
    - Props and sets get less articulation than characters

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Shading & Painting

- Shading and painting deal with the surface color and texture of the object
  - A procedural shader is a computer program that represents how light interacts with a surface
    - Shaders can provide surface deformation as well as color — they can make a smooth model look bumpy
  - Digital painting allows textures or other paint marks to be applied directly to surfaces
    - Once a surface has been shaded, digital paint can be used to rough it up or add other naturalistic details

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Shots

- Objects are assembled into shots
  - Layout sets up the basic blocking for character and camera movement
    - Layout is informed by the storyboards and story reel
  - Set Dressing ensures each shot is well framed by the set and props
    - Dressing may also build the set used by Layout
  - Animation moves each object
    - Animation provides the acting in 1/24^{ths} of a second
  - Lighting illuminates the shot to focus the action and to help create the mood
    - Lighting is directed by images created by Art

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Animation

- Animate means "to bring to life"
  - Animation uses the hinges/joints in the object's rig — "avars" or articulated variables — to change its location & position over time
    - Animators are actors who can break down a performance into poses
    - Each pose attempts to capture the essence of the character's thoughts and feelings

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Rendering

- Rendering is the final step in the implementation pipeline
  - Rendering is like taking a digital picture of the world inside the computer
    - The renderer produces a 2D image of the 3D scene in the computer
    - A film comprises 120,000 or more rendered 2D images, each onscreen for 1/24th of a second

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