CNM 190
Advanced Digital Animation
Lec 08: Cinematography & Editing Techniques
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Why Study Classic Techniques?

Those who cannot remember the past are condemned to repeat it. - Santayana
- You don’t want your camera and editing to obstruct your storytelling
- Instead, use them as tools to advance narrative!
- If you want to break the rules, you need to know what they are first!
- Do it for a good, artistic reason, not ignorance!

Six Main Criteria of Film Editing
http://en.wikipedia.org/wiki/Film_editing
- Walter Murch
  - Four Academy nominations for films edited on different systems
  - Film editing Pioneer!
  - He ranks editing criteria
    1. Emotion
    2. Story
    3. Rhythm
    4. Eye trace
    5. 2D place of the screen
    6. 3D space of action

Overview

What you know already
- Basic cinematography
- Distance of shot
  - Extreme close up
  - Close up (CU)
  - Medium close up (MCU)
  - Medium shot (MS)
  - Long shot
  - Point of view (POV) shot
- Camera Angles
  - Low angle (threat)
  - High angle (weakness)
  - Straight Angle

What you’ll learn today
- Classic techniques of cinematography & editing
  - Why study classical techniques?
  - Film & Editing Resources
  - Review
  - Continuity Editing
  - Duration
  - Camera Direction
  - Procedural techniques of cinematography & editing
    - Motion interpolation
    - Quaternions & Stepping
    - Splines

Film & Editing Resources

Film Art: An Introduction
- by David Bordwell & Kristin Thompson
- $38 on Amazon

In the Blink of an Eye (2nd Edition)
- Walter Murch
- Silman-James Press, 2001
- $11 on Amazon

Continuity Editing (CE)
http://en.wikipedia.org/wiki/Continuity_editing
- Goal
  - Make the editor as invisible as possible
  - The viewer should not notice the cuts
  - Shots should flow together naturally (direction, position, time)
  - Sequence of shots should appear to be continuous in time and space to advance narrative
  - If you notice editor, temperature in a room), something is wrong.
**CE: (Re)Establishing Shot**

- As the name implies, it “establishes” the scene and/or its participants.
- E.g., Seinfeld’s restaurant exterior shot before an interior scene.
- What is your establishing shot?

Exterior of “Jerry’s” restaurant from Seinfeld.

**CE: Shot/Reverse Shot & Eyeline Matches**

- A shot from the opposite side of the green 180° area.
- Often used as establishing.
- 30° rule: Camera moves at least that much between shots.
- An eyeline match is one that associates what a character is looking at.
- You see what they saw.
- Often associates matching close-ups.
- In film, characters don’t even have to be in the same room.

**CE: Match/Cut on Action (MOA)**

- Cuts between shots are more seamless if they occur on action.
- Definition: A cut which splices two different views of the same action together at the same moment in the movement.
- E.g., if A is getting up and walks to the window, cut as he’s getting up, not before.
  - Cutting after could be eyeline match.
  - MOA can help with a jumpy cut.
  - MOA can be a subtle motion too.

**CE: 180 degree rule**

- Often called The Line or Line of Action. It allows the camera to stay in the green area.
- If the camera crosses the line, the characters will swap places on screen.
- Subjects should be spatially consistent, with consistent axis of action.
- You can cross the line with intermediate head-on shot, POVs or reestablishing shot, but try to avoid this if possible.

Saturday Night Fever.

**CE: Graphic Match**

- Two successive shots joined so as to suggest a similarity.
  - Color
  - Shape
  - Location
- Some feel they are “heavy-handed”, not subtle.
- Kubrick’s classic 2001 A Space Odyssey: bone = spaceship.

Finding Nemo Main Titles.

**CE: Cut-in, Cut away**

- Cut-in:
  - Instantaneous cut to a close-up of something already in frame.
- Cut away:
  - Close-up to something in scene but not in the frame (usually).
  - E.g., if you had a character getting up to answer the door, you might cut away to a knock.

Traffic.

Dancer in the Dark.
CE : Cross-cutting
http://inst.eecs.berkeley.edu/~selfpace/handouts/film222/continuity.pdf

- A series of cutaways & cutbacks
- Also known as Parallel Editing or Parallel Montage
- Alternating shots of two or more lines of action occurring in different places, usually simultaneously
- E.g., a chase scene. First the cops, then the crooks, then the cops...
- Can also be used symbolically
  - Show a 1930s man in line for bread, then a rich man getting into a car
  - A man running from a train doesn’t have to be anywhere near it!
- The Simpsons used to do this a lot until Family Guy started too, then they quit!

Scenes from 'Juliet, 35mm': The daughter and daughter are both at home during different events

CE Rule #1 : Avoid Jump/Elliptical Cuts!
http://inst.eecs.berkeley.edu/~selfpace/handouts/film222/continuity.pdf

- A shot transition that omits part of an event, as if it had ellipses (...) in plot
- Also a cut with too-similar framing
- Or with straight angle but different people (they look like they morphed)
- It’s what you would do if you had no training in editing and just cut pieces of a story together
- If ususal looks like a mistake!
- This is what (maxes does when it summarizes a game into 10 mins.
- In the video, there was a wave of it.
- To avoid
  - Zoom instead of cut
  - Make the framing more different
  - Use the match techniques

Dancer in the Dark

Alternatives to CE

- Elliptical editing (jump-cuts)
- Montage
  - Montage/French for “editing”
  - In this context, we mean disparate images/shots that tell a story
  - Developed by 1920s Soviet theorists, e.g., Sergei Eisenstein
  - Five varieties of montage:
    - Make of of frames
      - rhythmic (rhythms)
      - formal (light-dark contrast)
      - visual (intense)
    - mixed
    - intellectual (all 4 but for meaning)

Traffic, Godfather

Long Take (Plan-sequence)

- A shot of unusual length
  - Draws attention to itself, very different from norm
  - Shots above 3 minutes are now considered long takes
  - Extremely hard to shoot in real life, but trivial in CG
  - Depending on movement, can make film intense, carefree, or stagnant!

- Examples
  - Orson Welles’ Touch of Evil
  - Robert Altman’s The Player
  - David Fincher’s Panic Room
  - Lots of CG now

Touch of Evil, The Player, Forrest Gump, Goodfellas

Duration

- Thanks to editing, time is completely in your control. You can...
  - have a very long take
  - cut boring events out (compress time)
  - Extend one event to the whole film (2X)
  - revisit it over and over
  - change the rhythm
  - explore the space-time continuum!

The Front (1993) 8 minute shot!
**Overlapping Editing**

- Cuts that recall part of the action, as if instant replay
- Draws attention to itself, again very distinctive
- Usually associated with experimental filmmaking
- Usually found in films where action >> plot
- Common in Hong Kong action films of the 80s / 90s

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**Rhythm**

- Rhythm is the “perceived” rate of sounds, movements & series of shots
- Usually it’s the cuts that determine the rhythm
- Just as the story has rhythm, so does the editing
- Muriel’s six main criteria when it comes to film editing
- There’s a feeling that the line art has been lost as we cater to the ADD MTV generation

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**Bullet Time**

- Imagine time and space as a two-dimensional graph:
- We can traverse anywhere in this space! (easy in CG)
- The rig used for Bullet time in The Matrix

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**Camera Direction**

- Lock-off camera
- Simplest form of setup
  - Position, angle, zoom, focus fixed throughout the shot
  - A film consisting only of lock-off shots will feel stiff
- Camera move
  - Rotating, moving, zooming, shifting focus or field of view
  - A film where the camera never stops moving can be unsettling
    - When does the ride end?
  - “Try not to get too carried away with camera moves”
  - Mantra: smooth cameras

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**Rack Focus**

- Changing the focus of a lens so that one element goes out and another comes into focus
- By default, CG images are through a pinhole camera
  - Infinite depth of field!
- Done in Maya via a choice of Depth of Field in Camera and adjusting the Focus Distance
  - Render time explodes!
  - Can be cheated in post by blurring composite layers

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**Maya Turntable Demo**

- Creating a turntable, or “how to rotate a camera around the center of the world”
  - Select camera group
  - Set keyframes for the start and end with 0 degrees and 360 degrees Y rotation
Linear vs Ease-in, Ease-out

- Linear interpolation of motion produces very unreal motion (Lerping)
  - $P(t) = \alpha(t) P_0 + (1-\alpha(t)) P_1$
  - Nothing has infinite acceleration
- Ease-in, Ease-out
  - $P(t) = \alpha(t) P_0 + (1-\alpha(t)) P_1$
  - With ($\alpha(t)$) being something smooth like the blue curve on the right
- $\alpha(t) = \sin(t(t-1)/2)+1/2$
  - Just one example of ($\alpha(t)$)

Orientation Representation & Interpolation

- Fixed Angle
  - Representation
    - Angles about fixed, global axes (e.g., xyz)
    - Gimbal lock when axes align... singularity!
    - Imagine plane straight up, where’s yaw?
    - Bad interpolation property
  - Euler angles
    - Angles of rotation fixed to object, not global
    - Some problems!

Quaternions

- Technique for encoding 3D orientation
  - Lots of math involved using complex rotation
  - Great interpolation properties
    - Finds the great circle arc between two positions
  - Interpolating between quaternion poses linearly is called Slerping

Smooth motion : Splines (1)

- Piecewise polynomial curves with great properties
  - Imagine interpolating lots of points with $y(t)$
    - You’d have to have a very high-dimensional function
    - But if you allowed it to be broken up into pieces, you could solve with many lower-dim functions!
    - Continuity of pieces?
  - Prof Barsky is local expert!

Smooth motion : Splines (2)

- Two classes
  - Interpolating (goes through control points)
  - Approximating (gets near the control points)
- Polynomial order?
  - Standard is cubic (order = 3)
  - Local control
    - Adjusting control point only affects local part of curve
  - Continuity (C0, C1, C2) across joints critically important
  - NURBS are generalizations with expressive power
    - Curves AND surfaces

Conclusion

- If time, look at Pixar Shorts
  - It’s important to understand the classical techniques of editing & cinematography
    - Use them to facilitate your narrative!
    - Smooth camera motions!!!
  - Tremendous power if you code motion yourself...
  - Most SW does heavy lifting!
- Next week:
  - Animation 1 : Basics, motion, sound, data