

*The Visual Systems Lab*



***The Evolution of Film Editing Technique  
and its Implications to the Parsing and  
Summarization of Motion Pictures***







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# Overview

-  *Overview of Shooting Related to Editing*
-  *Evolution of Grammar and Techniques*
-  *Relevance to Automated Parsing*
-  *Benefits to Summarisation*
-  *Issues and Obstacles*
-  *Conclusions*



# Shooting in Relation to Editing

 *Director controls what is shot*

 'Surrogate audience member'

 *Composition attributes affecting editing*

 Subject Position

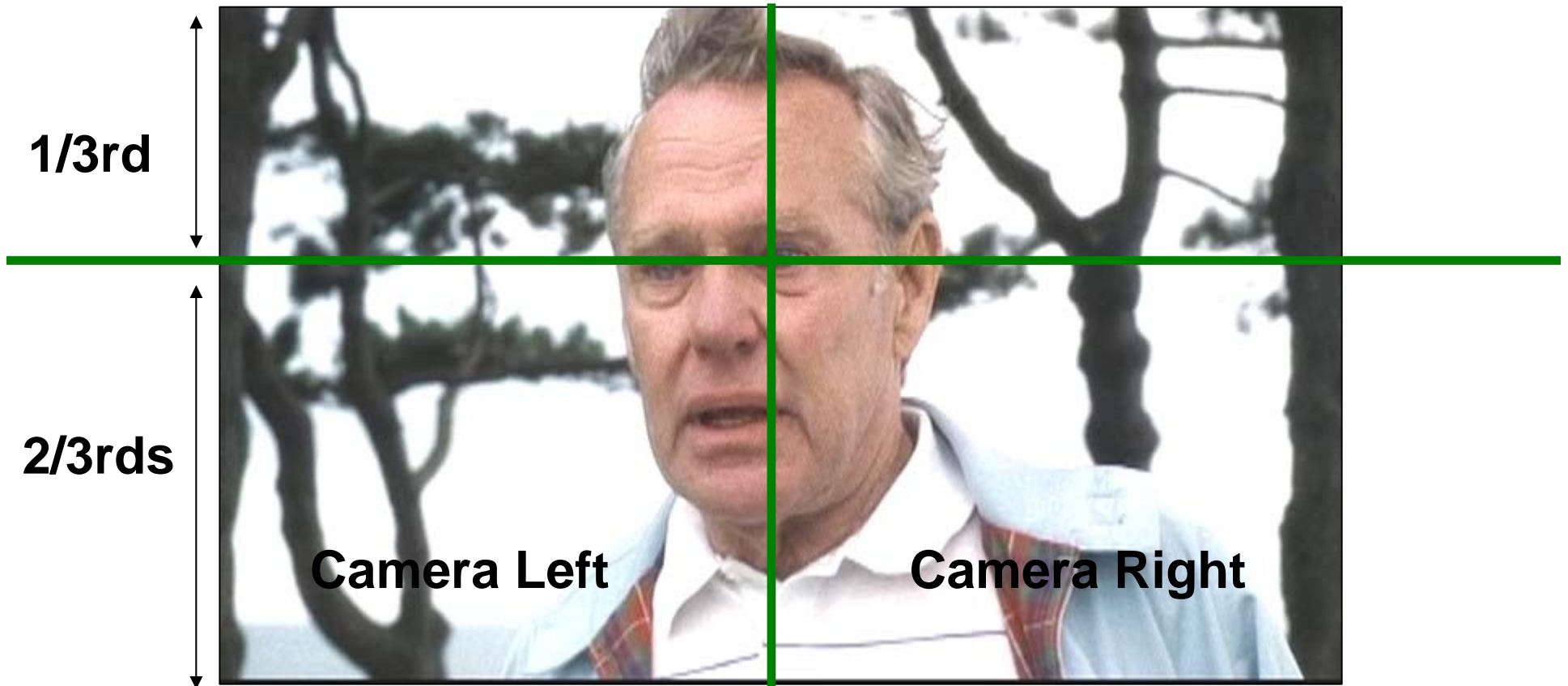
 Framing

 Lead space

 Eye line



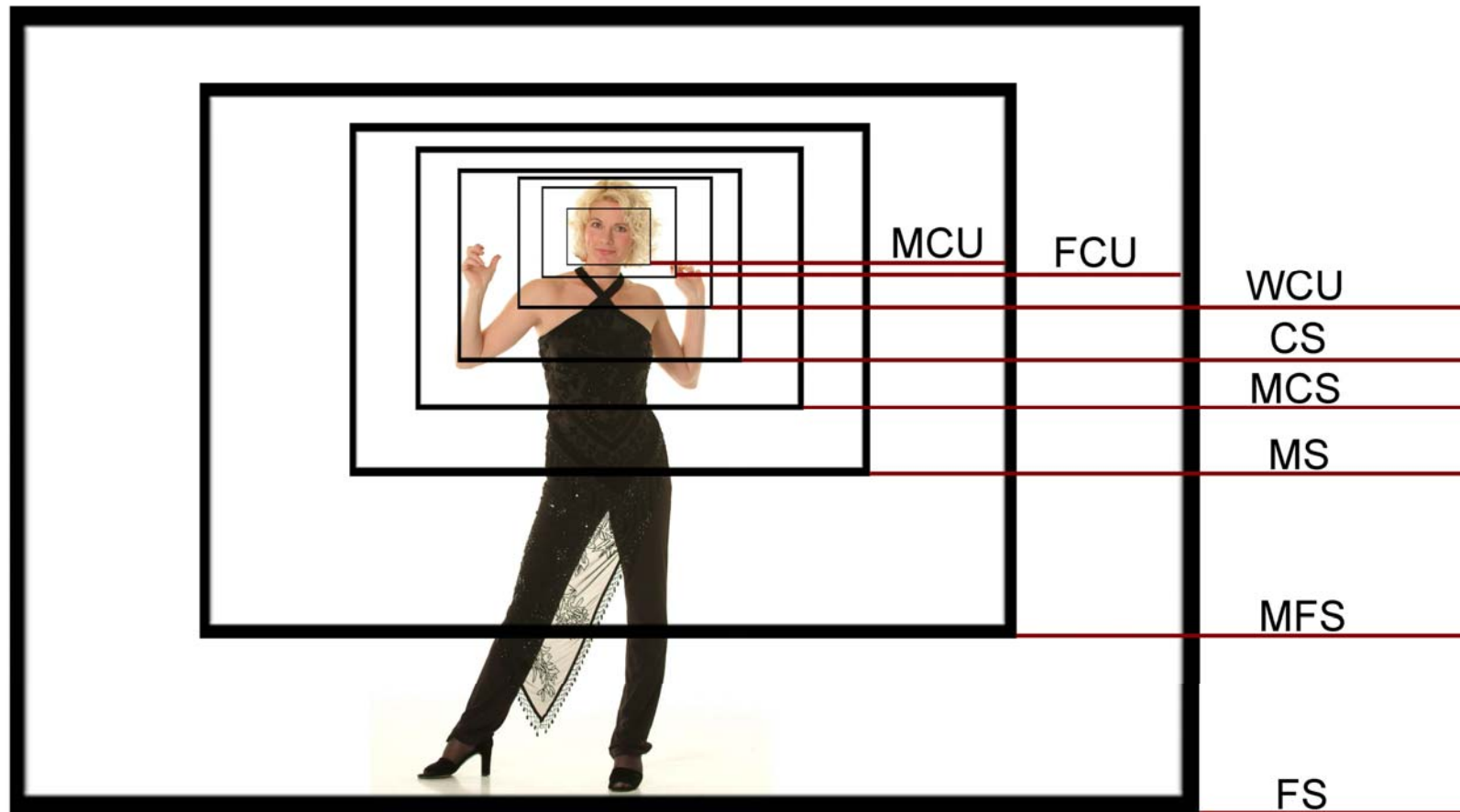
# Subject Position within Frame



*Saving Private Ryan* ©1998 Paramount



# Framings



# Lead Space



*Saving Private Ryan* ©1998 Paramount

# Eye Line



*Saving Private Ryan* ©1998 Paramount

# Shooting and Editing Scenes

## 🎬 *Scene Structure*

- 🎬 A clear *beginning, middle and end*
- 🎬 Not a resolution of story but of moment

## 🎬 *Coverage*

- 🎬 All shots taken to record the scene
- 🎬 Each new shot should advance story
  - *What does the audience need to see?*

## 🎬 *Processed raw footage called “Rushes”*



# Choosing Shots

- 🎬 *Variation in composition and angles will determine how shots “cut”*
- 🎬 *Continuity*
  - 🎬 *In Setting and Space*
  - 🎬 *In Action*
  - 🎬 *In Camera motion*
  - 🎬 *The “Line”*



# Thomas Crown Affair (1968)





*Clip from the bank manager scene*







# Relationship of Time to Editing

## *Time*

-  Running time – physical duration of program
-  Audience time – perceived duration
-  Story time – local duration within program
-  Action time – event duration

## *Flow of time controlled through “beats”*

-  In action, camera movement or transitions
-  Enable breathing space, emphasis



# Evolution of Film Grammar

- 🎬 *Pre-1900: Birth of Cinema*
- 🎬 *1900-1910: Evolution of Continuity*
- 🎬 *1910-1920: Beginning of Common Language*
- 🎬 *1920-1930: Conceptual Languages Emerge*
- 🎬 *1930-onward: Expansion of established grammars, development of new ones*

# Pre-1900: Birth of Cinema

- 🎬 *Camera not mobile*
- 🎬 *Requirement of light very high*
- 🎬 *Theatrical Presentation*
  - 🎬 *Fourth Wall model*
  - 🎬 *Audience kept distant*
- 🎬 *No transitions*
- 🎬 *Simply to record a constrained event*

# 1900-1910: Notion of Time

- 🎬 *Long takes*
- 🎬 *Straight cut transitions emerge*
- 🎬 *No line but evolution of continuity*
  - 🎬 entrance and exits from correct side
  - 🎬 action consistent between adjacent shots
- 🎬 *Initially real time (no ellipsis)*
- 🎬 *Location work just starting*



# Yorkshire Egg Collectors (1908)

*Clip of 'climbers' gathering edge  
from cliff faces in Flamborough  
From the Yorkshire Film Archives*



# 1900-1910: Continuity Evolves

- 🎬 *Linear time but in multiple locales*
  - 🎬 very beginning of ellipsis
- 🎬 *Variation in framing dictated by location*
- 🎬 *Audiences began to understand nature of film and basic continuity*
- 🎬 *Novelty drives filmmaking*





# **The Thieving Hand (1908)**

*Clip of the hand being pawned,  
stealing from the pawn shop  
and the police being summoned*



# 1900-1910: Continuity Evolves

- 🎬 *Early notion of 'Line' through Eye Line*
  - 🎬 Lead space used to guide viewer's attention
  - 🎬 Continuity of space still inconsistent
  - 🎬 Still 'fourth wall' model
- 🎬 *Technical innovations enhance technique*
  - 🎬 Stop motion photography, Multiple exposure
  - 🎬 Variation in recording frame rates
- 🎬 *Audience sophistication drives innovation*



# Princess Nicotine (1908)

*Clip of the stop-motion animation of cigar being created, man in living room smoking and tormenting the Princess*



# 1910-1920: Common Language

- 🎬 *Master-Scene language established*
  - 🎬 Start with *Establishing Shot*
  - 🎬 Closer shots to see subjects, action
  - 🎬 Close-ups to see emotion, reaction
  - 🎬 Wider shots for context, reinforcement
  - 🎬 Return to Closer shots to reinforce reaction
  - 🎬 Often Wide end shots to show resolution, exit
- 🎬 *'The Line' gains acceptance as standard*

# 1910-1920: Languages Develop

## 🎬 *Parallel Language established*

- 🎬 Action in multiple locations occurring simultaneously – ‘*cross-cutting*’

## 🎬 *Experimentation with convention*

- 🎬 Colour used to indicate time, emotion

## 🎬 *New technology enables moving cameras*

## 🎬 *Optical transitions become common*






# The Lonedale Operator (1911)

*Clip of the cross-cut sequence of  
the woman telegraphing for help  
as the robbers try to break in*




# 1920-1930: Conceptual Language

## *Pudovkin tests 'Constructive' model*

-  Meaning of film can be broader than content of individual shots
-  Enables conceptual communication
-  Creates tension, enhances action

## *Eisenstein expands this through 'Montage'*

-  Graphic, Rhythmic, Picture-Sound and Ideological juxtaposition



# **Battleship Potemkin (1925)**






*Clip of the Odessa Steps sequence*






# 1930-onward: Grammar Explored

## *Visual Discontinuity*

-  Buñuel, surrealists challenge perception and expectation
-  Exploit audience understanding of continuity
-  Continuity, Lead Space, Eye Line 'abused'
-  Development of *Graphic Match* cuts
-  Advent of *Jump Cuts* to jar viewer

 *If squeamish, look away now!*







# Un Chien Andalou (1929)

*Clip of the graphic match between  
the cloud crossing the moon and the  
lady's eye being sliced*



# 1930-onward: Grammar Explored

## *Transition Driven*

-  Focus audience attention explicitly
-  No attempt to hide technique
-  Most common in newsreels
-  Continues in 'hard sell' advertising






# **‘News on the March’ (1941)**

*Clip of the ‘news reel’ from  
Citizen Kane*



# 1930-onward: Grammar Explored

## *Dissection of Action (Vorkapich)*

-  Similar to montage but salient shots shown to convey a linear process
-  Focuses audience on steps involved, detail
-  Widely used today in conjunction with other techniques



# Cool Hand Luke (1967)

*Clip of the opening sequence where  
Luke cuts the heads off parking meters*



# 1930-onward: Evolution of Sound

- 🎬 *Initially based on Theatre model*
  - 🎧 Music accompaniment to enhance drama
- 🎬 *Evolved to basic recording of event*
  - 🎧 Dialogue, action but all live
- 🎬 *Multi-track recording, editing enabled control*
  - 🎧 Foley, looping, better synchronisation
- 🎬 *Sound design evolves to control how picture is interpreted*

# Modern Filmmaking

🎬 *Draws on all previous languages*

🎬 Exploits audience knowledge and expectation of grammar and genre convention

🎬 *There is little that is new...*

🎬 Re-invention, re-discovery of technique

🎬 *... except what technology enables*

🎬 Snorkel lens, virtual cameras, etc.





# **Raging Bull (1980)**

*Clip of the Sugar Ray Robinson  
title fight that Lamotta loses*



# Automated Parsing

- 🎬 *Can technique and language be of use?*
  - 🎬 Picture and Sound analysis can reveal patterns to potentially classify language
  - 🎬 Parsing certain elements could enable higher-level semantic concepts to be identified
  - 🎬 Determination of grammar could better define search ranges
  - 🎬 The goal is reduce the scale of the domain, splitting it into manageable data sets



# Picture Analysis

- 🎬 *Basic technical attributes can be readily parsed through image processing*
- 🎥 Pans, Tilts, Zooms and transitions can be found using disparity measures
- 🎬 *Camera movement can be classified based on 3D extraction from images*
- 🎥 Dolly moves, Crane shots, Steadicam, etc



# Picture Analysis

- 🎬 *Relative motion and subject tracking can be extracted via segmentation*
- 🎬 *Face Detection methods can facilitate the extraction of Framings and Groupings*
- 🎬 *Noting orientation of respective head positions can indicate Eye Line*
- 🎬 *Face Recognition can aid with context*
- 🎬 *Text recognition through OCR to add detail*







# Picture Analysis

- 🎬 *Object pattern matching techniques can be applied in stages*
- 🎬 Location or Setting can be established based on landmark detection (Eiffel Tower = Paris)
- 🎬 More abstract settings can be detected by salient features (traffic lights = street)
- 🎬 *The goal is to build semantic database to enhance chances of correct parsing*





# Sound Analysis

-  *Segmentation of soundtrack into music, dialogue and effects for individual parsing*
-  *Classification based on sound signatures noting time to correlate with picture*
-  Give clues as to what to search for visually
-  Enhance accuracy of parsing through reinforcement



# Film Language Analysis

- 🎬 *Patterns of picture and sound characteristics in shots can provide insight into language*
- 🎬 Framings and durations can create signature
- 🎬 Types of Continuity can be classified
- 🎬 *Could be used to determine genre*
- 🎬 *Could be used to assist dating of programs*
- 🎬 *Can provide additional detail for summarisation*





# Summarisation

- 🎬 *Rich Metadata and prosaic textual descriptions can be generated*
- 🎬 *Potential cross links with related programs to confirm/enhance extracted data*
- 🎬 *Benefit to visual summarisation unclear*
  - 🎬 Dependent on metaphor used
  - 🎬 Static depictions can nullify effect of editing technique



# Summarisation

## *Reverse Storyboarding Metaphor*

-  Based on film preproduction visualisation methods
-  Draws on extracted technical attributes of pictures
-  Automatically adds visual cues in keeping with storyboarding technique
  - *onion skins, streaks, trail lines, arrows, field cuts, etc.*
-  Annotated, mosaic or combination form

# Reverse Storyboarding

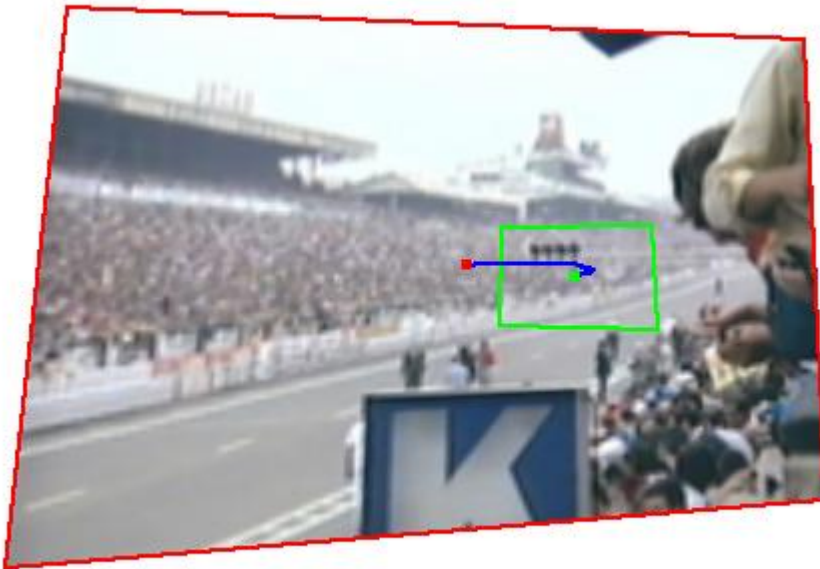


*Tilt Up, Pan Left in Arrow Form*

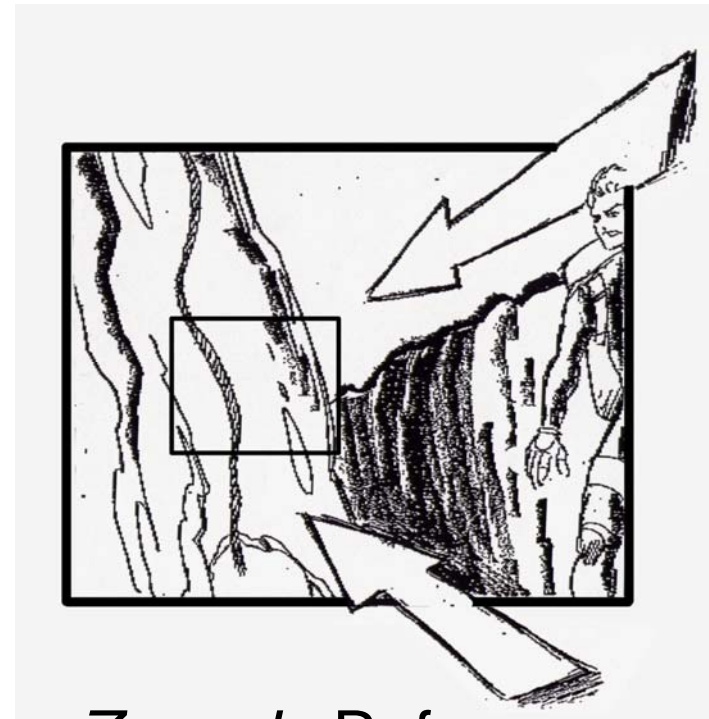


*Tilt Up Reference*

# Reverse Storyboarding



*Zoom Out* in Mosaic Form



*Zoom In* Reference

## Issues and Obstacles

- 🎬 *Film language very rich and not uniform*
- 🎬 *Patterns of editing not always consistent*
- 🎬 *Significant knowledge of film history required to create effective model*
- 🎬 *Accurate training and testing difficult given diversity of programs in existence*
- 🎬 *Computationally very expensive*

## Conclusions

- 🎬 *Film languages have evolved into a sophisticated and multi-faceted grammar*
- 🎬 *Techniques that facilitate these languages are constantly growing and changing*
- 🎬 *Understanding language and technique could enable better semantic extraction*
- 🎬 *Textual Summarisation could benefit but relevance to visual summaries unclear*

## Useful References

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**Thank You!**

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