Cinématographies Réelles Et Virtuelles

Real and Virtual Cinematography

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http://cinematography.inria.fr
General Methodology

Analyze and understand

Knowledge Elicitation

Film industry
Interactive Storytelling
Cinematographic drones

Adapt knowledge to new contexts

Computational models
Analyse & Understand

Extracting cinematic features
Towards NFP? (Natural Film Processing)

Figure 2: Density of head positions depending on the number filmed actors.
Film Analysis

Towards NFP (Natural Film Processing)

Statistical analysis

Structural analysis

Cognitive & emotional analysis
Structural Analysis

Languages to describe shooting [TOMM2018]

intensify{
    length: >= 3
    sub-sequence: same-size{
        length: >= 1
        sub-sequence: shot{
            size-relation: same (range: all)
        }
    }
    size-relation: closer (range: all)
}
Scene Analysis

Languages to describe staging

Scene 1:
Camera 1, CloseUp on George front screen center and Marty 3/4 back right screen left. George and Marty are in chair and near bar.
Exploiting The Extracted Knowledge

Tools for the film industry

Generating camera angles  
[TOG2015]

Generating scene layouts  
[MIG2018]

Optimising camera crane motions + VR  
[VR2019]
Exploiting The Extracted Knowledge

Tools for automated cinematography in storytelling

The “Editing Graph” [AAAI2015]
Searching for a good edit

• A good edit of a sequence should:
  - Convey relevant actions
  - Avoid discontinuities when cutting
  - Apply an appropriate cutting rhythm

• Cost of a sequence can be expressed as:

\[
P(s) = W^A \sum_j \sum_{t_j \leq t \leq t_j + d_j} P^A(c^t_j) + W^T \sum_{1 \leq j \leq n} P^T(c^t_{j-1}, c^t_j) + W^R \sum_j P^R(d_j)
\]

Action cost (Shot quality) Transition cost (Cut quality) Rhythm cost (Pace quality)

Where \( s = \{ s_0, s_1, ..., s_{j-1}, s_j, ..., s_n \} \) is a sequence of shots (edit)
Shot quality: action cost

- A good shot should:
  - be informative enough
  - **highlight** important information (provide guidance to viewers)
  - avoid distracting viewers

Actions unfolding over time

Importance of characters over time
Cut quality: «continuity editing» of actions

- Controls how storyline actions are perceived all together
  - **Make link** between pieces of information
  - **Guide** viewers’ attention (visual cues)
- Controls how a given action is perceived as continuous in time
  - **Do not break continuity** (coherency)

![Jump Cuts](image1)

![Continuity errors](image2)

![Keeps continuity](image3)
Automated editing with 25 cameras

- Fully automated editing
- $T < 30s$ on recent desktop

2 seconds pacing

10 seconds pacing
Automated Cinematography for games

- Fully-real time on Unity3D
- Integrated in game GTFO
- Demonstrated at Unite Los Angeles
Automated Cinematography for drones

Motivations:
➢ Generate an aesthetic flyby of given buildings

Approach [TOG2018]
➢ Automated computation of best viewpoints and best moves around landmarks
➢ Automated generation of camera path through landmarks
What’s Next?

• Data-driven cinematography (learning film style)
• Towards fully automated drones in complex shootings

Using DLIB tracker + OpenPose
Towards Cognitive & Emotional Cinematography

• Storytelling “The art of bringing an audience from a given cognitive and emotional state to an intended state, through a set of cognitive and emotions changes”

Towards a better understanding of “How Films Mean”
(H2020 FET-OPEN submitted with researchers in cognitive science, film linguistics and BBC R&D)