HAPTIC CINEMATOGRAPHY: AUTHORING HAPTIC FEEDBACK FOR MOVIES

Creative Haptic Expression: Trends and Tools

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1. Introduction

2. H-Studio

3. Haptic Cinematography

4. Principles for Haptic Cinematography

5. Conclusion

6. References
INTRODUCTION
Audiovisual Experience

- Evolution of the audiovisual experience
  - Improving the Quality of Experience
  - Focused on images and sound
  - Next step: sense of touch? (Haptics)
Haptics and Audiovisuals

- Haptics already used in VR
- Early results on haptics for AV
  - Haptics may enrich AV experience [O’Modhrain and Oakley, 2003]
  - New medium to express content [Magnenat and Bonanni, 2006]
  - New field of study: Haptic-AudioVisuals [El Saddik et al., 2011]
Haptics and Audiovisuals

- Haptics already used in VR
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Challenge

How to augment audiovisuals with haptic feedback?
Workflow

- Based on architecture for video streaming
- Three steps
  - Production
  - Distribution
  - Rendering

[Danieau et al., 2013]
H-STUDIO
Overview of the Authoring Tool
Overview of the Authoring tool

- Edition of motion effects
  - Capture of motion data
  - Manual edition thanks to force-feedback device
  - Automatic extraction of vibration effects
  - Preview of haptic effects
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Acquisition

- Capture device
  - Camera
  - IMU: linear acceleration

- Content
Preview of Haptic Effects

- Signal processing
  - Synchro with AV (haptic clap)
  - Low pass filtering
  - Gravity removal

- User feedback
  - Realistic movement
H-Studio 2

- Ported on Android device
- Use embedded sensors
H-Studio 2

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- Use embedded sensors
- Edition with touchscreen

[Mollet et al., 2015]
H-Studio 2

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- Edition with touchscreen
- Full body stimulation

[Mollet et al., 2015]
H-Studio 2

- Ported on Android device
- Use embedded sensors
- Edition with touchscreen
- Full body stimulation
- Multiple haptic effects (vibration, temperature, motion, etc.)

[Mollet et al., 2015]
HAPTIC CINEMATOGRAPHY
Haptic Cinematography

- How to associate haptic feedback to movies?
Haptic Cinematography

- How to associate haptic feedback to movies?
- Mainly used with action movies
  - Physical events: explosions, car chases, gun shots, etc.
  - 4D cinemas
How to associate haptic feedback to movies? ▶ Mainly used with action movies ▶ Physical events: explosions, car chases, gun shots, etc. ▶ 4D cinemas

Drama, comedy, romantic movies?
Haptic Cinematography

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- Drama, comedy, romantic movies?

Non-diegetic effects
Move beyond enhancement of physical events only
Diegesis: definition

- Non-diegetic effect
  - Effect whose source is neither visible on the screen nor has been implied to be present in the action
- Example: non-diegetic sound
  - Narrator’s commentary
  - Mood music
Taxonomy of Haptic Effects

[Danieau et al., 2014]
Taxonomy of Haptic Effects

[Danieau et al., 2014]

Focus

Study of cinematographic camera effects
Cinematographic Camera Effects

- Typical cameras effects
  - Arcing
  - Traveling
  - Tilting
  - Zoom-in
  - Vertigo
  - **Crane shot**
  - **Dutch angle**
Cinematographic Camera Effects

- Typical cameras effects
- Two types of haptic feedback
  - Cinematic → direct mapping
  - Semantic → haptic metaphor
Cinematographic Camera Effects

- Typical cameras effects
- Two types of haptic feedback
  - Cinematic $\rightarrow$ direct mapping
  - Semantic $\rightarrow$ haptic metaphor
- Proof-of-Concept
  - 7 video sequences
  - HapSeat
Cinematic Model

- Follows camera movement
- Example with Arcing, Tilting and Zoom-in
Semantic Model

- Based on the semantic of the Camera Effect
  - Crane shot → Flying away
  - Dutch angle → Instability
  - Arcing → Intensification
  - Traveling → Crab walk
  - Tilting → Inferiority
  - Zoom-in → Walk forward
  - Vertigo → Vertigo

- Designed with H-Studio
Objective : study of the influence of the haptic effects based on camera motions on the QoE

Hypothesis : New haptic effects increases QoE

Variables
- 7 video sequences
- 4 haptic conditions (cinematic, semantic, random, none)

Measure
- Pairwise comparison (78 couples)
- Score computed for each model

38 participants ($\bar{x} = 36.3, \sigma_x = 10.4$)
User Study

- Haptic effects enhance QoE
  - Cinematic > Semantic
    ≈ None > Random
  - Semantic > None
    - Vertigo
    - Arcing
    - Tilting

- Discussion
  - Metaphors well understood
  - Dynamics of haptic feedback should be similar to dynamics AV content
Application
PRINCIPLES FOR HAPTIC CINEMATOGRAPHY
Inspiration

- Guidelines for designing haptic effects?
- Inspired from Disney’s 12 principles of animation
  - realistic animations
  - law of physics, emotional timing, character appeal, etc.

[Thomas and Johnston, 1995]
Principles for haptic cinematography?

- Lot of tests, demonstrations, discussion with professionals
- Work with student in cinematography
- H-Studio
- Blender Foundation Movies

9 Principles for the Haptic Cinematography [Guillotel et al., 2016]
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9 Principles

1. Staging
2. Continuity
3. Realism
4. Perception
5. Anticipation
6. Exaggeration
7. Synchronism
8. Kinetic Interpolation
9. Diegesis
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CONCLUSION
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- Haptics → strong potential for enhancing AV
- Authoring tool: H-Studio
  - Capture
  - Manual edition
  - Preview with force-feedback device
  - Full body
- Haptic Cinematography
  - Taxonomy of haptic effects
  - 9 principles
Thanks! Questions?
REFERENCES


References II


