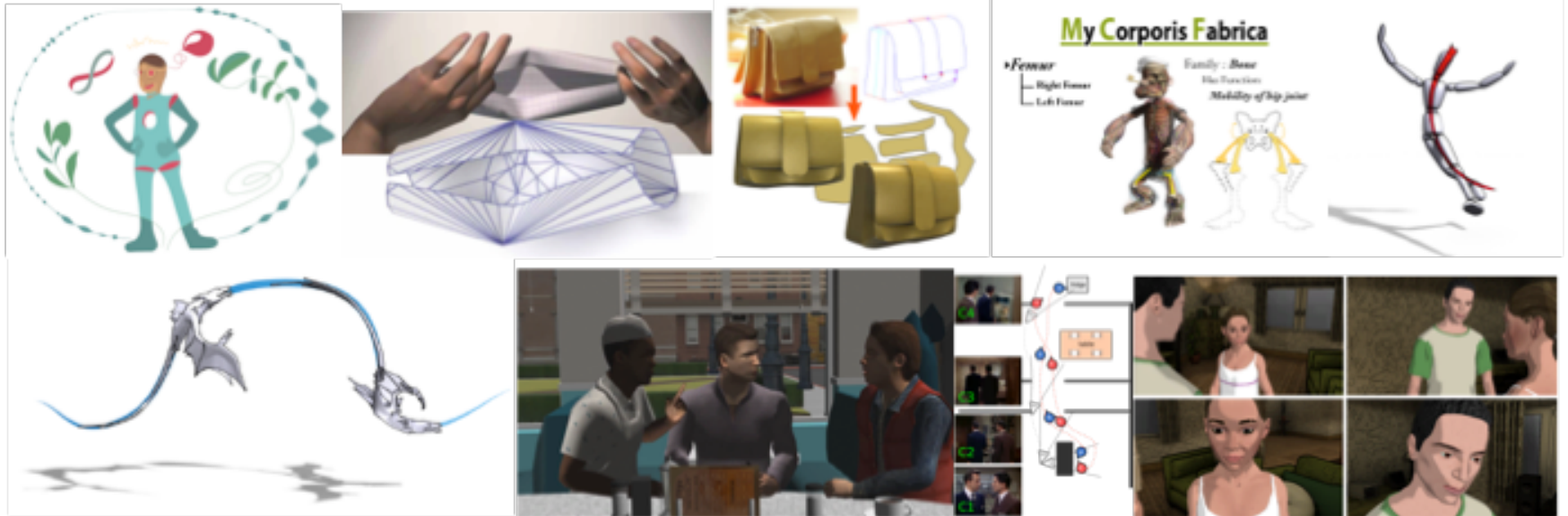




IMAGINE

Intuitive Modeling and Animation for Interactive Graphics & Narrative Environments



Lab. Jean Kuntzmann, Univ. Grenoble Alpes, Inria



A Computer Graphics group

3D Modeling, Animation, Cinematography

A multi-disciplinary team

Rémi Ronfard (DR Inria)

Stefanie Hahmann (Prof in applied-math, Ensimag / INPG)

Jean-Claude Léon (Prof in mechanics, Ense3/ INPG)

Olivier Palombi (Prof in anatomy, Univ. Grenoble Alpes)

Marie-Paule Cani (Prof in computer science)

François Faure (Prof in computer science)

Damien Rohmer (Prof in computer science)

Frédéric Devernay (CR Inria)

Mélina Skouras (CR Inria)



Motivation

Major Issue : demand for more and more complex scenes
Armies of Computer Artists during several years?
Or automatic creation ... with little control ??

Scientific focus: **Creation tools for animated virtual worlds**
Applications to films & games, engineering, other sciences, general public



Creation of Virtual Worlds

Practice in the film industry

Best research results quickly available but...

Artists do as much as they can **WITHOUT** computers
Shape, motion, stories are drafted on paper, clay, etc.



Design stages



Digital stages

[Pixar, « Geri's game », 1997]

Creation of Virtual Worlds

Practice in the industry

Standard software

- Direct editing of DoF (NURBS, subdivision)
- Years of training

Spoils creativity!

Grand challenge?



*“Make tools as transparent to the artists
as special effects were made transparent to the public!”*

[Rob Cook, Technical director Pixar, 2009]

Making tools transparent ? Methodology

User-centered perspective on shapes, motions & stories

High-level models embedding a priori knowledge
Generate details from minimal user input
Advanced transfer and editing tools



Creating interactive virtual prototypes

Designing & experimenting in the same system
Natural interaction gestures
Real-time response



Motion

Shape

Story

Long term Vision

“Magic pen” to seamlessly create shapes, motions & stories



Research objectives for this period

Shape design:

- general shapes (3D + 2D +1D parts, distributions)
- shapes with functional features (CAD, anatomy)

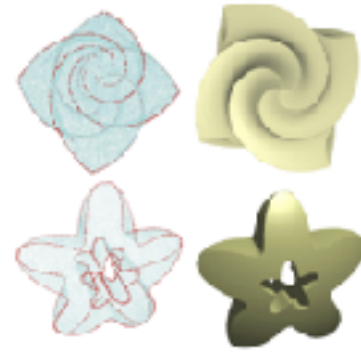
Motion design:

- real-time physics for complex models
- sketching/acting and sculpting/transferring motion

Narrative design:

- learn cameras & film editing rules
- create and edit temporal event sequences

Axis 1 - Shape design



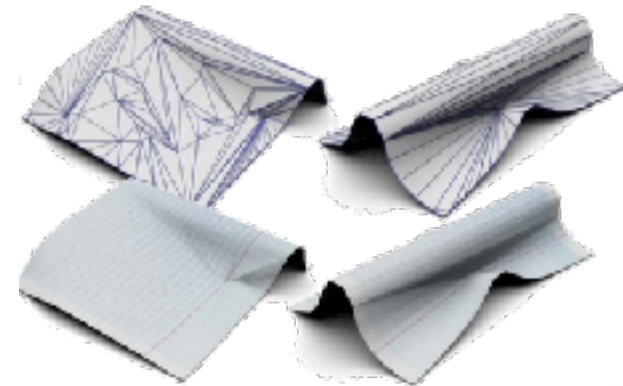
Goal is to develop responsive shape models, i.e. 3D models that respond in the expected way under any user action.



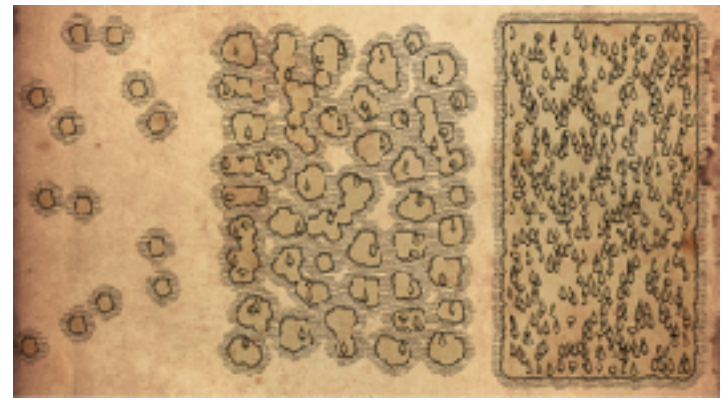
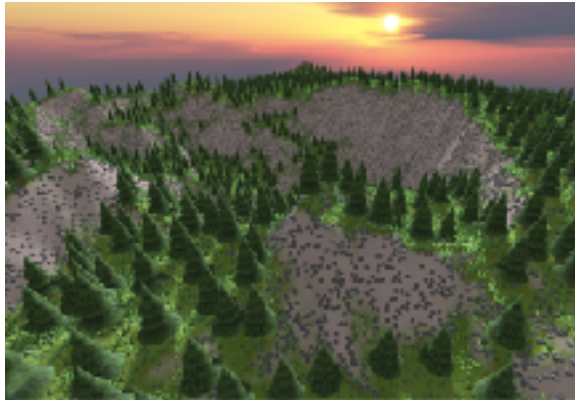
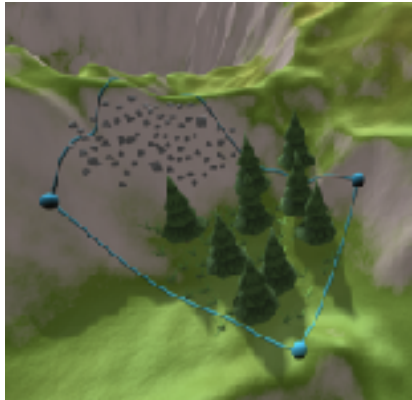
Zoom: Developable surfaces



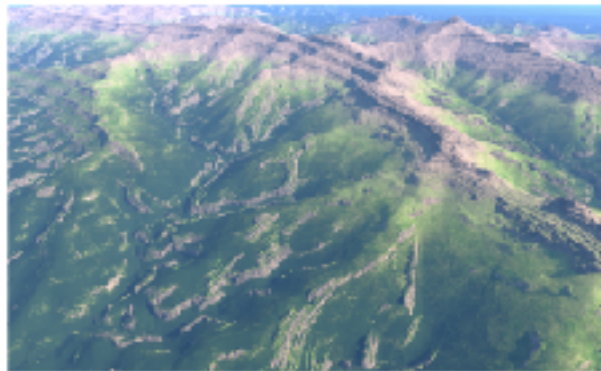
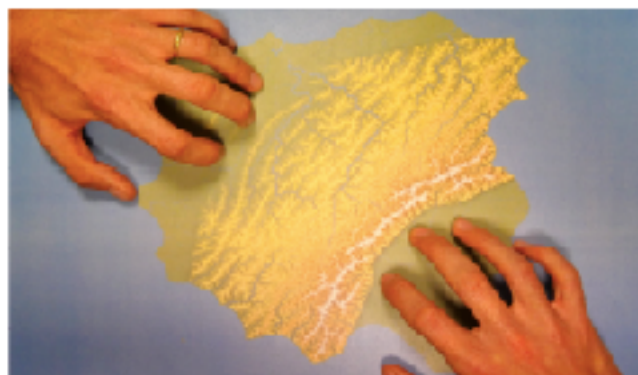
Sketching Folds: Developable Surfaces from Non-Planar Silhouettes,
TOG, Siggraph Asia 2015.



Zoom: Sketching and sculpting virtual worlds

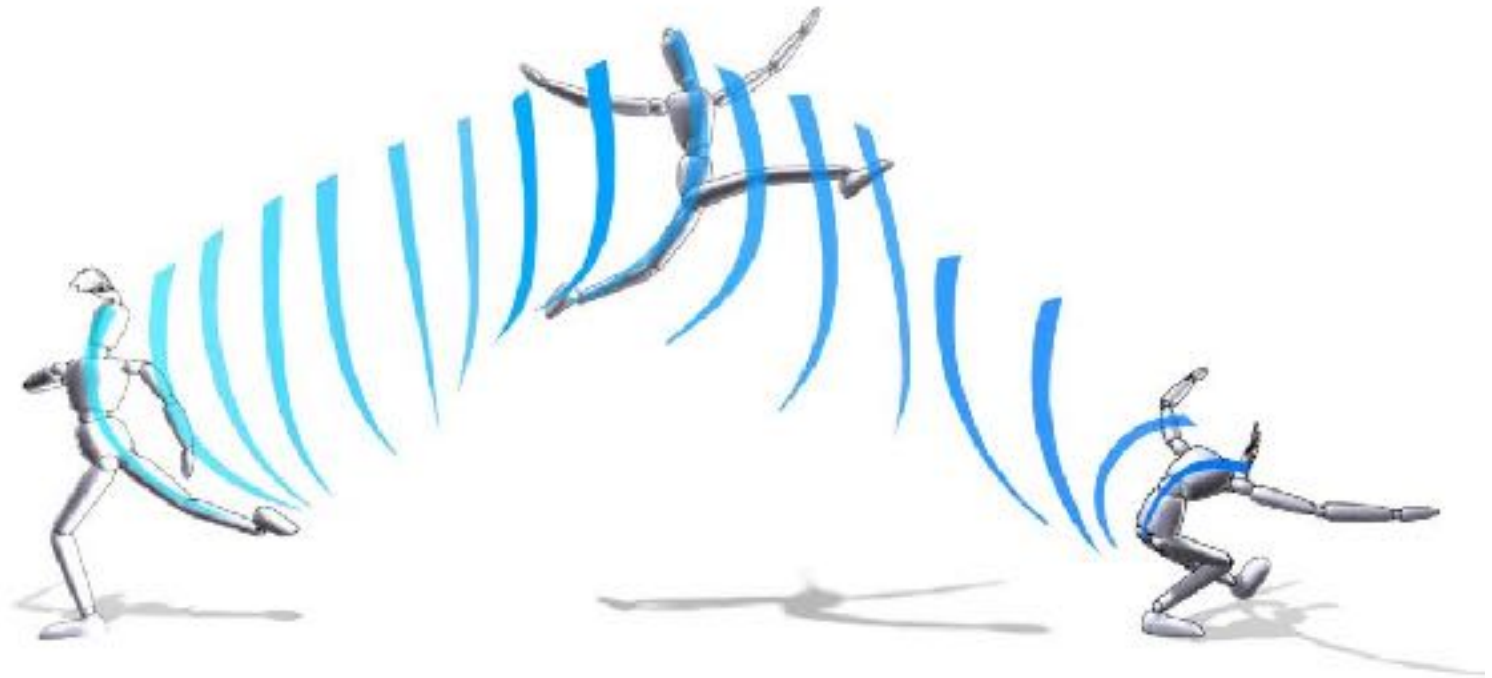


WorldBrush: Interactive Example-based Synthesis of Procedural Virtual Worlds, Siggraph 2015.



Sculpting mountains, IEEE trans. Visualization and Computers Graphics, 2018.

Axis 2 - Motion design



Goal is to enable real-time, coarse-to-fine animation of responsive shapes and expressive characters.

Zoom: Sketching and sculpting animation

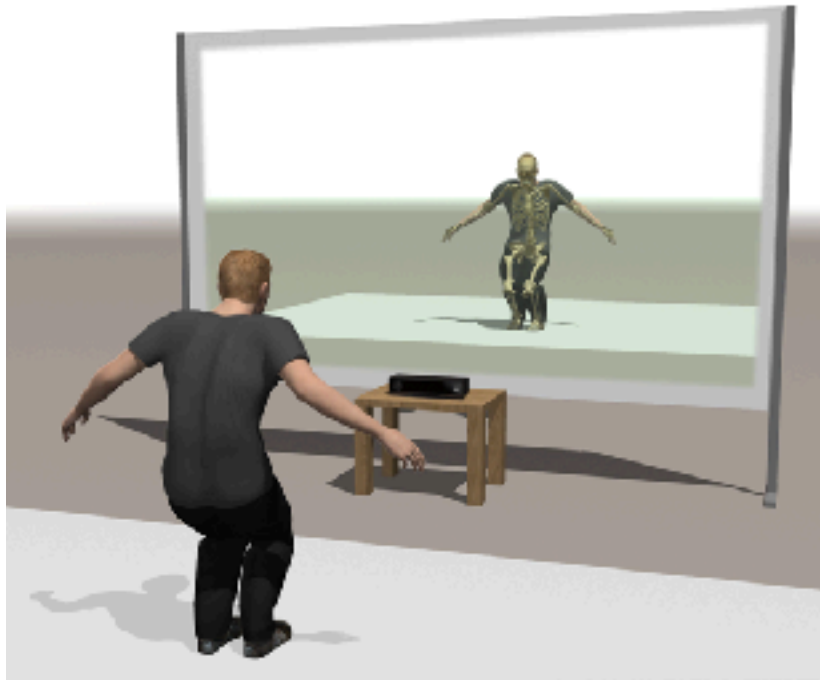


The line of action, Siggraph Asia 2013



Space-time sketching of character animation, Siggraph 2015.

Zoom: Animating anatomy



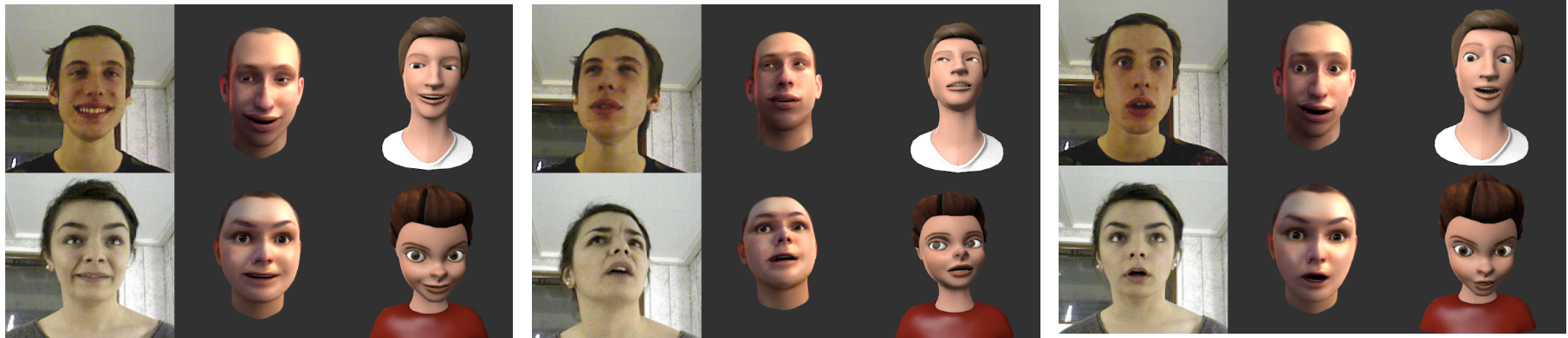
Anatomical augmented reality with 3D commodity tracking and image-space alignment. Computer and Graphics, 2017.

Axis 3 - Narrative design



Goal is to direct virtual actors and their actions with rule-based cameras enabling to convey a narration.

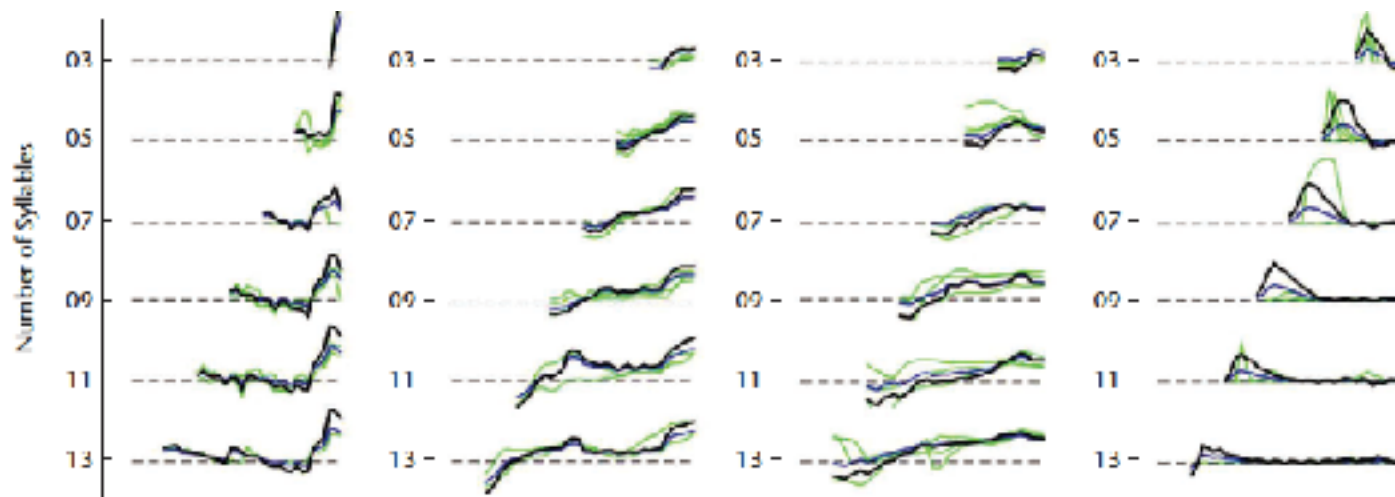
Zoom: Directing virtual actors



Seductive

Thinking

Scandalized

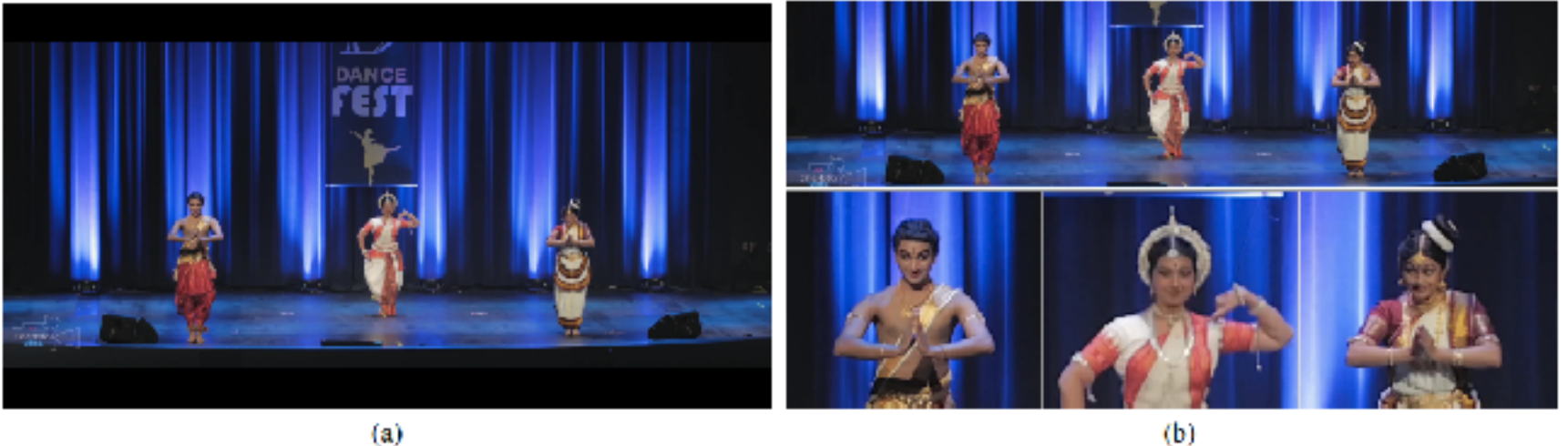


Generative prosodic model for character animation [Barbulescu et al. CGA 2017]

Zoom: Directing virtual cameras

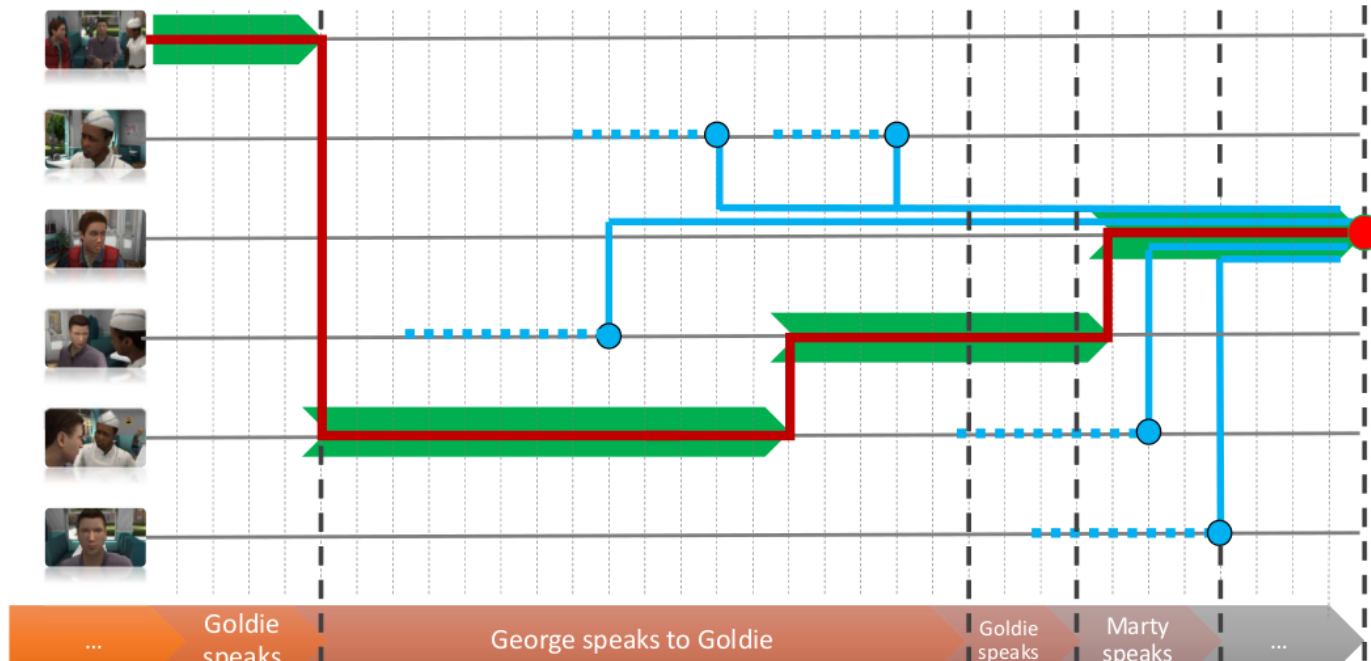


Narrative-driven cameras for cinematic replay [Galvane et al. MIG'2014]



Zooming On All Actors: Automatic Focus+Context Split Screen Video Generation [Kumar et al. Eurographics 2017]

Zoom: Automatic film editing



Continuity editing for 3D animation [Galvane et al, AAAI 2015]

Assessment and perspectives

- Common methodology applied to all topics
- Generalized sketching and sculpting metaphors
- Space-time geometry a common theme
- 20 PhD theses, 40 journals, 40 conferences
- New research challenges: creating story worlds
- A much smaller team



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