



Ontology-based annotation of narrative segments

The CADMOS project

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Narratives in today's media

“Let's crunch some hypothetical numbers.
Take a media-aware person of, say, 30 years of age.
Call him Ollie Overwhelmed.

When **Ollie's great-grandfather** was 30 he had perhaps seen **2,500** hours of audio-visual narrative (plot).
His **grandfather**, age 30, had seen about **10,000** hours.
His **father** had seen **20,000** hours.
Ollie in 2009, age 30, has seen approximately **35,000** hours of audio-visual narrative.

These are not hard numbers. I've read no polling to this effect.
But this seems about right. That's 35,000 hours of plot.”

Paul Schrader, “Beyond the silver screen”
[The Guardian, Friday 19 June 2009](#)

Character-based Annotation of Dramatic Media Objects

- Aim: innovating the production flow of narrative audiovisuals by means of annotation
- Now: each production phase involves specific documents and is supported by specific media (and software)



- The semantic gap is generated *along* the pipeline

Production perspective

- Annotations are generated at production time, to propagate narrative information through the pipeline
- Applications:
 - Production optimization:
 - query the annotated story to get all the shots located in the same place/time, etc
 - Better products due to information sharing:
 - actors and staff know the role of a scene in the story
 - awareness of modications
 - computer assisted production to enforce continuity and avoid meaning gaps
 - Availability of annotated products after production time

Re-use perspective

- Annotated audiovisuals support search and retrieval
 - Task: find media objects with given narrative features
- Two scenarios
 - Media reuse
 - syndication, social media, etc.
 - aggregators
 - Cultural heritage exploitation
 - Content-based access to audiovisual archives for the general public
 - Analysis of narrative contents

New media perspective

- Adaptive and interactive media
- User-adaptive and interactive story generation:
 - Annotations are needed to generate narrative content according to user profile
 - To select suitable continuations given user's choices
- The same perspective can be applied to support off-line authoring
 - Receive suggestions
 - Test narrative products with target audience

PRESENTATION UNIT INF_004

<p>ACTING: A2 CAMERA: <LS, -90, RIGHT_POS, FIXED_CAMERA, NO_WEB> WORDS: The first owner of the Palace was the marchioness Beatrice Langosco di Stroppiana. The beautiful lady, widow of an earl, was very ... intimate ... with the duke Carlo Emanuele I ...</p>
<p>ACTING: C2 CAMERA: <LS, -90, CENTRE_POS, CENTRED_CAMERA, WEB> WORDS: So, she was his mistress ... and gave him three children ... illegitimate children of course, ... but this was normal at the time ... in fact, in 1583, the lady married the noble man from Brescia</p>
<p>ACTING: C4 CAMERA: <LS, 0, RIGHT_POS, FIXED_CAMERA, WEB> WORDS: Francesco Martinengo di Malpaga, and bore other five children, and was then beloved by the later duke Emanuele Filiberto for her services ...</p>
<p>ACTING: E1 CAMERA: <MS, 0, CENTRE_POS, FIXED_CAMERA, WEB> WORDS: For her services? (<i>red face</i>) ... well, it was a prize for this ... ehm ... love story ... or morganatic marriage ... well ... (<i>Carletto trips over a web wire; then stands up again and says</i>)</p>
<p>ACTING: F1 CAMERA: <CU, 0, CENTRE_POS, FIXED_CAMERA, WEB> WORDS: ... I'd like not to introduce an equivocal ...</p>

ANNOTATION TAGS for INF_004

COMMUNICATIVE FUNCTION	INFORMATIVE	
	topological	historical
TOPIC ONTOLOGY	Palazzo Chiablese	Beatrice Langosco Carlo Emanuele I
GIVEN/ NEW	given	new
	===	Beatrice Langosco
EDITING	start	end
	<LS, NO_WEB>	<CU, WEB>

ANNOTATION FOR ANIMATION PRODUCTION

ACTING: Code for action types
CAMERA: <shot_type, angle, orientation, camera, props>
WORDS: text and annotation for actor

ANNOTATIONS FOR NARRATIVE GENERATION

TOPIC: location and protagonist
GIVEN/NEW: discourse planning
EDITING: editing and continuity information



Models of narrative in computational systems

- Story generation vs story analysis
 - Story based models: mostly employed for story classification and analysis
 - Inspired by structuralist theories (Propp, Greimas)
 - Character based models: mostly employed by story generation
 - Inspired by agent theories (Bratman, Rao & Georgeff)
- Overcoming this dychotomy is a main challenge for annotation

Partners and funding

- 2 years
- 4 partners
 1. CIRMA, University of Turin (research partner)
 2. Show.it s.r.l. (software company)
 3. Lumiq Studios (media production, ME)
 4. La Fiorita Officina (media production, SE)

Cadmos Project structure

Computational framework							
	Annotation system						
			System engineering and annotation				
				Pilot production I (original production)			
					Pilot production II (archive)		
						Monitoring and evaluation	
M3	M6	M9	M12	M15	M18	M21	M24

Project structure

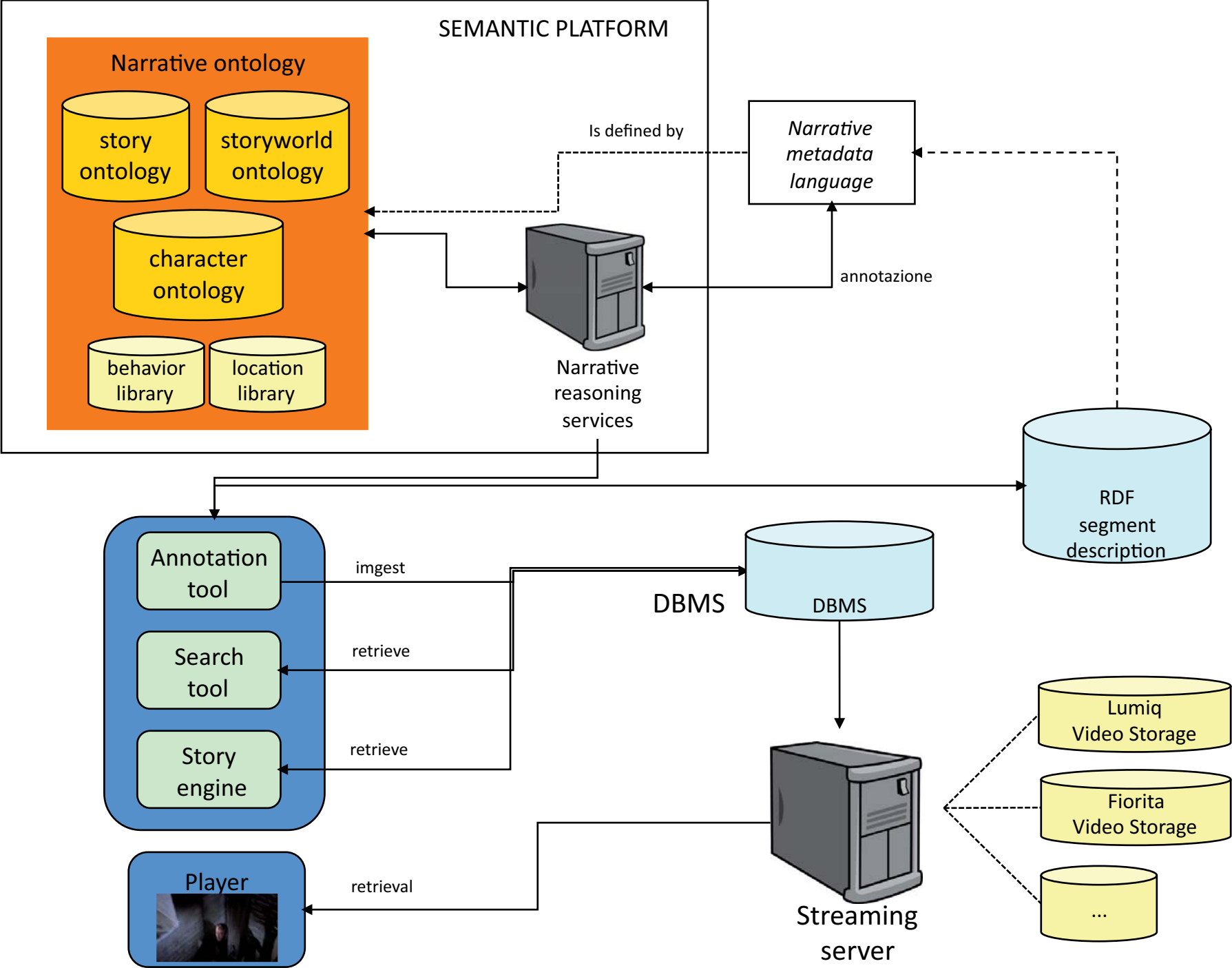
1. Computational framework
 1. Computational model of narrative
 2. Ontology of narrative
 3. Annotation schema
2. Annotation system
 1. Design
 2. Implementation
3. Software engineering and annotation
 1. Debugging and redesign
 2. Corpora annotation
4. Production pilot I: original production
5. Production pilot II: archive production
6. Evaluation

Expected results

- “Intelligent” tool for narrative annotation
- Annotation methodology
- Annotated corpora
 - Fiction films
 - Documentary films
- Impact evaluation on production

Perspective architecture

- At the end of the first year (september 2011) the project will deliver a semantic based tool for narrative annotation of media objects.
- Planned functionalities:
 - Assisted annotation: suggestions about suitable actions given character's properties / given action structure / time and location
 - Annotation validation given ontological definitions
 - Searching: searching for more specific / more general action types, character types, location types
 - Editing engine



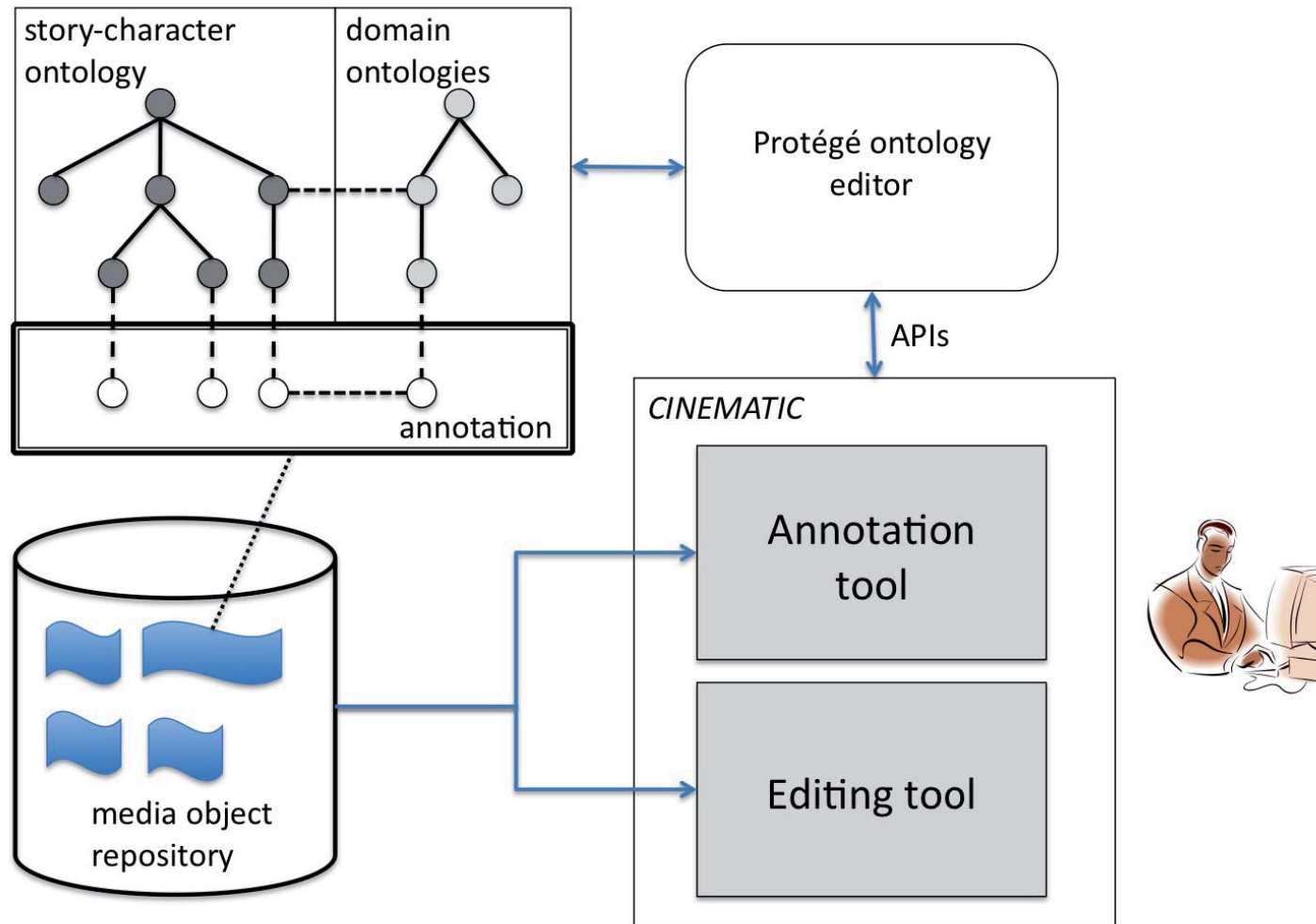
Current research: Cinematic

- Annotation and editing of media objects
- Embeds Protégé ontology editor
- Templates and ontology browsing
- Testing and experiments
- Limitations

Underlying model: assumptions

- Story can be recursively segmented into smaller segments, each segment being a DMO
- Characters are modeled as intentional agents according to the BDI paradigm
 - They are assigned emotions and moral values
- Causal links: DMOs are described as operators that modify the story world
 - They have preconditions and effects
 - Are related with medium-specific languages (e.g. editing)

Cinematic architecture

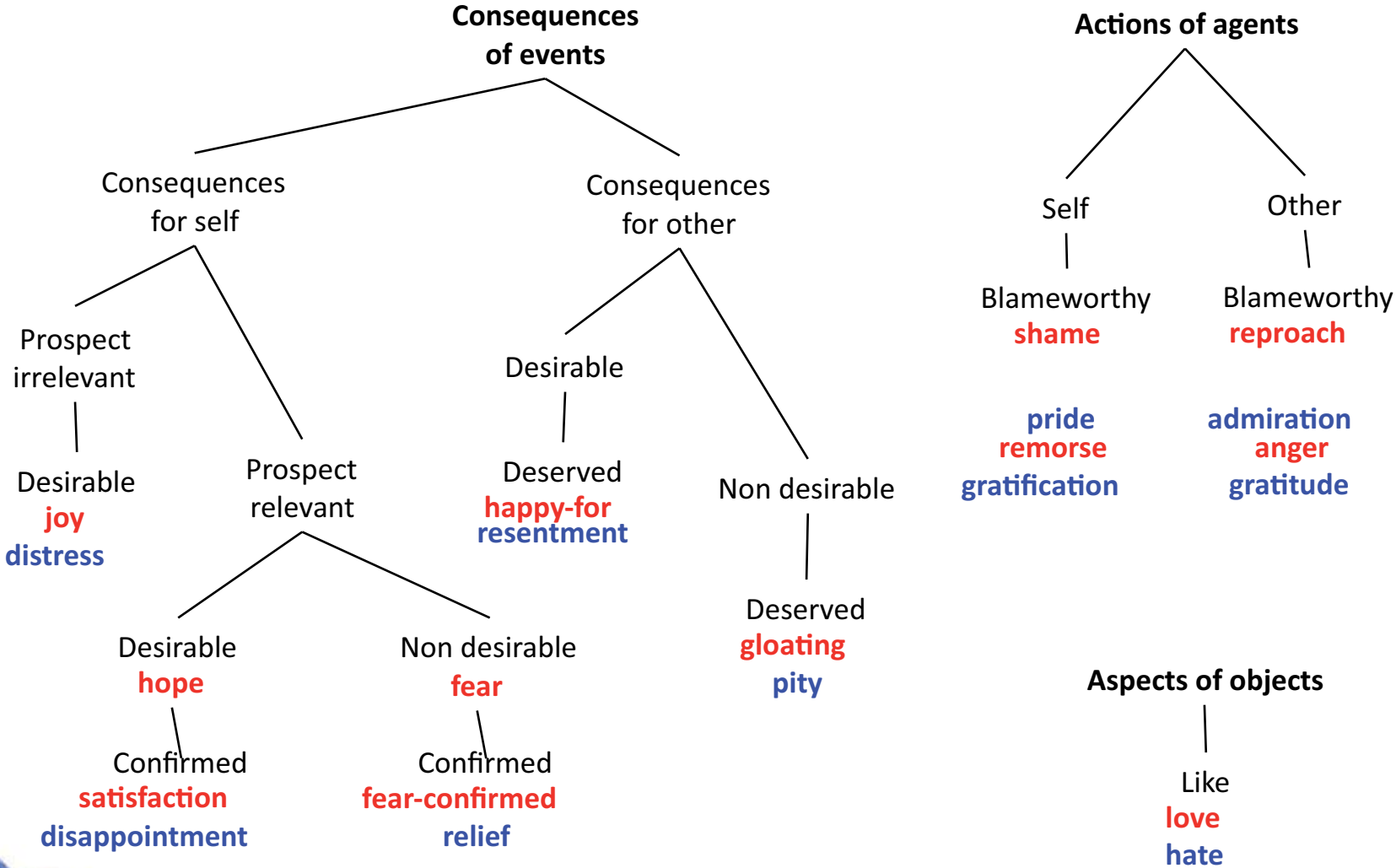


Narrative and domain ontologies

Cinematic relies on three ontologies

- Drammar ontology specifically encoded for Cinematic based on Damiano-etal (2005)
- IEEE SUMO/MILO Ontology for action and goal types
- OCC taxonomy of emotions

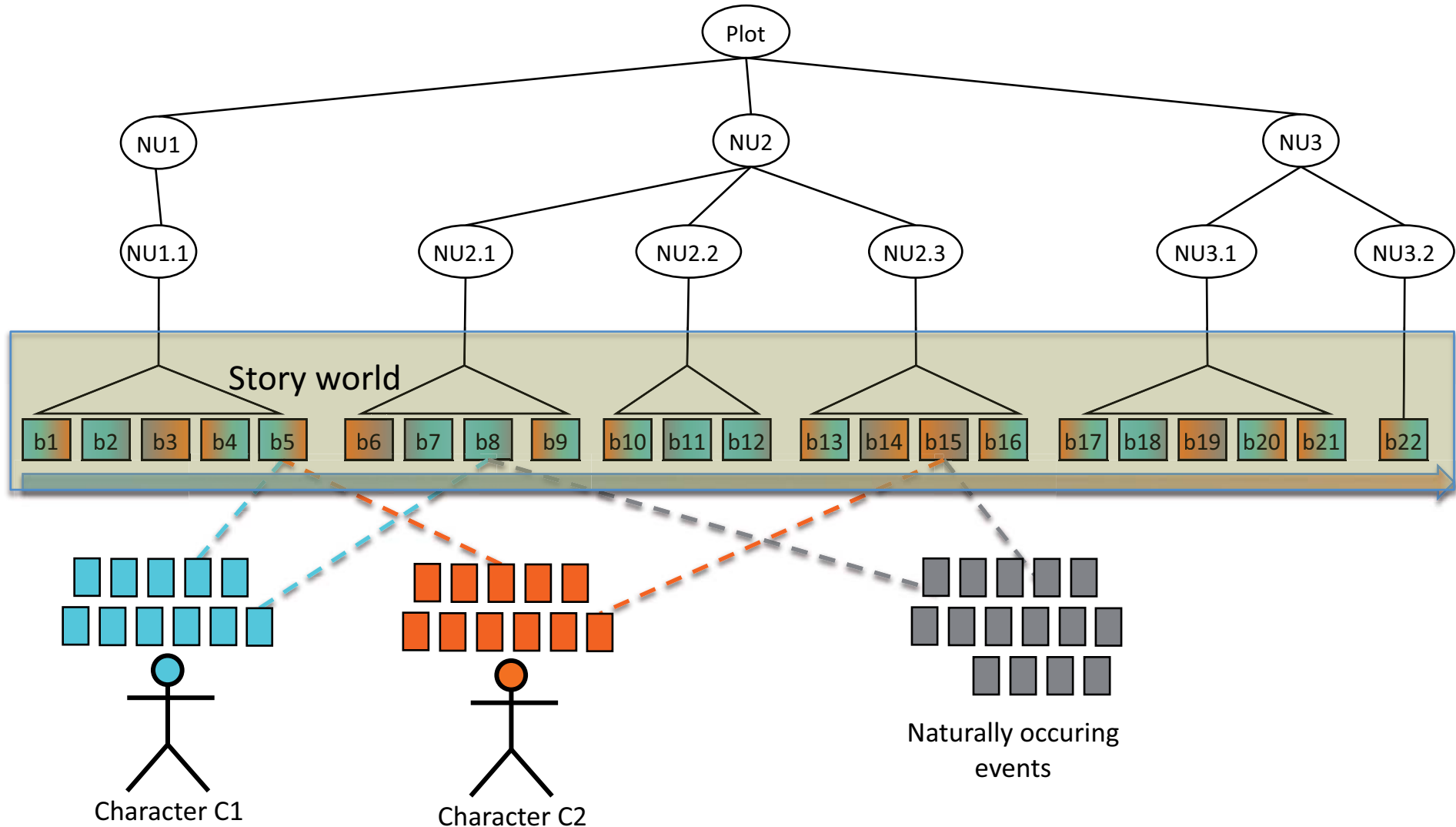
OCC Cognitive Model of Emotions



IEEE SUMO: the ontology of processes

- [-] **process**
 - [+] **dual object process**
 - [-] **intentional process**
 - [+] **intentional psychological process**
 - [+] **recreation or exercise**
 - [+] **organizational process**
 - [+] **guiding**
 - [+] **keeping**
 - **maintaining**
 - [+] **repairing**
 - [+] **poking**
 - [+] **content development**
 - [+] **making**
 - [+] **searching**
 - [-] **social interaction**
 - [+] **change of possession**
 - **pretending**
 - [+] **communication**
 - **cooperation**
 - **meeting**
 - [+] **contest**
 - **maneuver**
 - [+] **motion**

Two-fold perspective: story and characters



Beat DramaUnit

Beat annotation

Initial beat:

Beat data - Mike_beat1

Starter	Mike
Starter's goal	Mike gets Sulley on board
Starter's action	Mike invites Sulley on board
Starter's goal achieved	true
Opponent	Sulley
Opponent's goal	Sulley going back
Opponent's action	Sulley being skeptical
Opponent's goal achieved	false



Beat editing

Number of segments: 4

Beat identifier:

- Mike_beat1
- Mike_beat3
- M
- M

Validation

Valid sequence

Story world changes

Video material

- beat_21
- Mike_beat1**
- Mike_beat10
- Mike_beat11
- Mike_beat12
- Mike_beat13
- Mike_beat14

Pre-conditions

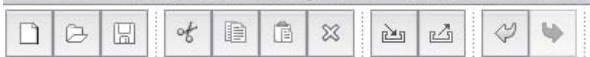
not(in(Mike, Mike_new_car))
 not(in(Sulley, Mike_new_car))
 not(in(Mike, engine))

Effects

in(Mike, Mike_new_car)
 in(Sulley, Mike_new_car)

Annotation schema

- Story Structure
 - Unit Id
 - Level
 - Children Units
 - Description
- Characters
 - Character_1
 - Character's properties (name, profession, age, appearance, scale of values, etc.)
 - Character's belief
 - Character's goal
 - Goal achievement
 - Character's action
 - Values at stake
 - Emotions
 - Character_n
- World state
 - Preconditions
 - Effects
 - Link to the media object



Classes Slots Forms Instances Queries

CLASS BROWSER

For Project: mike_new_car

Class Hierarchy

- :THING
- ▶ • :SYSTEM-CLASS
- ▼ • Entity
 - ▶ • Object (6)
 - ▶ • Process
 - DramaUnit (1)
 - Beat (14)
 - Extra
 - UnitaAlberoDecisionale (48)
 - risposteFinali (62)
 - risposteDomande (48)

INSTANCE BROWSER

For Class: Beat

- ◆ Mike_beat1
- ◆ Mike_beat10
- ◆ Mike_beat11
- ◆ Mike_beat12
- ◆ Mike_beat13
- ◆ Mike_beat14
- ◆ Mike_beat2
- ◆ Mike_beat3
- ◆ Mike_beat4
- ◆ Mike_beat5
- ◆ Mike_beat6
- ◆ Mike_beat7
- ◆ Mike_beat8
- ◆ Mike_beat9

Types

- Beat

INSTANCE EDITOR

For Instance: Mike_beat1 (instance of Beat)

Name

Mike_beat1

Iniziatore

◆ Mike

GoalIniziatore

◆ Getting_on_board589

AzioneIniziatore

◆ Inviting634

GoalAttainedIniziatore

Oppositore

◆ Sulley

GoalOppositore

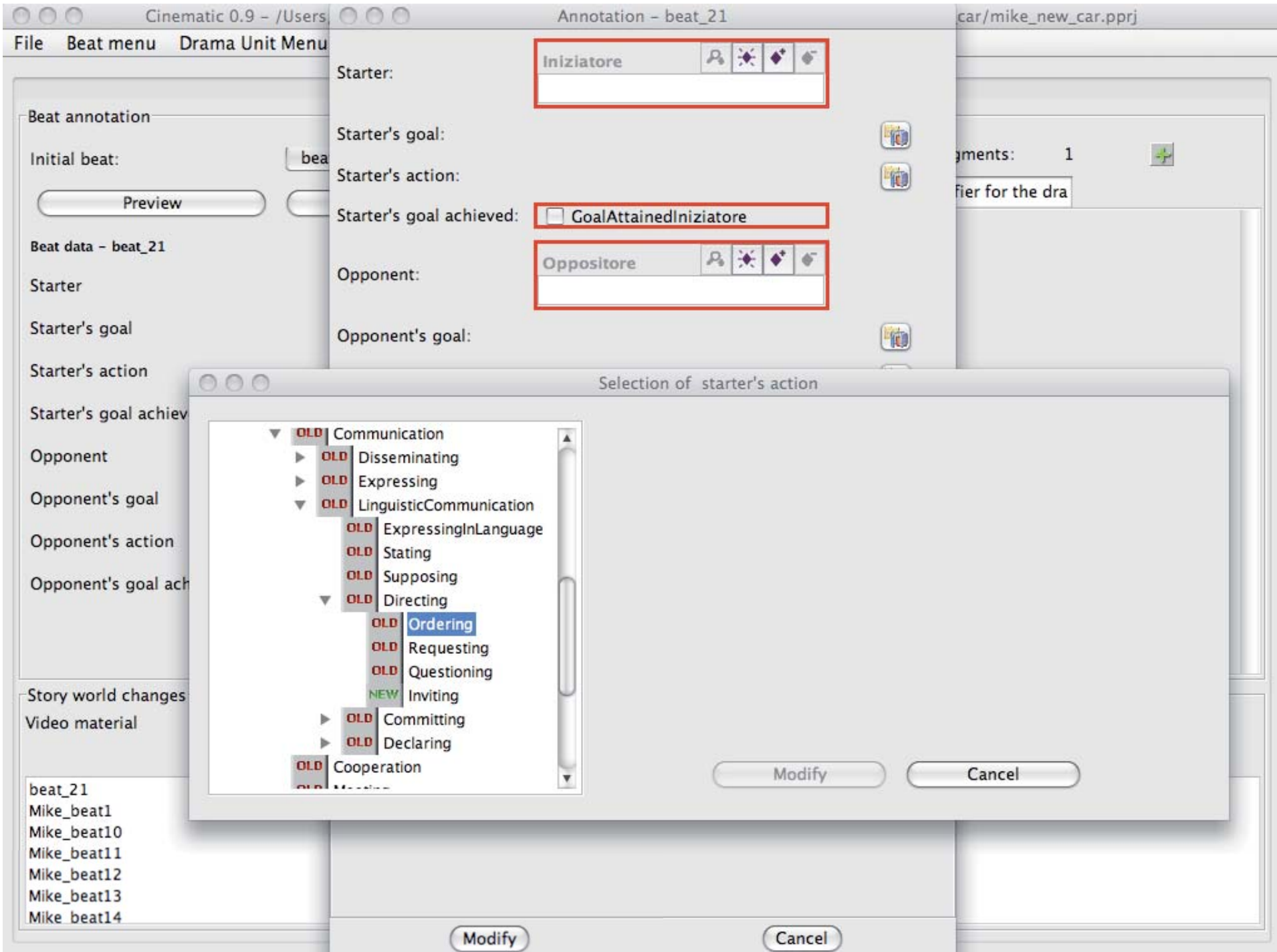
◆ Going_back131

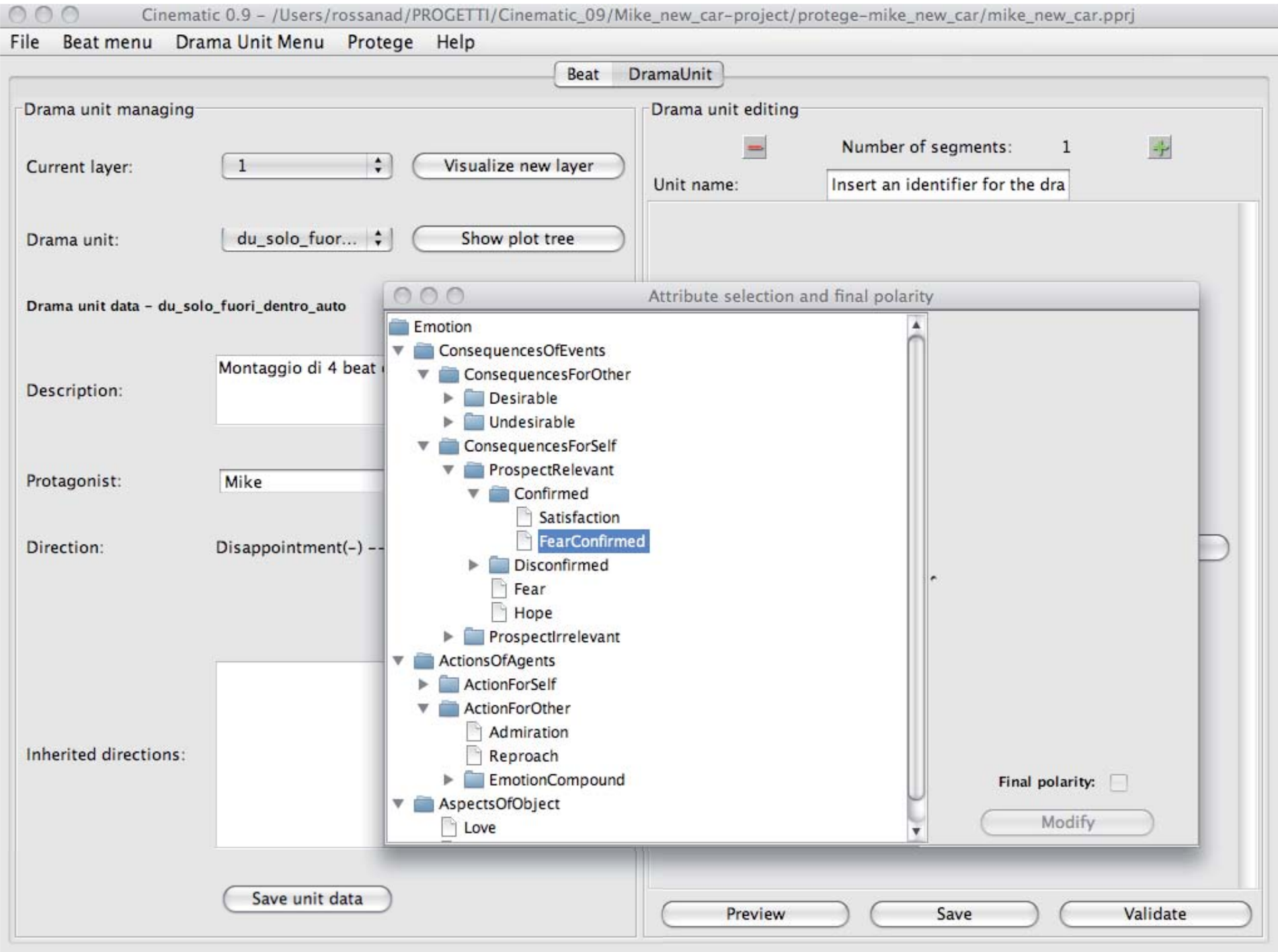
ReazioneOppositore

◆ Being_skeptical285

GoalAttainedOppositore

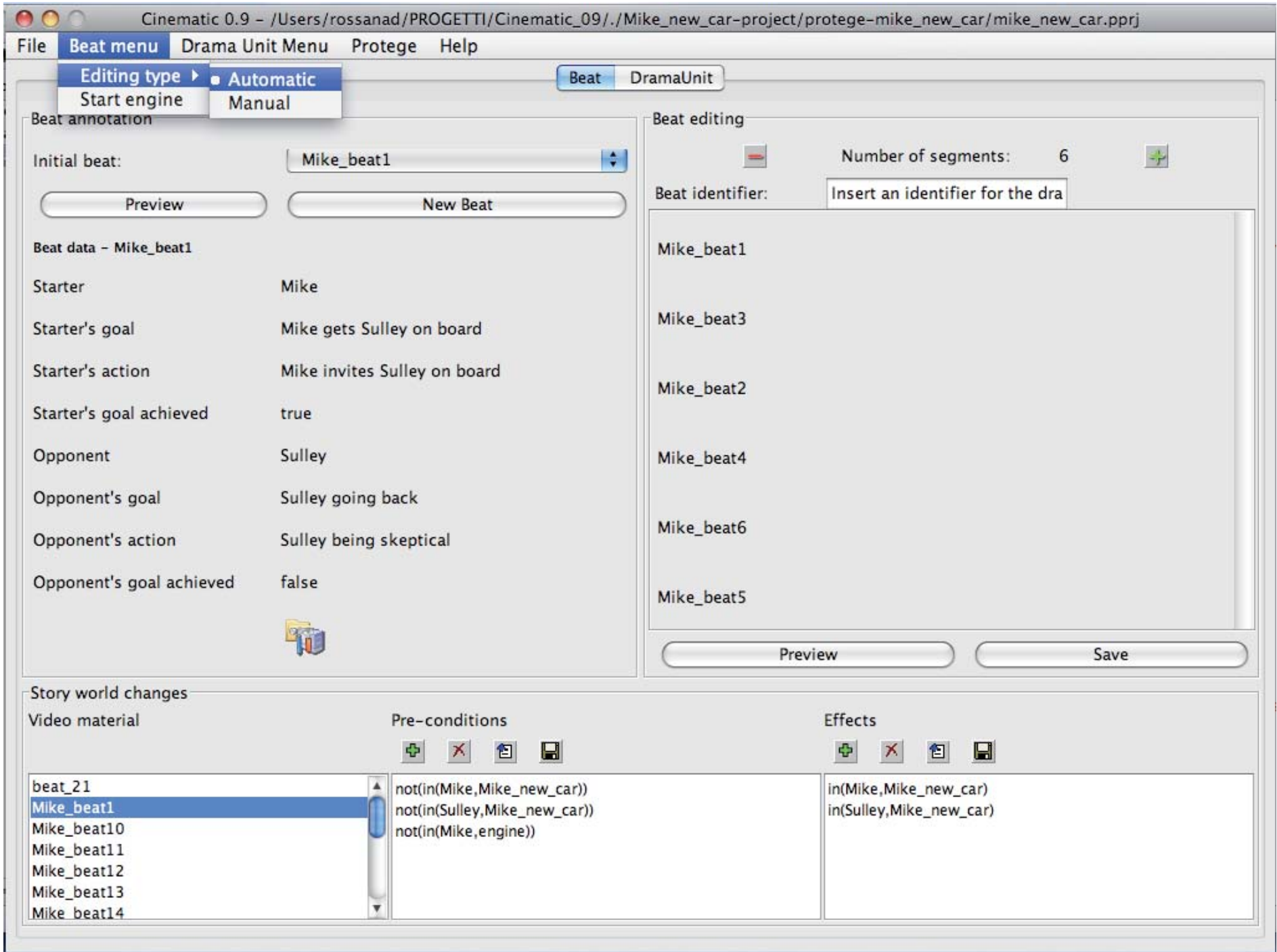
```
<rdf:Description rdf:about="#Mike_beat2">
  <rdf:type rdf:resource="#Beat"/>
  <goalIniziatore rdf:resource="#StartEngine622"/>
  <oppositore rdf:resource="#Sulley"/>
  <azioneIniziatore rdf:resource="#Searching389"/>
  <reazioneOppositore rdf:resource="#Game811"/>
  <link rdf:datatype="http://www.w3.org/2001/XMLSchema#string">/Users/rossanad/PROGETTI/Cinematic_09/
    Mike_new_car-project/Mike_new_car-beats/Beat02_Cinepak.avi</link>
  <precondizioni rdf:datatype="http://www.w3.org/2001/XMLSchema#string">
    in(Mike,Mike_new_car)
    in(Sulley,Mike_new_car)
    not(in(Mike,engine))
  </precondizioni>
  <iniziatore rdf:resource="#Mike"/>
  <goalOppositore rdf:resource="#FeelComfortable752"/>
  <goalAttainedOppositore rdf:datatype="http://www.w3.org/2001/XMLSchema#boolean">true</
    goalAttainedOppositore>
  <goalAttainedIniziatore rdf:datatype="http://www.w3.org/2001/XMLSchema#boolean">false</
    goalAttainedIniziatore>
</rdf:Description>
```







Story world dynamics and editing

- Describes characters' actions in a *Situation Calculus* perspective
- Preconditions: applicability conditions for a beat
- Effects: consequences of the beat
- Inspired by the notion of continuity (avoiding meaning gaps)
- Sequence valid if, for each segment, its Preconditions hold in the state of the world when it occurs



<p>World State in(M, C) in(S, C)</p> <p>M.I = introduce(M,C,S) S.I = please(S,M)</p> <p>Precond's of I.2 in(M, C) in(S, C)</p>	<p>I.2 Sulley explores the car, Mike checks the car</p>  <p>Sulley Goal: Be_comfortable(S) Action: Explore(S,C) Emotions: {Distress(S)} VaS: {relaxed_lifestyle}</p> <p>Mike Goal: Test_ok(C) Action: Check(C) Emotions: {Love(M,C)} VaS: {car_importance}</p>	<p>Effects of I.2 not (relaxed(S))</p> <p>World State in(M, C) in(S, C) not (relaxed(S))</p> <p>M.VaS={car_aspect(2)} S.VaS={relaxed_lifestyle (2)}</p> <p>M.I=introduce(M,C,S) S.I=please(S,M)</p> <p>Precond's of II.1 in(M, C) in(S, C) not (relaxed(S))</p>	<p>II.1 Mike starts engine, Sulley is waiting</p>  <p>Mike Goal: Start_engine(M) Action: Turn_key(M) Emotions: {Satisfaction(M)} VaS= {car_importance}</p> <p>Sulley Goal: not(Annoy(M)) Action: Stay_motionless Emotions: {Disappointment(S)} VaS: {relaxed_lifestyle}</p> <p>Car Goal: Rebel(C,M) Action: Buzz(C) Emotions: -- VaS= {quiet}</p>	<p>Effects of II.1 worried(M)</p> <p>World State in(M, C) in(S, C) not (relaxed(S)) worried(M)</p> <p>M.I=introduce(M,C,S) S.I=help(S,M)</p>
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Annotation Experiments

- Past experiments
 - Film analysis
 - Amleto Blob: same story, different films
 - Cross-media annotation (“Dune”: novel, film, videogame)
- We are currently conducting some preliminary experiments in annotation to solve open issues
 - Cinematic does not relate the story level with the characters’ level
 - More comprehensive annotation schema: mood, background/foreground, speech, sound, etc.

Amleto Blob

- Content aggregation from four
- 4 different realizations of Shakespeare's Hamlet for cinema,
 - 1948 Laurence Olivier's ``Hamlet" (A)
 - 1980 Rodney Bennet's ``Hamlet, Prince of Denmarck" (B)
 - 1990 Franco Zeffirelli's ``Hamlet" (C)
 - 2000 Campbell Scott's ``Hamlet" (D)
- The project focuses on an individual scene, the duel between Hamlet and Laertes (5th act, 2nd scene)
- The annotated scene consists of 13 numbered narrative units
- In all versions, the scenes realizes the Shakespearian text and features with only minor variations
- Units were numbered equally and received the same annotation in terms of pre-conditions and effects.
- By operating with random choices, Cinematic provides possible editings, so as to achieve an artistic effect.

Author-centred (or production-centred)

- In the writing practice, a story is split into units that represent story advancements
 - A screenplay is segmented into DMOs that are a partition of the whole story
- It should be possible to cut the film into segments that are *non overlapping* DMOs
- Less granular

Audience-centred perspective

- The audience perceives the story as characters' actions
 - Actions can be concluded or interrupted in a segment, goals can be achieved or not
- Independent from story advancements
- DMOs can overlap
- More granular



How can these two perspectives be reconciled?

- Bottom-up perspective
- Shot detection for basic DMOs
- Describe basic DMOs in terms of
 - Characters' actions
 - Preconditions and effects
- Gather adjacent DMOs into larger DMOs based on conditions on characters' intentional state
 - Goal achievement, goal failure, replanning, redeliberation