

Interactive Storytelling

“... it’s Planning, Jim, but not as we know it ...”

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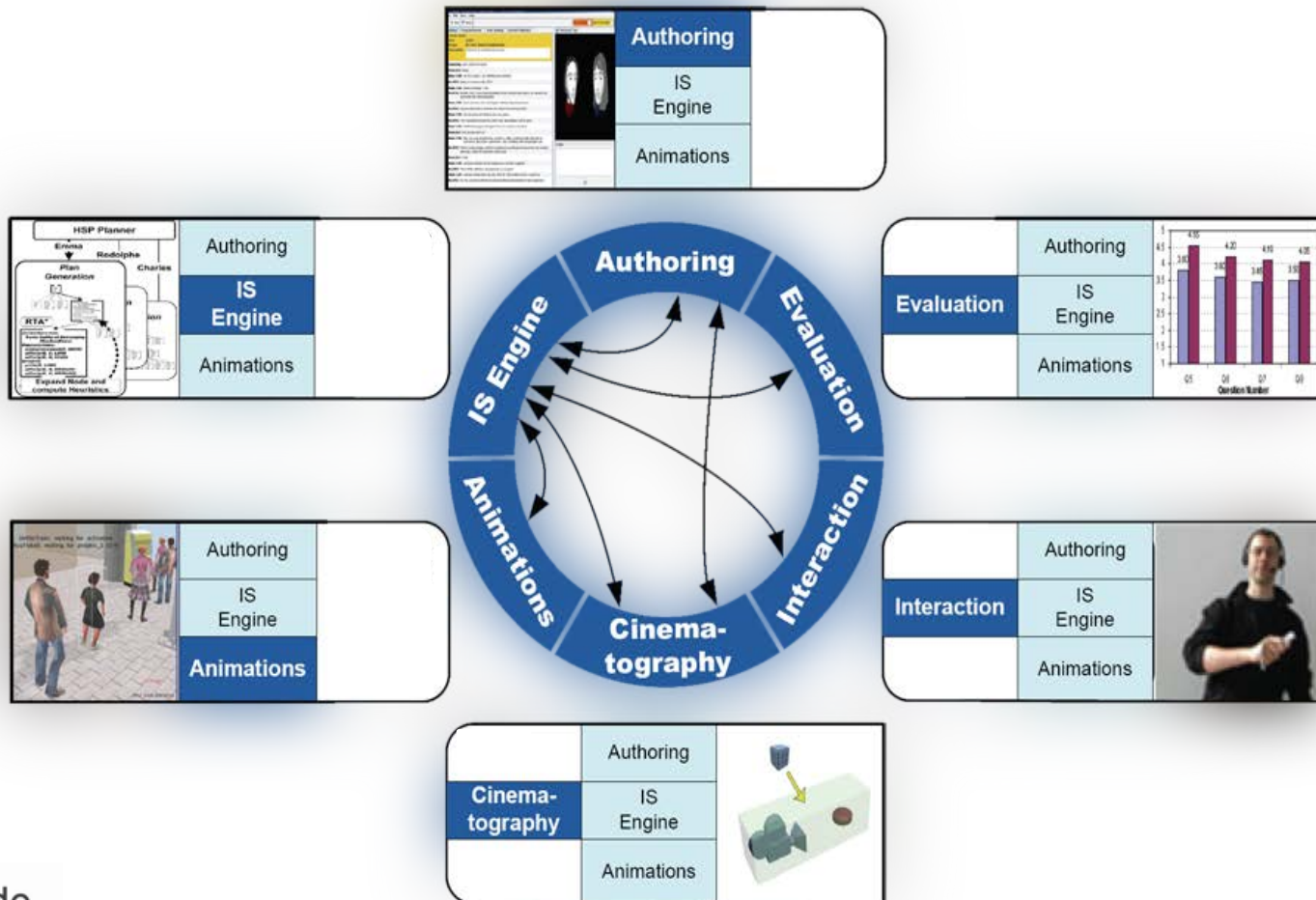


Planning and Interactive Storytelling

INTRODUCTION

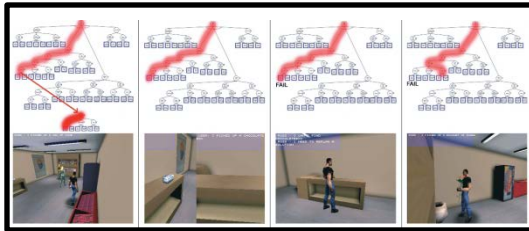
Interactive Storytelling

“... the endeavour to develop new media in which the presentation of a narrative, and its evolution, can be influenced, in real-time, by the user ...”

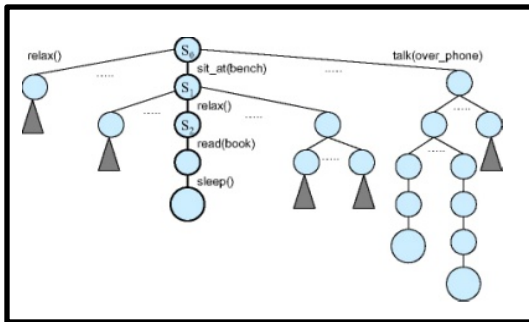


PLANNING AND IS: CONCEPTS

Background: Planning in IS



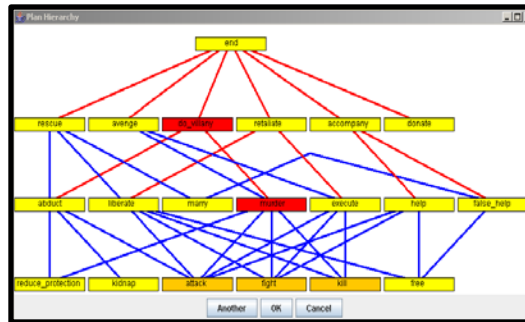
[Cavazza et al., 2002]



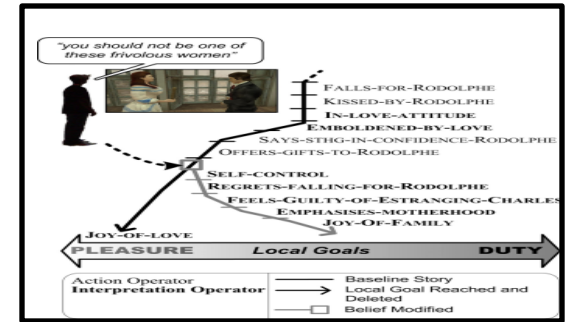
[Thawonmas et al., 2003]



[Barros & Musse, 2005]



[Karlsson et al., 2006]

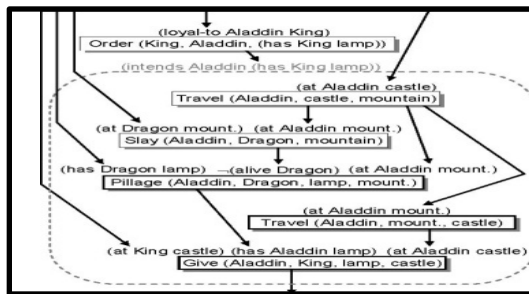


[Pizzi & Cavazza, 2007]

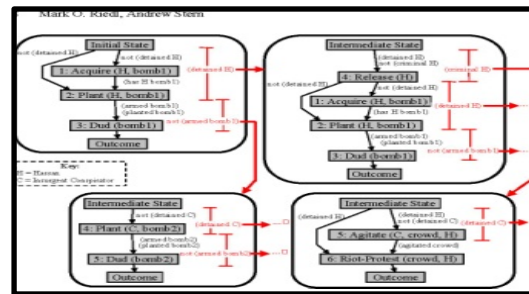
- 10+ years of use of Planning in (non-textual) IS since [Young, 2000]
- Planning is the dominant technology for implemented IS prototypes
- A considerable body of empirical knowledge on use of planning in IS
- Key issues: Representation, Control, Real-time Performance, Scalability

Key hypotheses

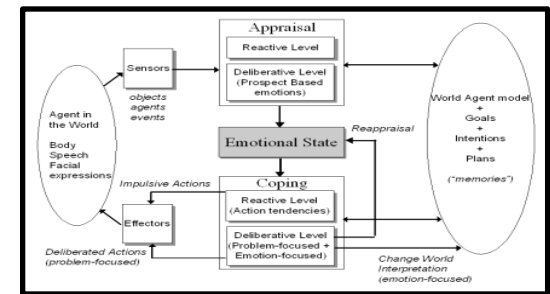
- Planning generates a sequence of narrative actions – neutral towards narrative theories, but embeds key principles of *causality* and (implicit) *temporal ordering*
- Planning starts with a baseline formalisation of a default plot (no *ad hoc* choice points) based on narrative actions and their semantics
- Generativity supports Interactivity (via real-time re-planning) and/or story variants



[Riedl & Young, 2003]



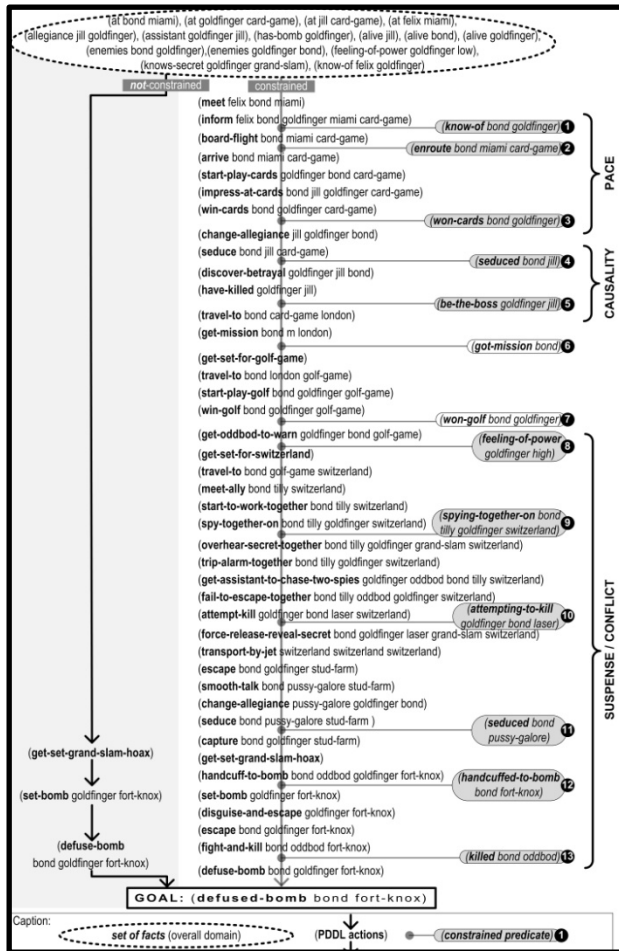
[Riedl & Stern, 2006]



[Aylett et al., 2006]

Representational Aspects

- Plot equates to the Plan e.g. bank robbery (but with genre limitations)
[Riedl, Saretto, Young, 2003]
 - Characters' Plans equate to Roles
[Cavazza et al., 2002] [Pizzi et al., 2007]
 - Plan is simply *representing* Plot (weakest assumption):
 - Optimality requirements for planning disappear
 - Other 'quality' criteria related to Plan 'trajectory', Plan dynamics, compatible with dramatic aspects (Aristotelian) or empirical descriptions (tension, suspense, pace)
- [Porteous & Cavazza, 2009]



[Porteous & Cavazza 2009]

Domain Modelling: Narrative Variant Approach

- Model default/baseline story
- Goal state: default story ending
 - different goals allow for different endings around baseline
- Narrative actions represented as a planning operators
- Determinants for variability:
 - User interaction e.g. Users can remove objects and invalidate pre-conditions forcing the story in different directions
 - Inclusion of new narrative actions that (even without interaction) allow for variation given different initial state, goal, and so on

Character and Plot Duality

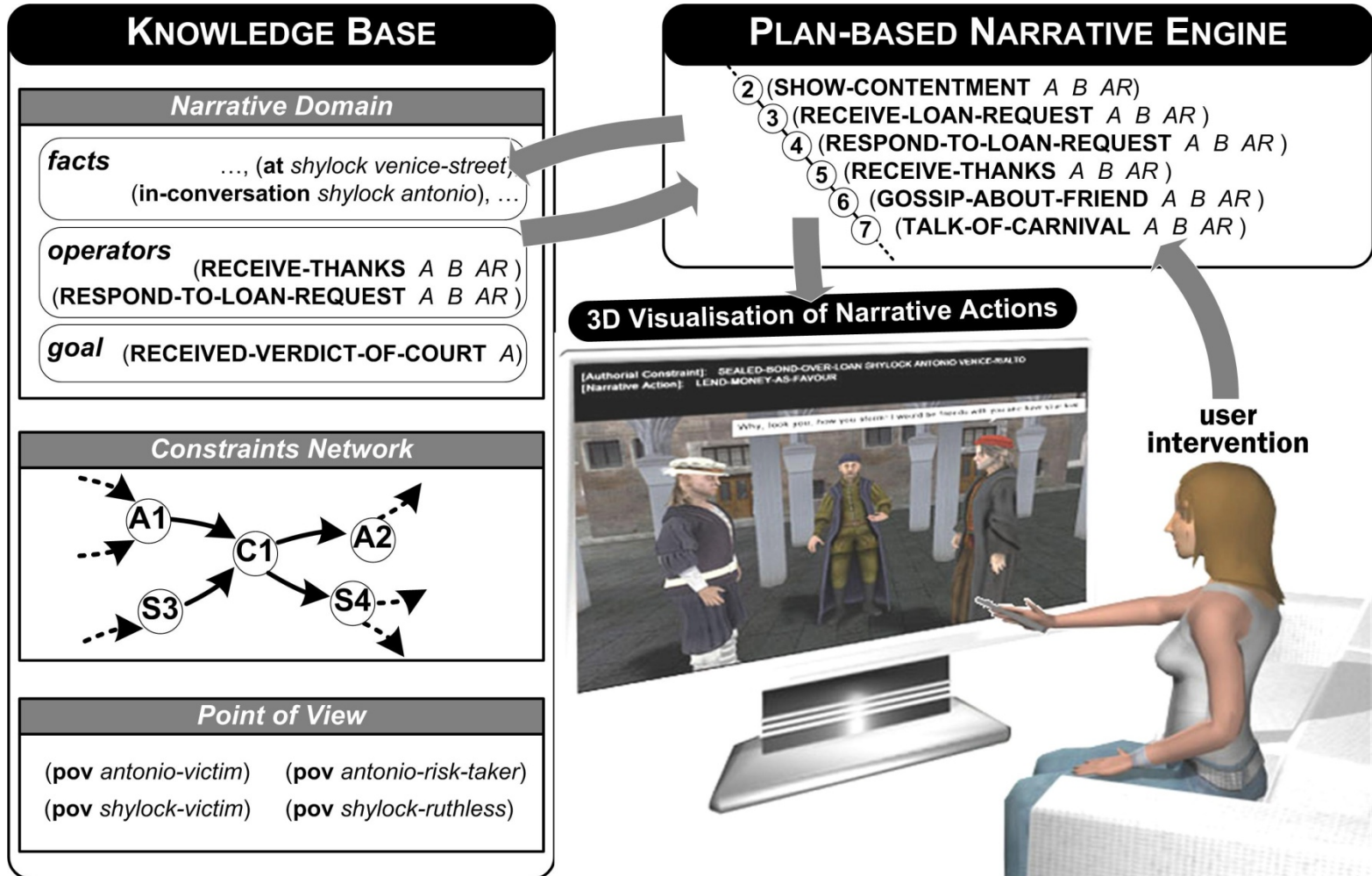
Character-based Approaches

- Individual characters are designed first
- Narrative generation mechanism controls them independently
- Strengths:
 - better representation of individual characters attributes
 - Increased generativity
 - Improved exploration of changes to cast, char roles etc
- At the expense of control
- Examples: [Cavazza et al, 2002], [Aylett et al, 2006], [Brenner, 2010]

Plot-based Approaches

- Narrative generation based on a model of the baseline plot itself
- Generate from plot perspective with narrative actions whose execution can involve multiple actors
- Strengths:
 - Assists with narrative control
- At the expense of reduced generative power
- Examples:
[Cavazza et al, 2009], [Riedl and Young, 2010], [Porteous et al, 2010]

The “Standard” IS System



Prototype IS Systems

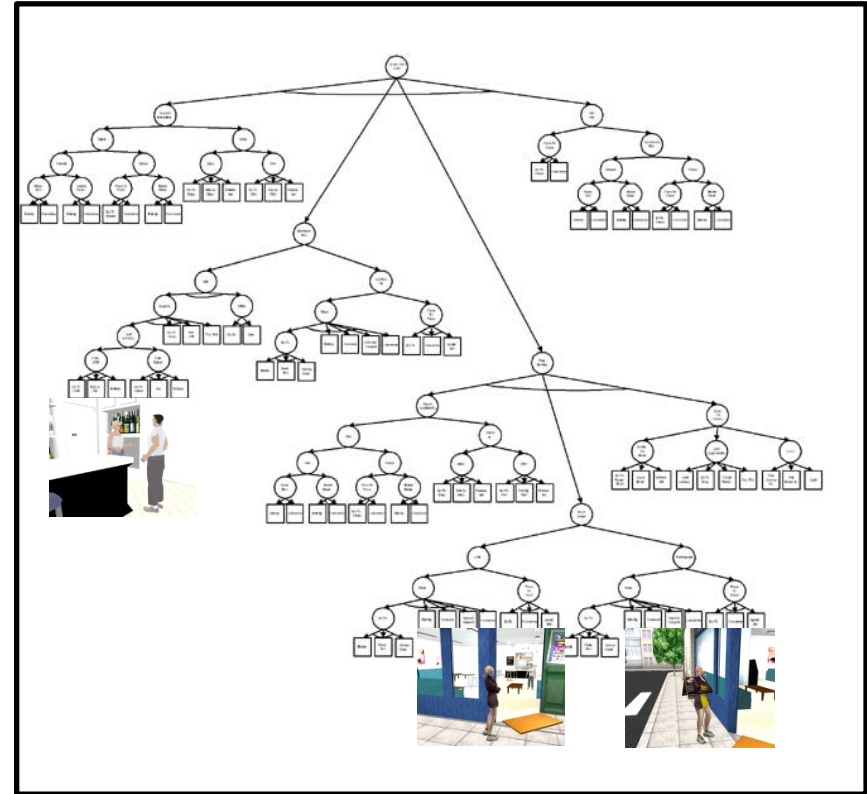
APPLYING PLANNING TO IS

Application I: Intent-based Planning

- [Riedl and Young, 2010] emphasised importance of:
 - Causal Progression of Plot
 - Character Believability = **intentional** agents
- Partial Order Causal Link Planning + Intention
 - Reason about both Author Goals and Character Goals
- Distinguish between
 - Fabula
 - the narrative itself
 - Sjuzet
 - The parts of the narrative that are presented to an audience
 - Can be generated from the fabula [Jhala, 2009], [Bae & Young, 2008], [Cheong & Young, 2008]

Application II: Hierarchical Planning

- Hierarchical Task Network (HTN) Planning [Nau et al., 2003]
- Well suited to knowledge-intensive domains such as IS
- Supports authoring of storyline through individual actors' roles and or plans
- Examples:
[Cavazza et al, 2002], [Hoang et al, 2005], [Kelly et al, 2007]



Application III: Constraint based Decomposition

Approach to Narrative Generation [Porteous & Cavazza '09], [Porteous et al '10]

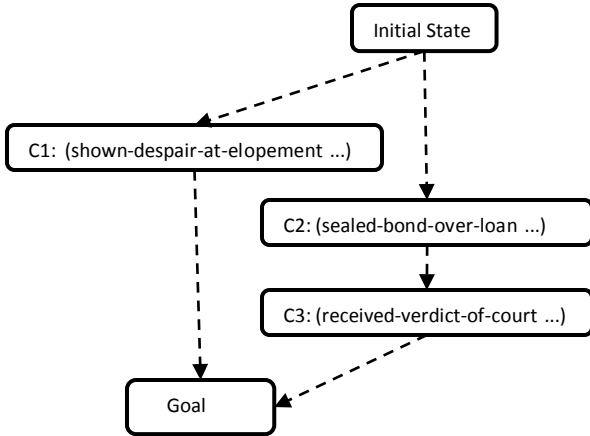
- Builds on ideas of Landmarks [Hoffmann, Porteous & Sebastia '04], planning with constraints and preferences [Gerevini & Long '05]
- Key mechanism: use authored constraints (key story facts) to decompose/structure narrative construction.

Visual Environment to showcase the approach:

- Inspired by Shakespeare's play "The Merchant of Venice"



Partial Order over constraints:



The control mechanism selects constraints, in order, from the constraints network with ties being broken arbitrarily.

In this example, the constraints are selected in the sequence C2 -> C1 -> C3. The narrative is built up incrementally starting with the narrative for C2, followed by the narrative for C1 and then C3. The narrative is completed with the narrative segment for the final goal.

Constraint: constraint

Order between Constraints: - - - - ->

Narrative Path: —————>

Initial state: (at shylock venice-rialto), ...

.....
 4: (RECEIVE-LOAN-REQUEST SHYLOCK BASSANIO VENICE-RIALTO)
 5: (MAKE-BUSINESS-DECISION SHYLOCK BASSANIO VENICE-RIALTO)
 6: (RESPOND-TO-LOAN-REQUEST SHYLOCK BASSANIO VENICE-RIALTO)
 7: (RECEIVE-DINNER-INVITATION SHYLOCK BASSANIO VENICE-RIALTO)
 8: (REFUSE-DINNER-INVITATION SHYLOCK BASSANIO VENICE-RIALTO)
 9: (RECEIVE-LOAN-REQUEST SHYLOCK ANTONIO VENICE-RIALTO)
 10: (EXPRESS-ANGER-AT-PERSECUTION SHYLOCK ANTONIO VENICE-RIALTO)
 11: (ASK-ABOUT-LENDING-WITH-INTEREST SHYLOCK ANTONIO VENICE-RIALTO)
 12: (RESPOND-TO-LOAN-REQUEST SHYLOCK ANTONIO VENICE-RIALTO)
 13: (LEND-MONEY-AS-FAVOUR SHYLOCK ANTONIO VENICE-RIALTO)

Narrative for C2

C2: (sealed-bond-over-loan shylock antonio)

.....
 19: (SHOW-DESPAIR-AT-ELOPEMENT SHYLOCK SHYLOCK-RESIDENCE)

Narrative for C1

C1: (shown-despair-at-elopement shylock)

....,
 29: (ASK-FOR-JUSTICE SHYLOCK DUKE COURTROOM)
 30: (SPEAK-OF-JUSTICE SHYLOCK ANTONIO DUKE COURTROOM)
 31: (SPEAK-OF-PERSECUTION SHYLOCK ANTONIO COURTROOM)
 32: (RECEIVE-MERCY-REQUEST SHYLOCK ANTONIO COURTROOM)
 33: (SHOW-MERCY SHYLOCK ANTONIO COURTROOM)
 34: (RECEIVE-VERDICT-MERCY SHYLOCK ANTONIO COURTROOM)

Narrative for C3

C3: (received-verdict-of-court shylock)

....,
 38: (SHOW-SADNESS-OVER-FAMILY SHYLOCK SHYLOCK-RESIDENCE), ...
 40: (END-OF-PLAY SHYLOCK)

Narrative for Goal

Goal: (end-of-play)



Current issues in IS

I: NARRATIVE TIME

Rationale: Narrative Time in IS

- Timing issues arise in IS but paradoxically no use of temporal planning in IS
- Without explicit temporal representation and reasoning certain narrative features are problematic:
 - agent deliberation
- We explored the use of temporal planning in narrative generation

Narrative Time in IS

- Problem of spatio-temporal synchronisation
 - if staged execution time is ignored during planning, problems may only be discovered when failure occurs as actions are visualised
- Output narratives include information that facilitate multiple possible ways of staging actions
 - Scheduled action start times and durations
- Some aspects of narrative can only be generated when using explicit temporal approach
 - e.g. process of deliberation

Current issues in IS

II: AUTHORIZING

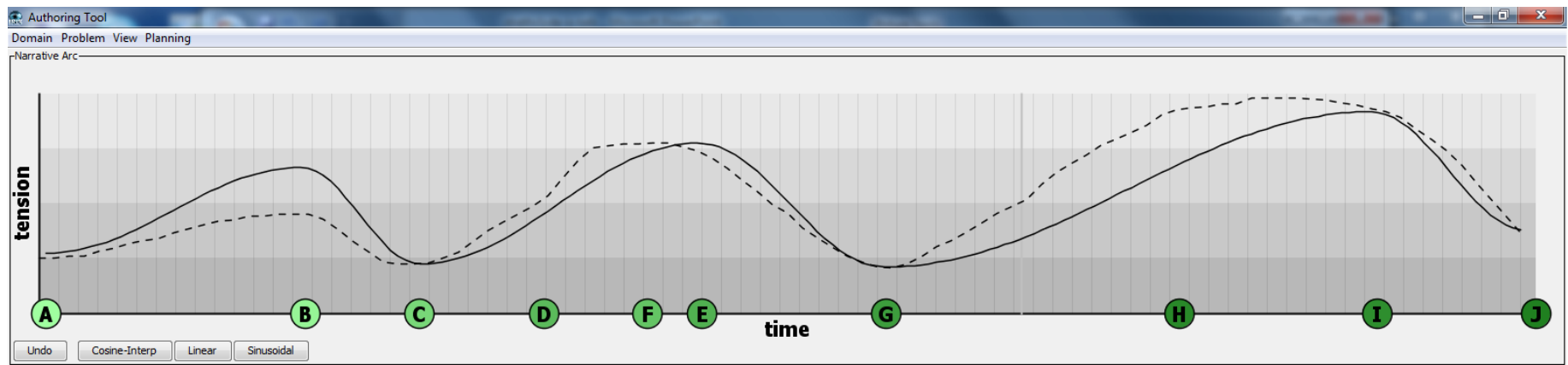
Authoring I: Generating Solution Storyboards

- Tool enabling exploration of game level solutions
- Use planning to produce game level solutions
- Application to Hitman Game
- Plan visualisation via dynamic generation of Storyboards
 - Universal, easy to understand and more expressive
- Evaluation
 - Possible to find new game level solutions



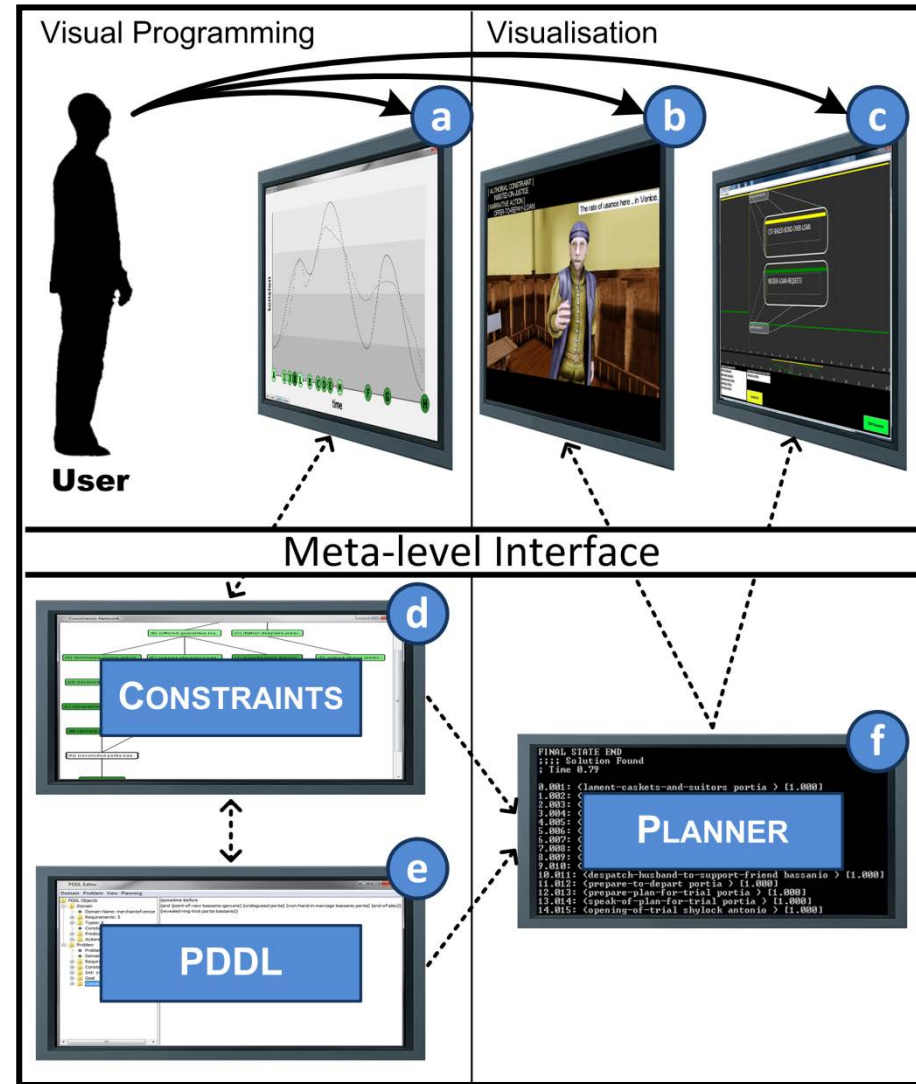
Authoring II: Visual Authoring of Plan Dynamics

- Aim: Authoring Story/Plan Dynamics
 - Aristotelian arc as control mechanism
- We translated that into:
 - authoring story dynamics rather than action formalisation
 - looked for technical approach to implement the idea



System Architecture

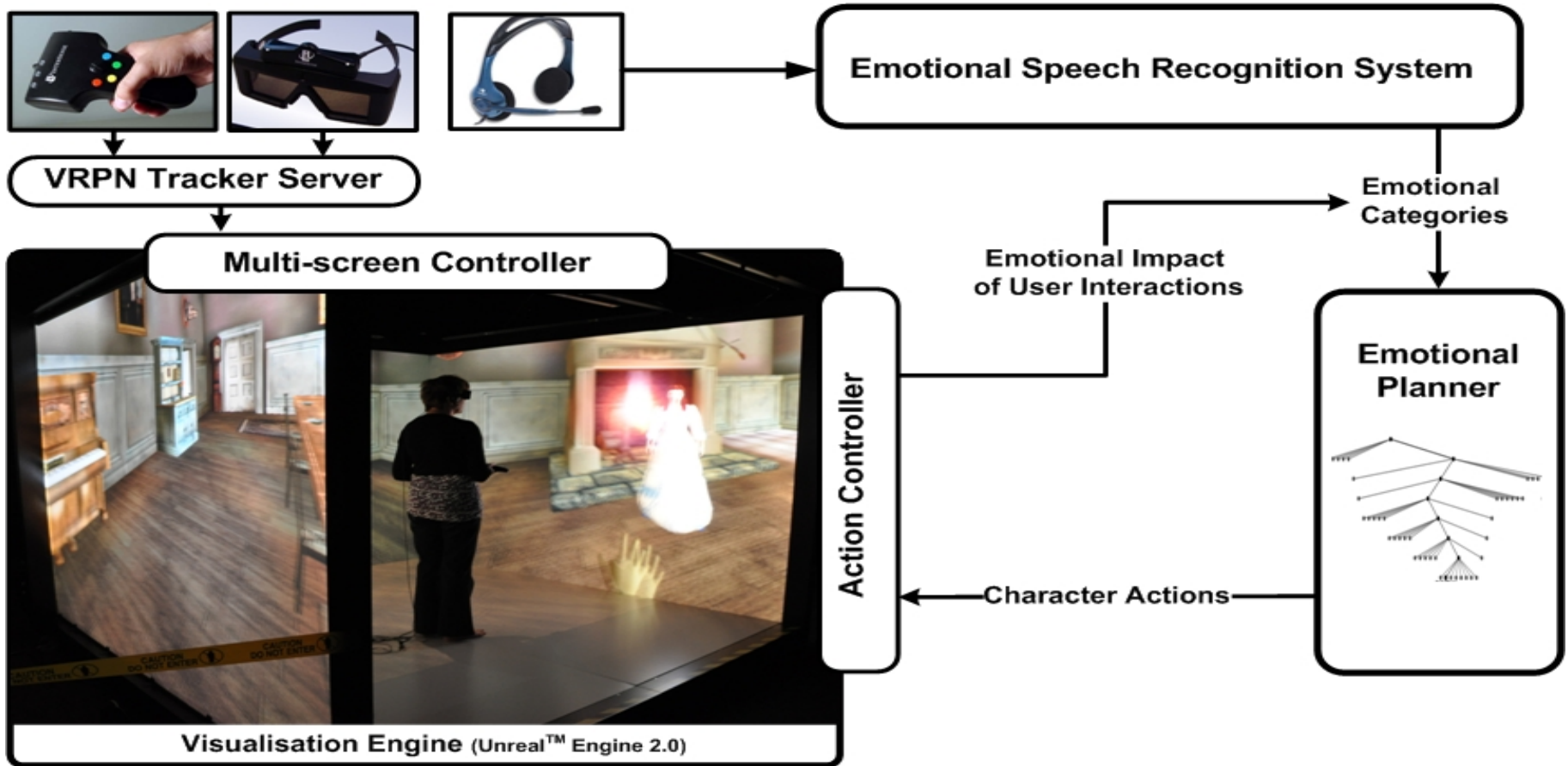
- User draws arc at meta-level **a**
- Can explore generated narratives via:
 - Animation Window **b**
 - Timeline Window **c**
- Hierarchically organised lower level components:
 - Constraints **d**
 - PDDL **e**
 - Planner **f**



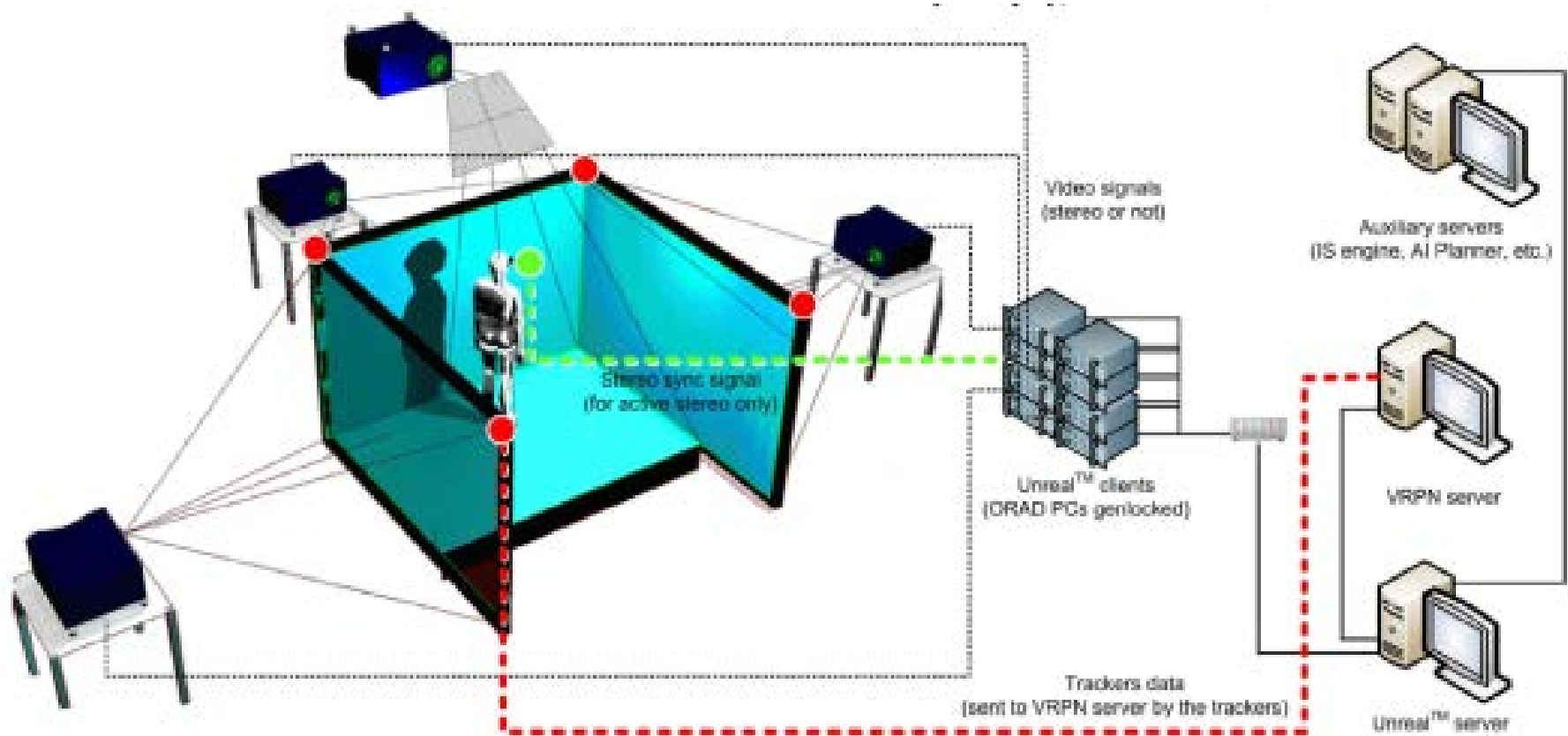
Can we build it? Is it fun?

EVALUATING IS SYSTEMS

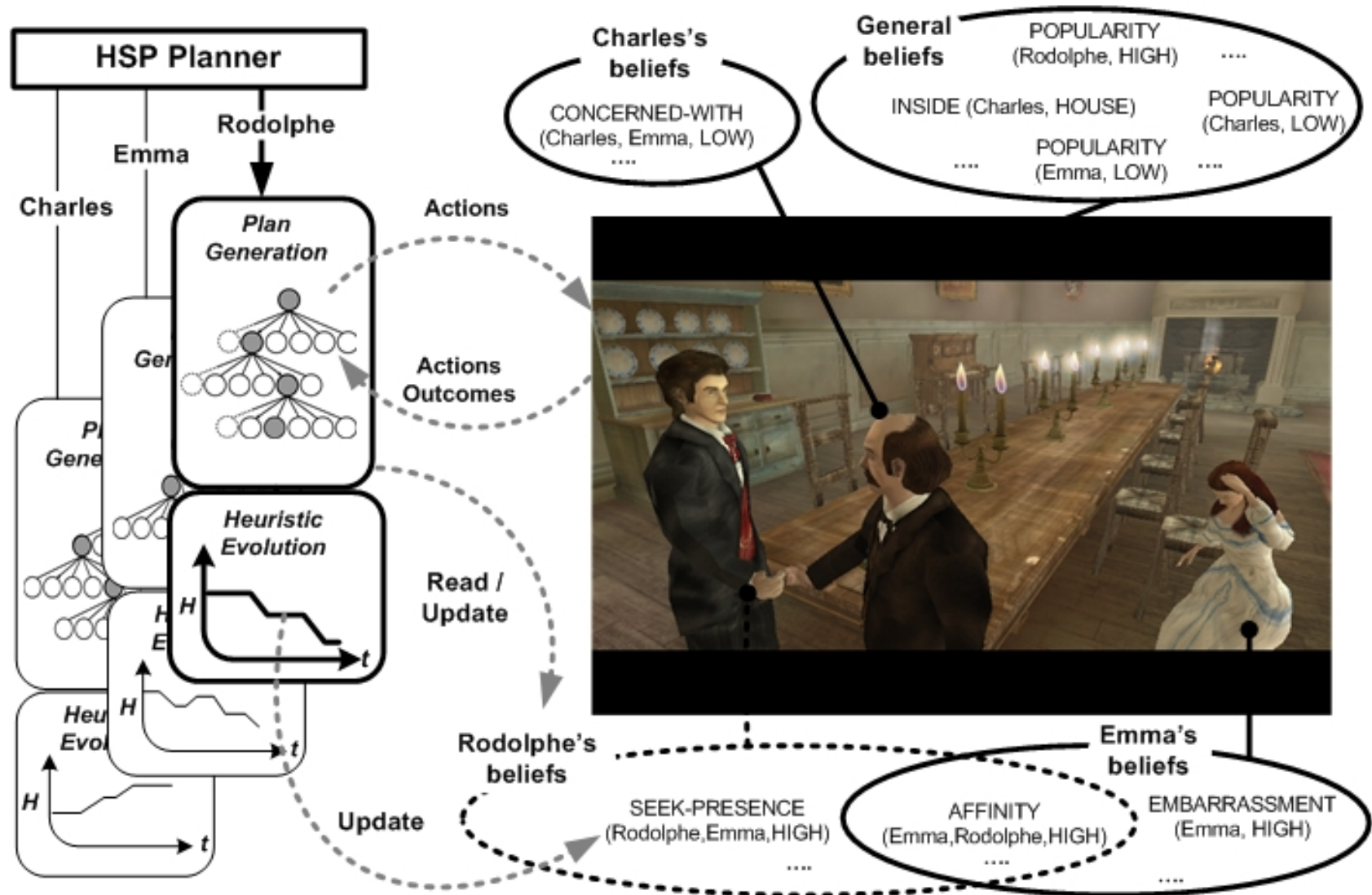
Immersive Interactive Storytelling



CaveUT™ Architecture



Interactive Storytelling





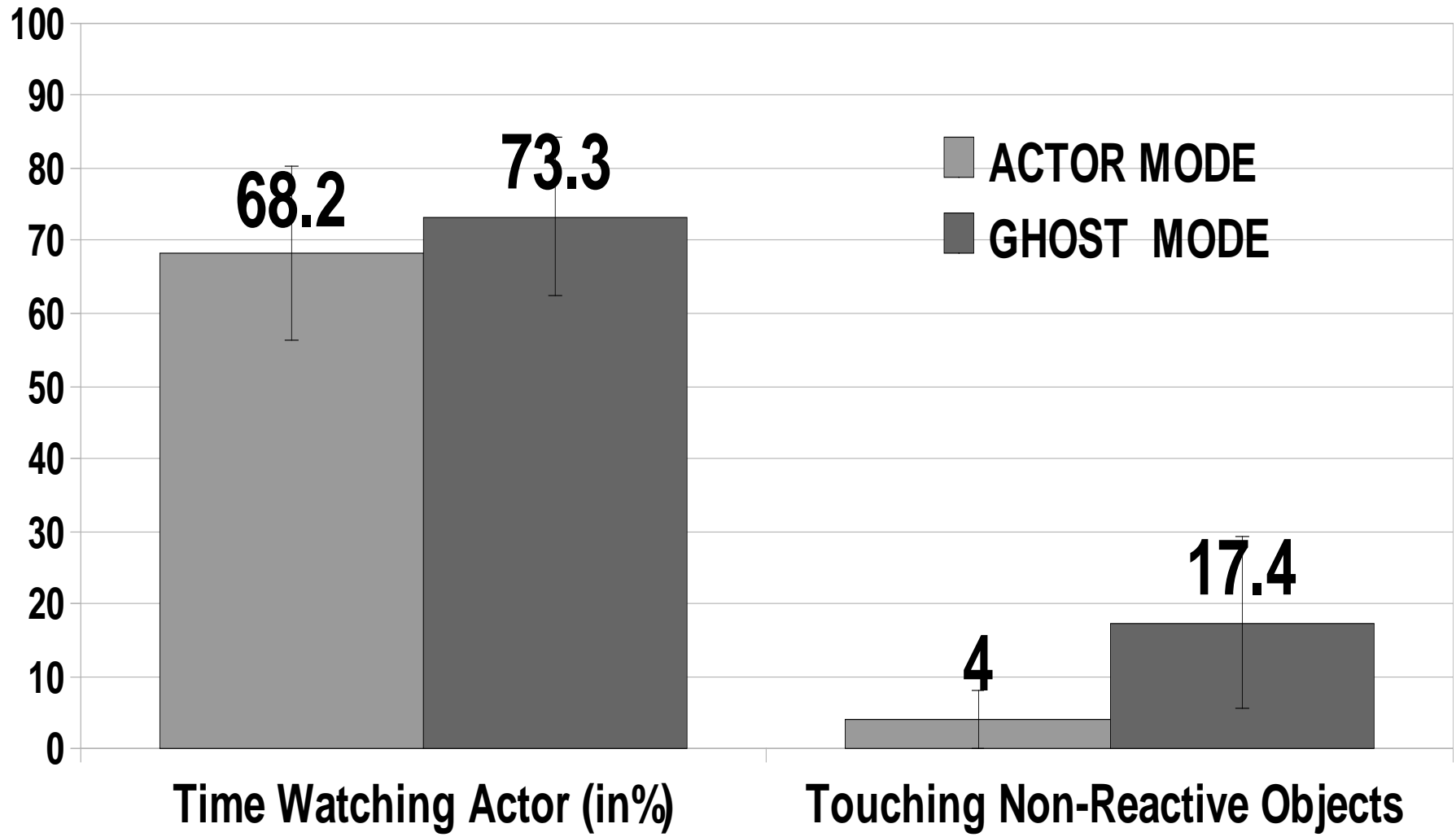
Interaction Paradigms

- Different Modes for user
 - Actor Mode: user plays role of Rodolphe
 - Ghost Mode: user is free to interact as they wish
- User Interaction:
 - Speech: Emotional Speech Recognition
 - Physical: User free to move objects in the world

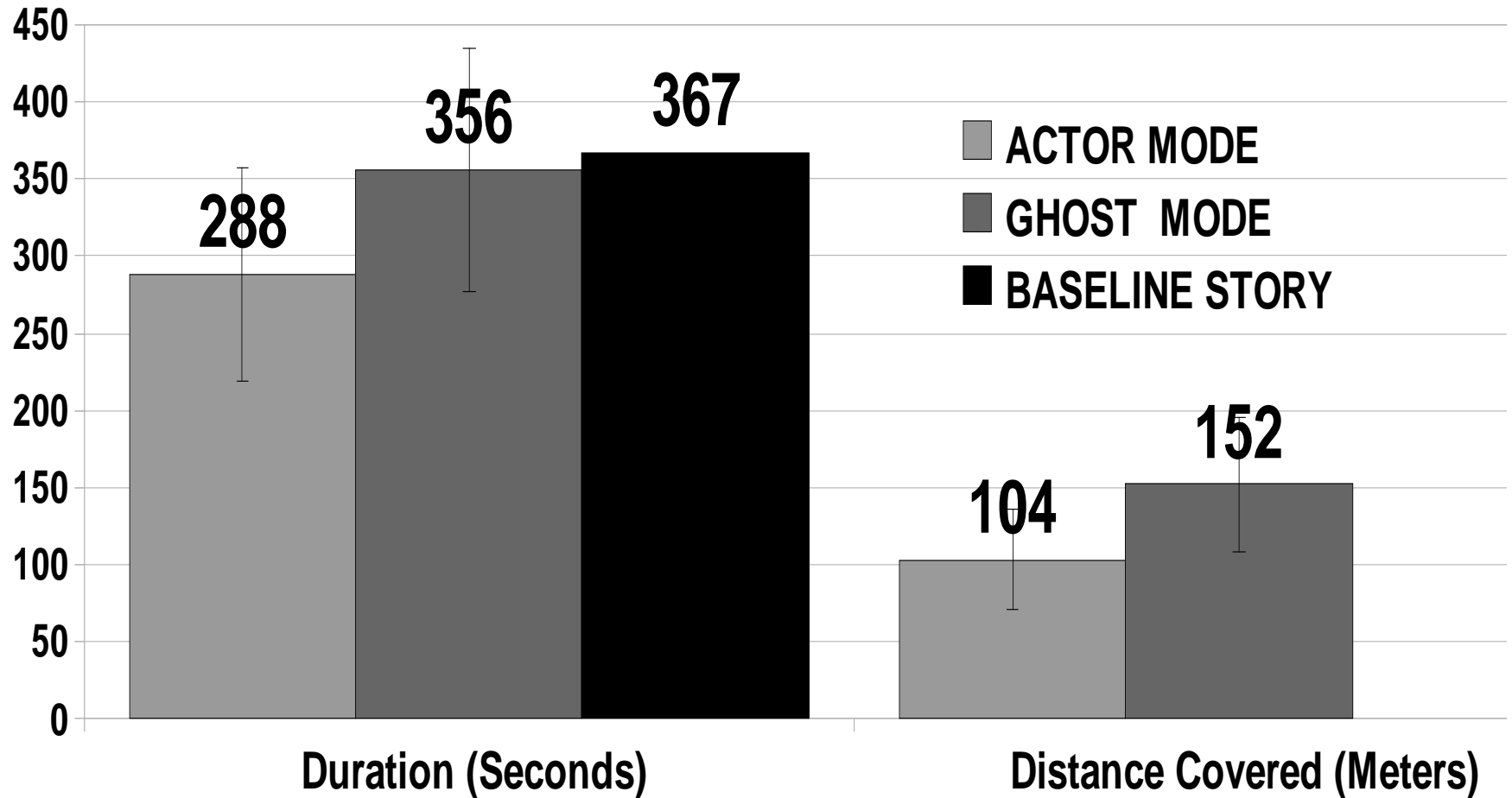
Experiments

- 38 subjects (20 males, 18 female)
- av. Age 30.6
- Session: av. 45 mn:
 - 10 briefing, 10 VR practice, 6 + 6 experiments, 15 questionnaires filling
- \$30 high street voucher
- NGA evaluation philosophy
- 1 casualty

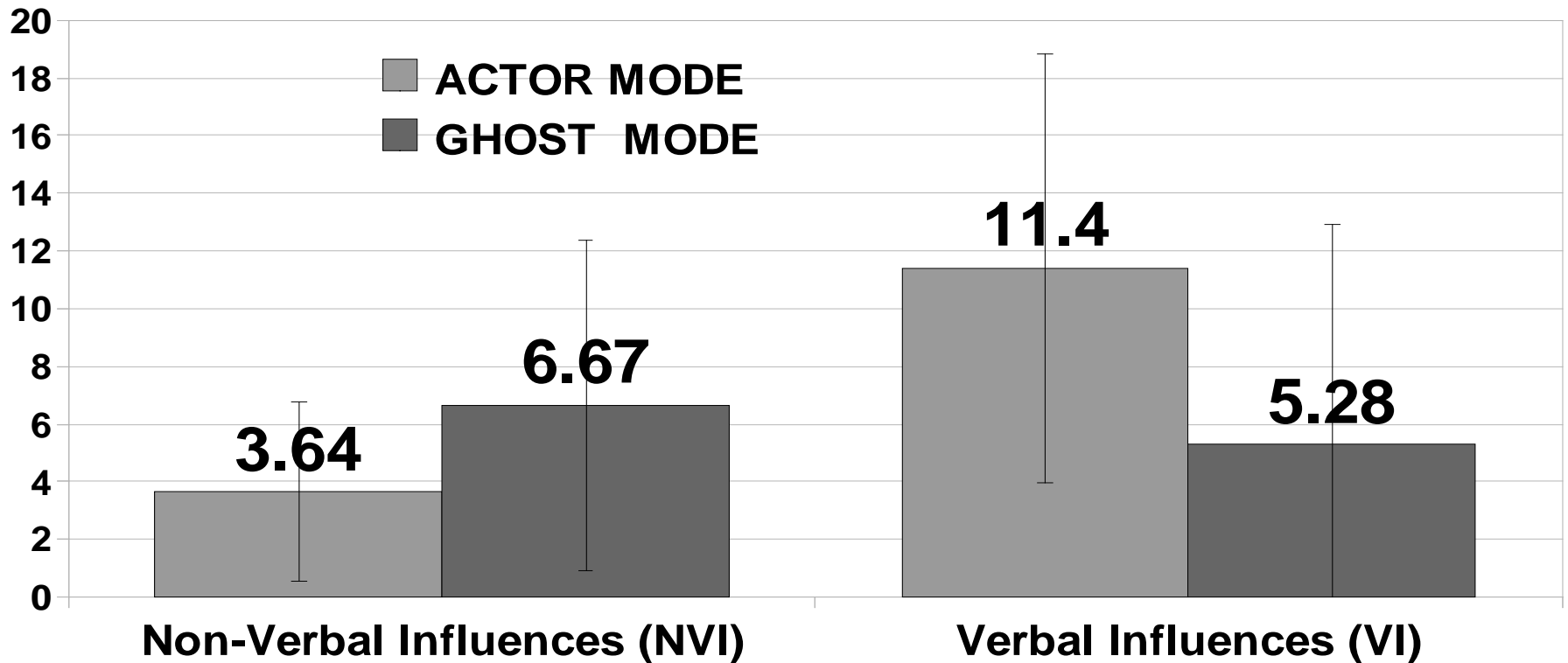
User Experience: what they do



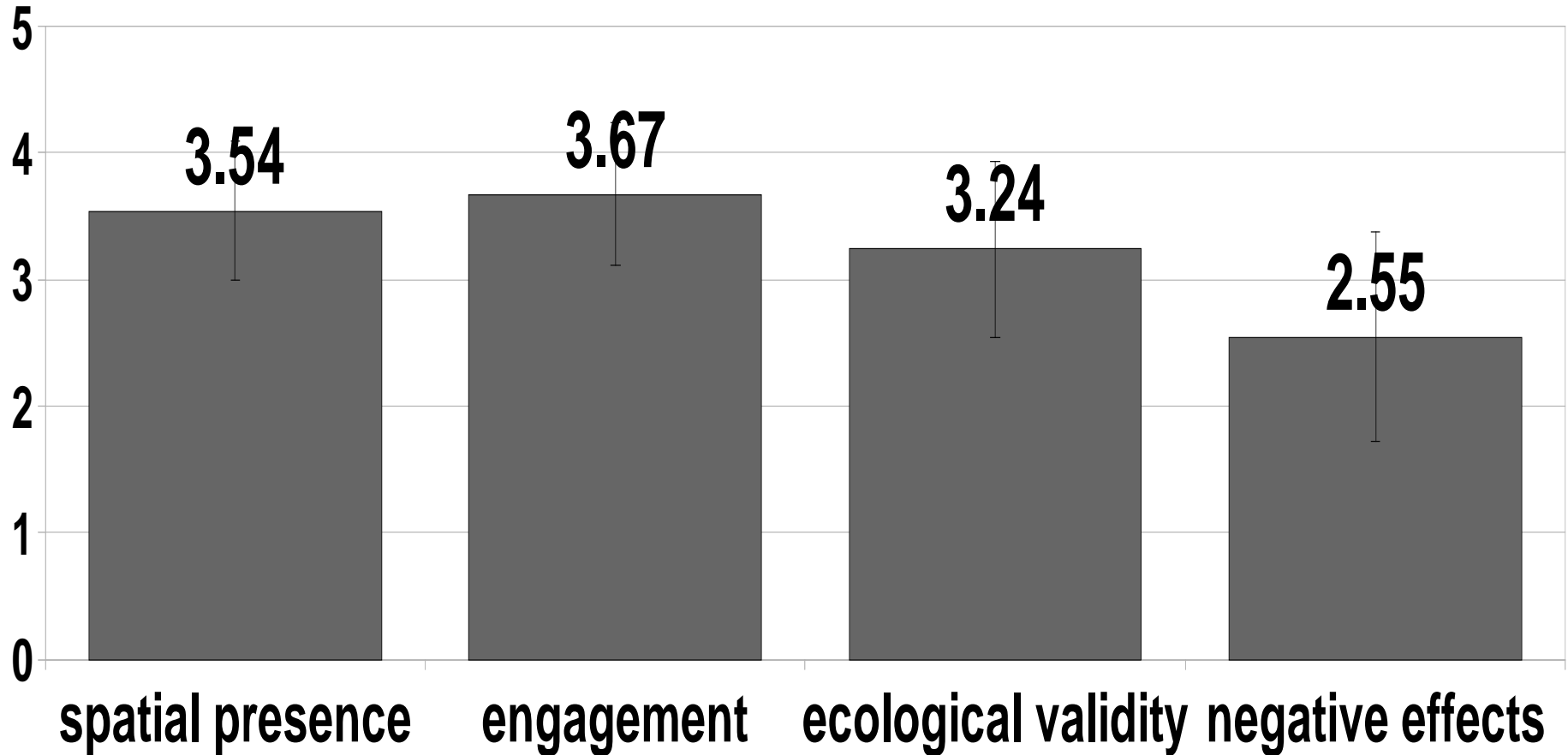
Navigating stage and story



User Interactions



User Experience (fun?)

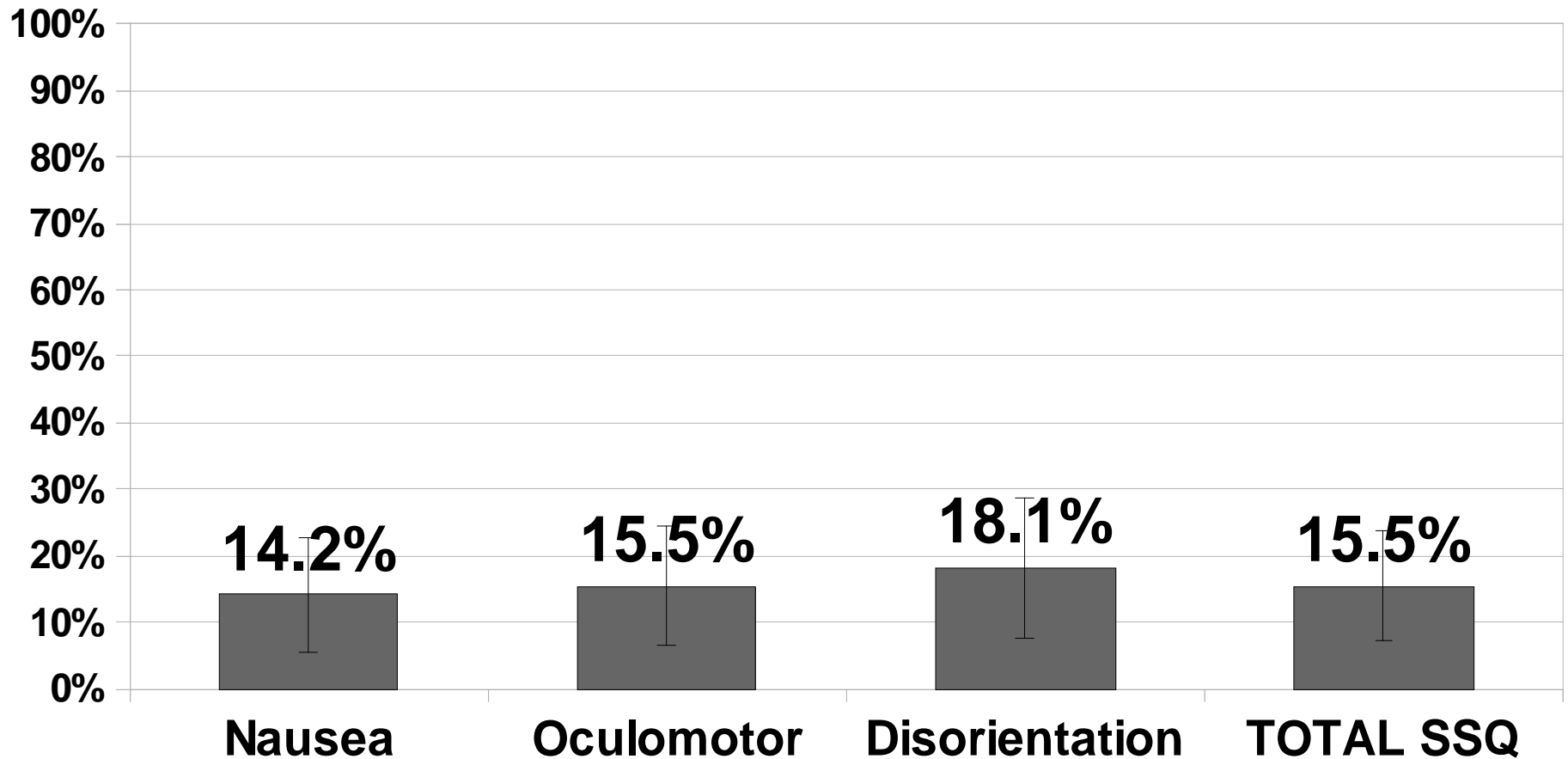


ITC/SOPI

User Comments

- 63.2% of users contributed written comments after the experiments - of these 44.7 % included explicit positive statement such as *"I enjoyed the experiment a lot", "I think the experiment was great", "... It definitely was an interesting experiment... , "Absolutely fantastic- could have done that all day. " "I felt that I could really interact with Emma, which made the experience really interesting and pleasurable", "I was able to 'steal' Emma's gift to Rodolphe, thus changing the outcome of the scene, I found it particularly enjoyable"*.
- Most of the 21% comments including negative aspects refer to disorientation, such as *"I felt a little disoriented turning around while moving forward."*
- Some comments also expressed certain preferences towards one particular interaction paradigm: *"I preferred the role of Rodolphe as I felt there was a definite purpose. As a ghost I didn't feel really involved", "I enjoyed the first part of the story where I took the role of a character as that made me more comfortable in the environment as I had a role"*.

Simulation Sickness ...



CONCLUSION

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