



## **Using Real Objects to Communicate with Virtual Characters**

**5th International Working Conference on Intelligent Virtual Agents**

**September 12-14, 2005 Kos, Greece**

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# Outline

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- Installation
- Creation
  - challenges
  - domain and context
  - event management
- Authoring
- Interaction Design
- Summary and Future Work





## Installation

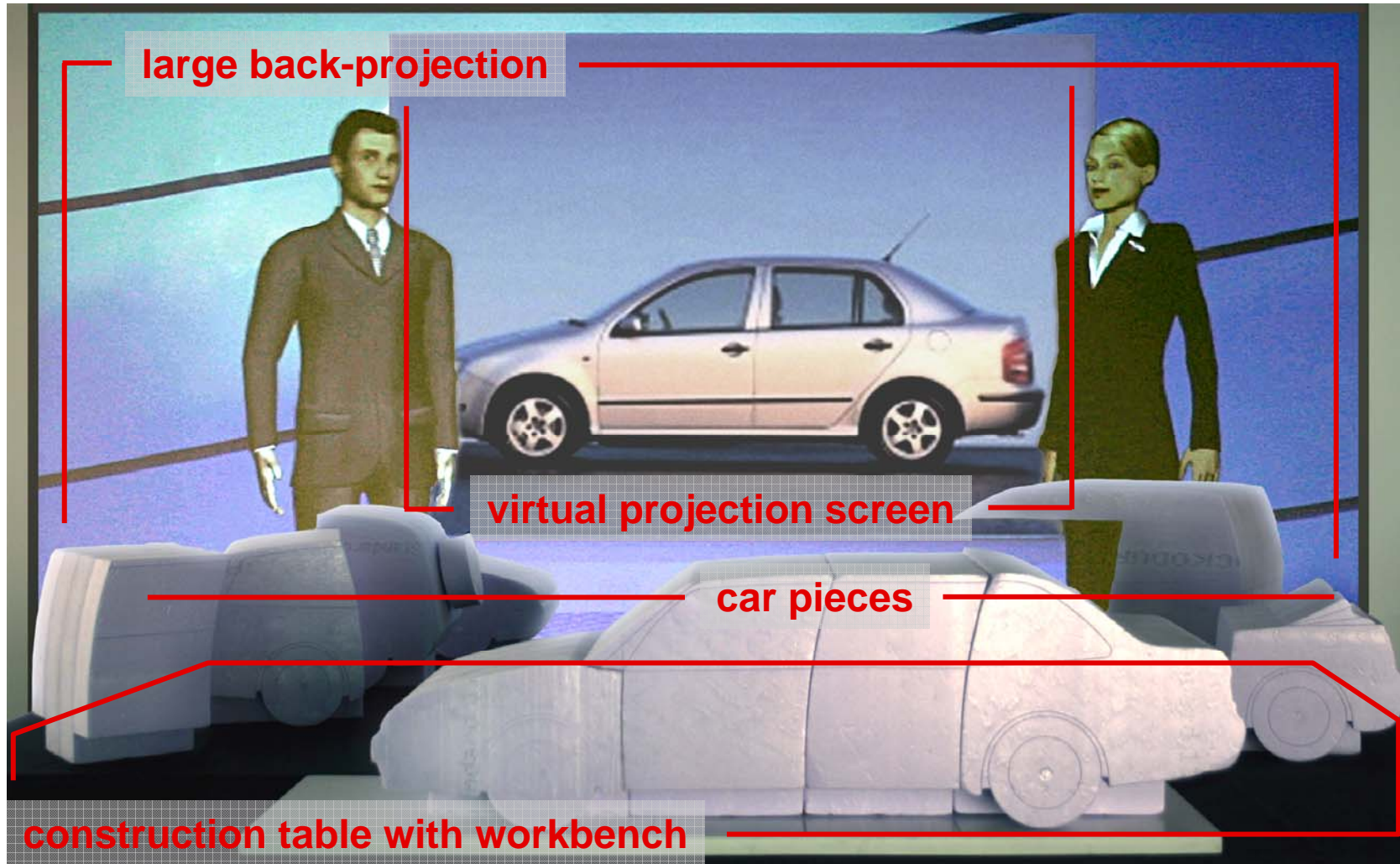
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- Automobile theme park environment
- Tangible exploration experience
  - 3D car puzzle
  - 10 RFID equipped car pieces
- Life-size virtual characters
  - comment user activities
  - help and motivate
  - guides, commentators, experts, motivators, tutors
- **Communicative Exhibit**



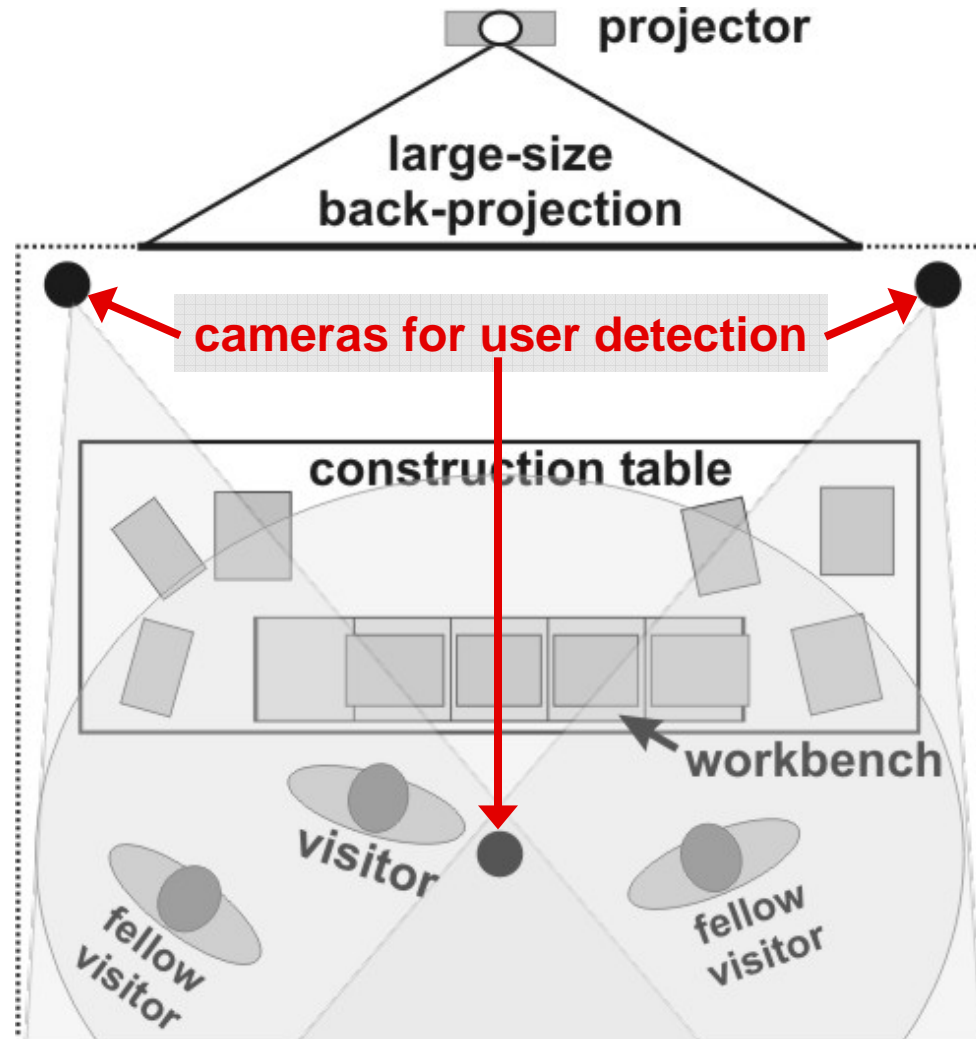


# Technical Setup





## Technical Setup (cont.)





# In Action – The Three Phases





## Challenges

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- Robustness
- Different interaction styles
  - kids and adults
  - single and multi user
  - action-focused vs. character-focused
- Overall: it has to be fun!
- Flexible authoring process
  - Extensions (content)
  - Redesign (interaction behavior)





## Creation Process

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- Domain modeling and context classification
  - car configurations
  - construction states
- Event management
  - recognizing users' actions
- Interaction modeling
  - SceneMaker \*
  - sceneflow (narrative structure, hierarchical FSMs)
  - scenes (content, screen-play like language)

\* Gebhard et al. Authoring Scenes for Adaptive, Interactive Performances  
In: Proceedings of the Second International Joint Conference on Autonomous Agents and Multiagent Systems (AAMAS-03), Melbourne, 2003.







## Car Configurations

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- 10 car elements, 5 workbench positions
- 802.370 combinations!
- Construction code  
F, C, M, R, # (e.g. FCR, FC#R)
- Construction orientation
  - determined by majority of elements pointing in same direction
  - can change!





## Construction State

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- Evaluation of local context
  - reduces complexity
  - e.g. FR#
- Five major states
  - car completed, e.g. FCMMR (30)
  - valid construction, e.g. FCM (8040)
  - invalid configuration, e.g. RC
  - completion impossible, e.g. CM at the left side
  - wrong direction, e.g. FCMR





## Event processing

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- Two phases
  1. visitors' actions → transition events (event rules)
  2. classification → updating domain model
- Top-level transition events
  1. visitor appeared, visitor disappeared
  2. car completed, car disassembled
  3. piece taken, piece placed
  4. piece uphold
- Transition events for sceneflow branching





## Authoring

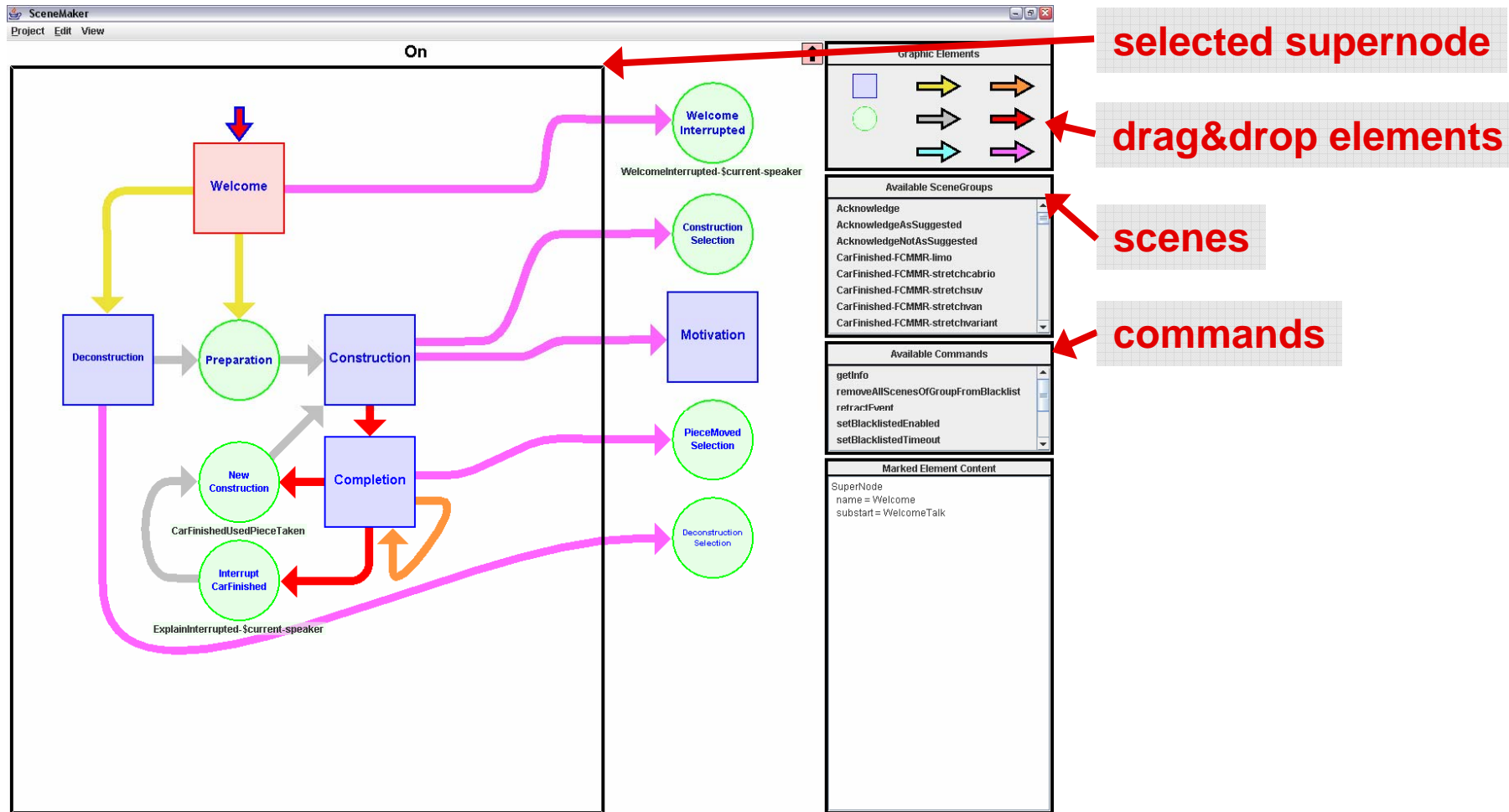
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- SceneflowEditor
  - faster creation and redesign
  - “safer” authoring
  - visualization of narrative structure
- Scenes
  - multiple topic histories
  - template-based (using context queries)
  - variability through alternative turns





# SceneflowEditor



# COHIBIT Scenes

scenes.doc - Microsoft Word

W.1: [GET current-model def acc] haben Sie ja vorhin schon gebaut.  
W.2: [GET current-model def acc] können wir ja jetzt schon.  
V: Wir haben jetzt schon [GET trials] Autos kommentiert. Warum wechseln wir nicht mal das Thema?  
W.1: Und welches Thema meinst du?  
W.2: Und welches Thema könnte das sein?  
V.1: Virtuelle Charaktere.  
V.2: Also uns zum Beispiel.

**Scene de: CarFinished-FCR-roadster (1) {model=roadster}**  
W: [happy] [+turn2visitor] [picture roadster\_sportlich.jpg] Was Sie da gebaut haben, nennen wir einen Roadster. Ein sportlicher Zweitürer.  
V: [happy] Und natürlich ein Cabrio. Ein Wagen mit Stil.  
W: [cup] Der Kofferraum ist etwas kleiner als bei Autos mit festem Dach.  
V: [progressive] Im Kofferraum wird nämlich das [picture cabrio\_stoffdach\_zu.jpg] Verdeck untergebracht. [W +nod] [+look@other] Welche Verdeckvarianten gibt es eigentlich, Wiebke?  
W: [walls] [picture cabrio\_stoffdach\_offen.jpg] Ich grüß das klassische textile Verdeck oder eines mit festen Dachsegmenten. Natürlich liefern wir auch das sogenannte Hardtop.  
V: [happy] Also ich muss schon sagen: der Roadster gefällt mir.

**Scene de: CarFinished-FCMR-cabrio (1) {model=cabrio}**  
W: [picture F1CMR1.jpg] Sie haben sich für ein viertüriges Cabriolet entschieden.  
[point@panel\_big] Ein Modell, das zugleich sportlich und geräumig ist. [walls] Der Kofferraum ist etwas kleiner als bei Modellen mit festem Dach.  
V: Das Verdeck gibt es in verschiedenen Varianten. Als textiles Verdeck, als Hardtop mit

context commands

alternative turns

emotions

gestures

overlay gestures

system commands

scene topic





## Interaction Design

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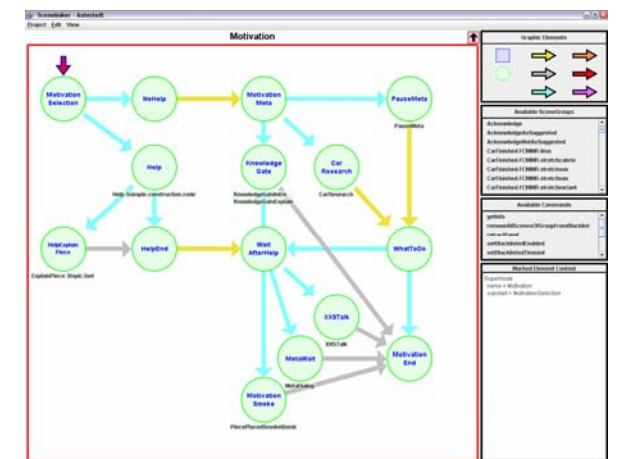
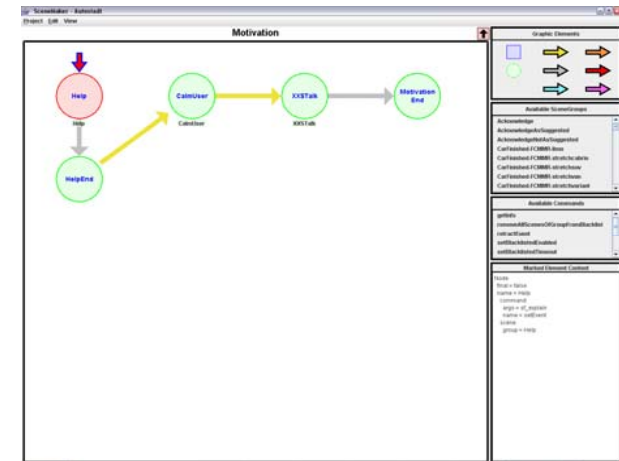
- Iterative process based on user observations
- 15 naïve visitors at 2 development stages
- **Balance continuity and reactivity**
  - user action focused → erratic behavior
  - information focused → dull behavior
- **Believable dialog behavior and variance**
  - handling interruptions
  - motivation of users





# Motivation of users

- Initial: sequential
  - >8sec help, >20sec calm user, >30sec smalltalk
- Observation
  - motivation is appreciated
  - comments often too late
  - simple dialog pattern lowers believability
- Current: hybrid
  - context based
  - random branching







# Handling Interruptions

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- Initial: hard interruption
  - events directly interrupt on-going conversation
- Observations
  - mechanical behavior
  - confusing abrupt topic changes
- Current: smooth interruption
  - making some scenes uninterruptible
  - providing transition scenes





## Summary and Future Work

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- Scripted interactive installation with virtual characters
- SceneMaker with SceneflowEditor enables flexible fast design and redesign workflow
- Facts: 2 months, 7 people: 375 scenes, 1 sceneflow with 82 nodes and 114 transitions
- Future: more automation!
  - gesture generator
  - dialog act generator

