

## Objectifs

- implementing the perception and socio-psychological cognition of spatial sound in virtual scenarios
- testing virtual sound and embodied interaction for scenic sound
- extending audio plays by the interlink of narration and interaction
- applying technologies for audio augmented environments and tracking technology to artistic expression

## Assumptions

- I. Issues of spatial sound can be researched by the use of scenic application (localization, perspectives, immersion, environment)
- II. Aspects of socio-psychology are likely to be incorporated in virtual sound environments and sonic scenarios (back sphere, emotivity, proxemics, modalities of intimacy)
  - The back sphere can be characterized by higher vulnerability and reduced control, leading to a higher emotivity.
  - This higher emotivity to outstanding sound can be balanced via other modalities of intimacy like glance behavior or personal distance (cf. "Equilibrium theory of intimacy" by Argyle/Dean).
  - Both distances and body attributes (as modalities of intimacy) can be represented through sound and/or voice.
  - Thus, socio-psychological issues can be applied to sound, such as proxemics by E.T. Hall, treating distances between humans as encoded behavioral spheres (cf. "The Hidden Dimension").
  - Loudness, reverbs and the attitude of the actor represent instruments to adapt the meaning of sounds in a scenario.
  - Moreover, specific connotations of the back sphere (as well as everyday situations) offer dramaturgical ideas for spatial sound scenarios.

→ Cf. [3]

## Methods & Results

### Description

#### Idea

A simple scene as test scenario, taken from Norbert Niemans novel: Four strangers meet in the train, Helene (H) and his husband Rudolf (R), a soldier (S) and a poem-reading lyricist (L). Interacting by the use of tracked headphones, the user can explore several dimensions: thoughts of the characters, their actions, their interaction, the ambiances (music, train sounds, abstract sounds)

#### Interaction

user sitting down  
→ entering the characters thoughts (intimate sphere)  
user nodding in the direction of another virtual character (chair):  
→ switching to thoughts about the other virtual character

#### Example

Sitting on the chair of Helene and nodding towards the lyricist, the user hears Helene talking about the way the lyricist makes her remind her of her son and that she feels attracted to him.

#### Installation Levels

start: chaotic conversation + chaotic sounds (smoking, snoring, eating, preparing food/drinks, etc.)  
sitting down: thoughts, reverberations have disappeared  
nodding: thoughts about the other virtual characters  
standing up: linear conversation + fix narrator (center)  
moving around: linear conversation + accompanying narrator + fix ambiances on the outlines of the room



#### Binaural rendering

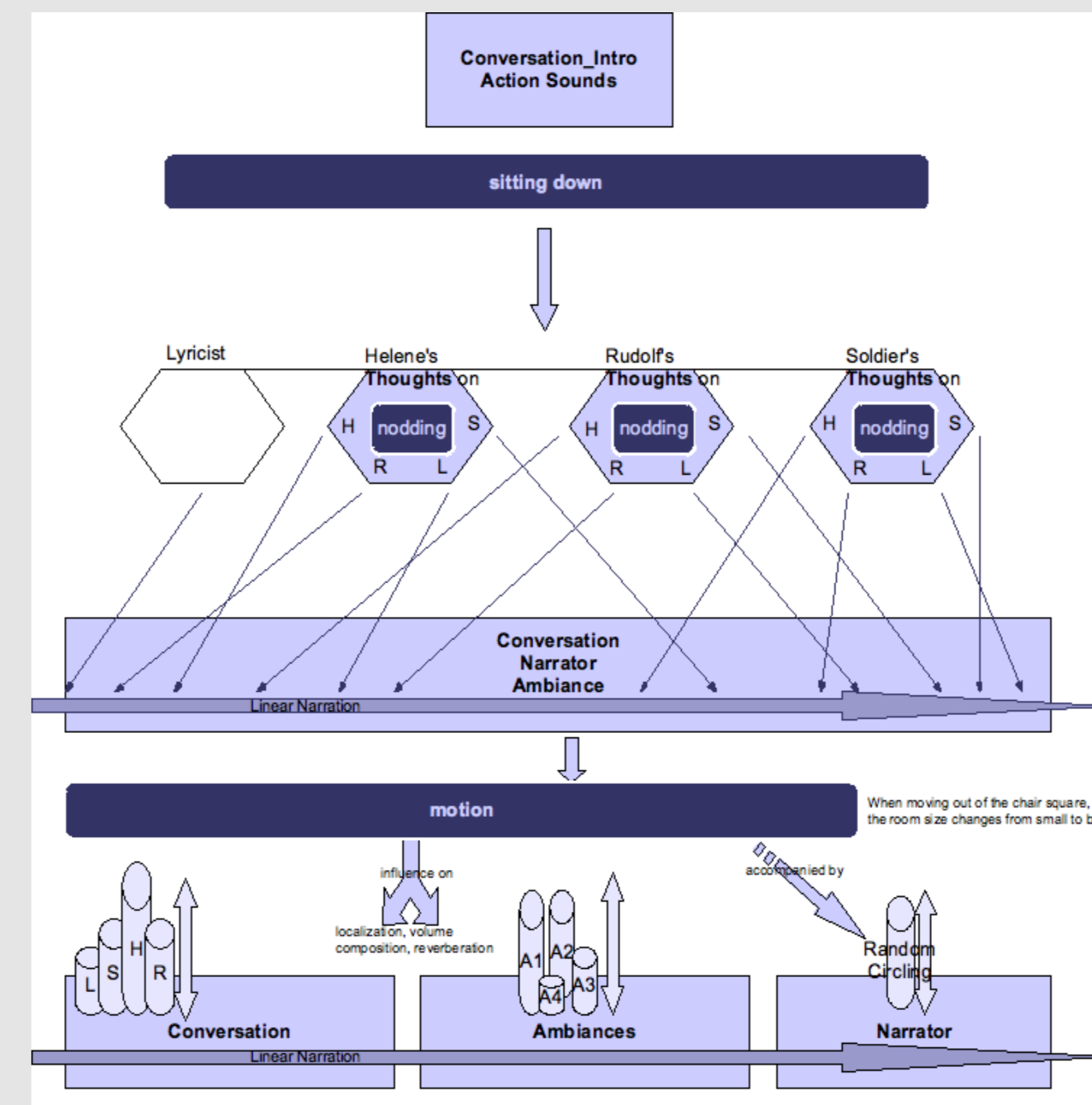
**Computational power**  
order of ambisonic system (for 3D system (m+1)<sup>2</sup> channels / virtual loudspeakers) + impulse responses + amount of sounds sources + quality of the sound material  
→ performance of a single powerbook is not sufficient (errors appear)

#### Aesthetics

contrast of spatialized (conversation, ambiances) and not-spatialized (thoughts) sound + widening of punctual virtual sound sources (amb.)

#### Convincing sound

ambisonics order, reflections; directivity (not implemented so far)



#### Intuitive movements and tracking

#### Idea

Transforming narrative content to a multidimensional, cross-linked structure that is based on optional behavior; using intuitive body movements for cuing switch points of the scenario

**Programming** (by Thomas Musil, IEM)  
Transforming narrative content to a multidimensional, cross-linked structure that is based on optional behavior; using intuitive body move

- Sitting down  
The area of the real chairs had been measured (x and y axis). Together with the difference in height (z axis), the cue could be defined.
- Nodding  
Analyze of several test nods had been smoothed with a filter + stylized nodding with not only a downwards movement but also with a preceding upwards movement in order to make the acquisition more distinguishable + the tilt of the head (vertical plane) is used to capture the nodding + the direction (horizontal plane) of the nodding serves as cue to switch from one character to another

## Questionnaires

Eight probands went separately through the installation within 15min up to 50min. An initial introduction was given to them first, including a test nodding. Afterwards they were asked to answer twelve questions.

## Conclusions

- The general concept of interactive sonic scenarios seems interesting for both:
  - the artist (mixing up, contrasting and playing with realistic sensation and artistic creation)
  - the listener (exploring different perspectives within the multi-dimensional structure, putting together the "global picture")
  - the researcher (spatial sound perception can be more anchored scenically)
- For a functioning immersion, all components need to be tuned and worked out.
- Especially the implication of the body is both challenging and promising.
- Future work The complexity of the scenario can be progressively elevated, giving the user the possibility to interact with virtual characters and objects within the virtual environment, as well as with other users.

## References

[1] Markus Noisternig, Thomas Musil, Alois Sontacchi, Robert Höldrich: 3D Binaural Sound Reproduction using a Virtual Ambisonic Approach. IEEE International Symposium on Virtual Environments (VECIMS), Lugano, Switzerland, 2003.

[2] Stefan LEITNER, Alois SONTACCHI, Robert HÖLDRICH: Head position related binaural sound reproduction – the ambisonic approach, Tagungsband der 21. Tonmeisterstagung, VDT, Hannover, November 2000

[3] Gampe, Johanna (2006): Hörspiel als Raumklang. Diplomarbeit im Fach "Audiovisuelle Medien", Fachhochschule Stuttgart, Hochschule der Medien