

Natural and Adaptive Interaction

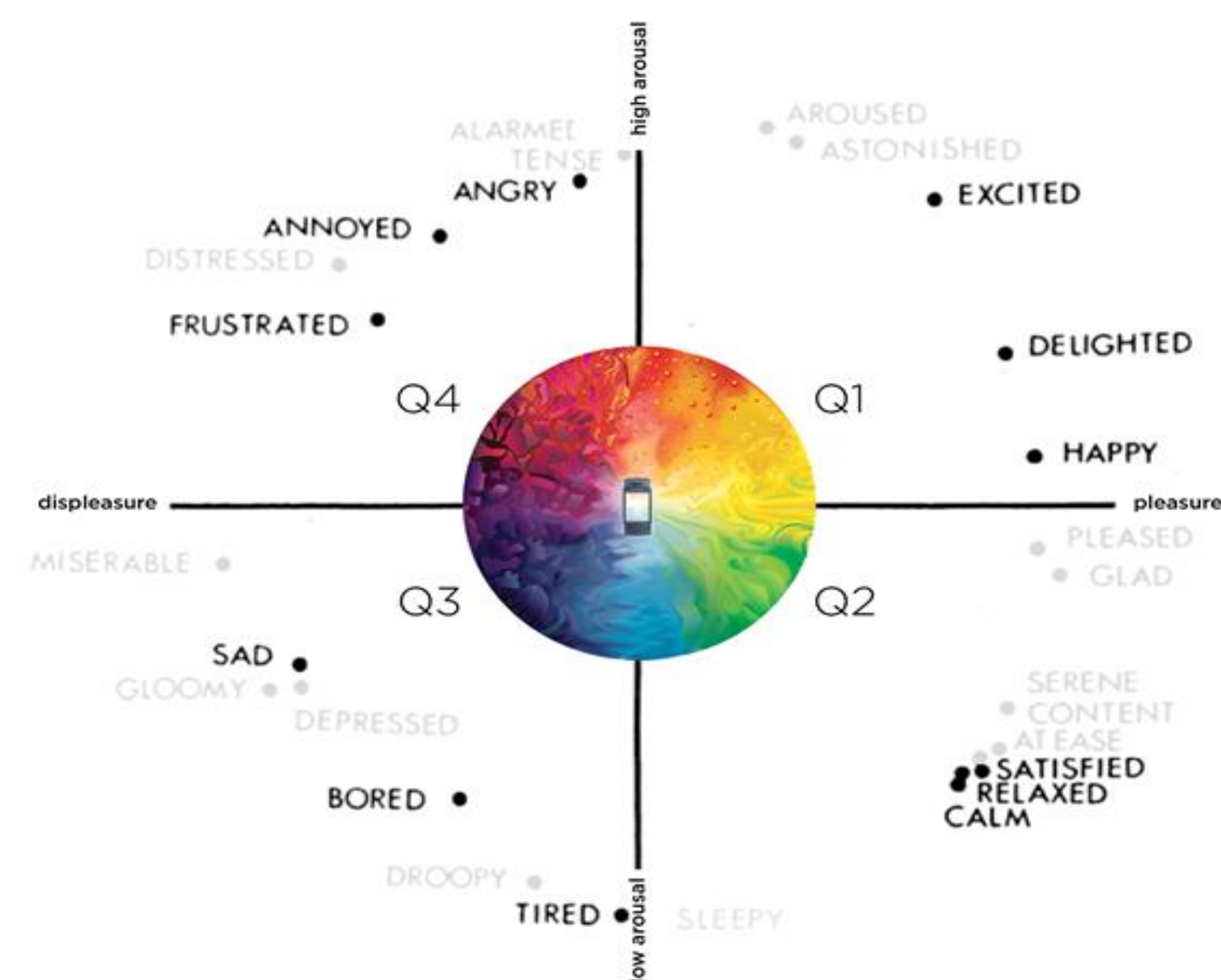
Psychologically aware computing can aid the users by providing flexible, adaptive and human oriented interaction. Can we create socially situated characters that provides a natural and adaptive interaction for healthcare, education and entertainment applications?

- Social presence and natural communication is necessary in long-term interactions
- Reducing cognitive load is important (Maes, 1994)
- Performing behavioral activities that are mindful to emotional feedback can ease the adaptation to the system



Empathy Driven Interaction

Emotional expressions are a basic component of human communication and interaction. Systems that can both perceive and express affect in communication can provide a ground for natural communication (Bates, 1992). For our system we used circumplex model of affect (Russel 1980).



- User needs and goals can be extracted from user moods, emotions and personality traits
- Emotionally intelligent agents can enhance believability
- Can be used to simulate personality traits
- Emotions can facilitate the social interactions and help cooperation

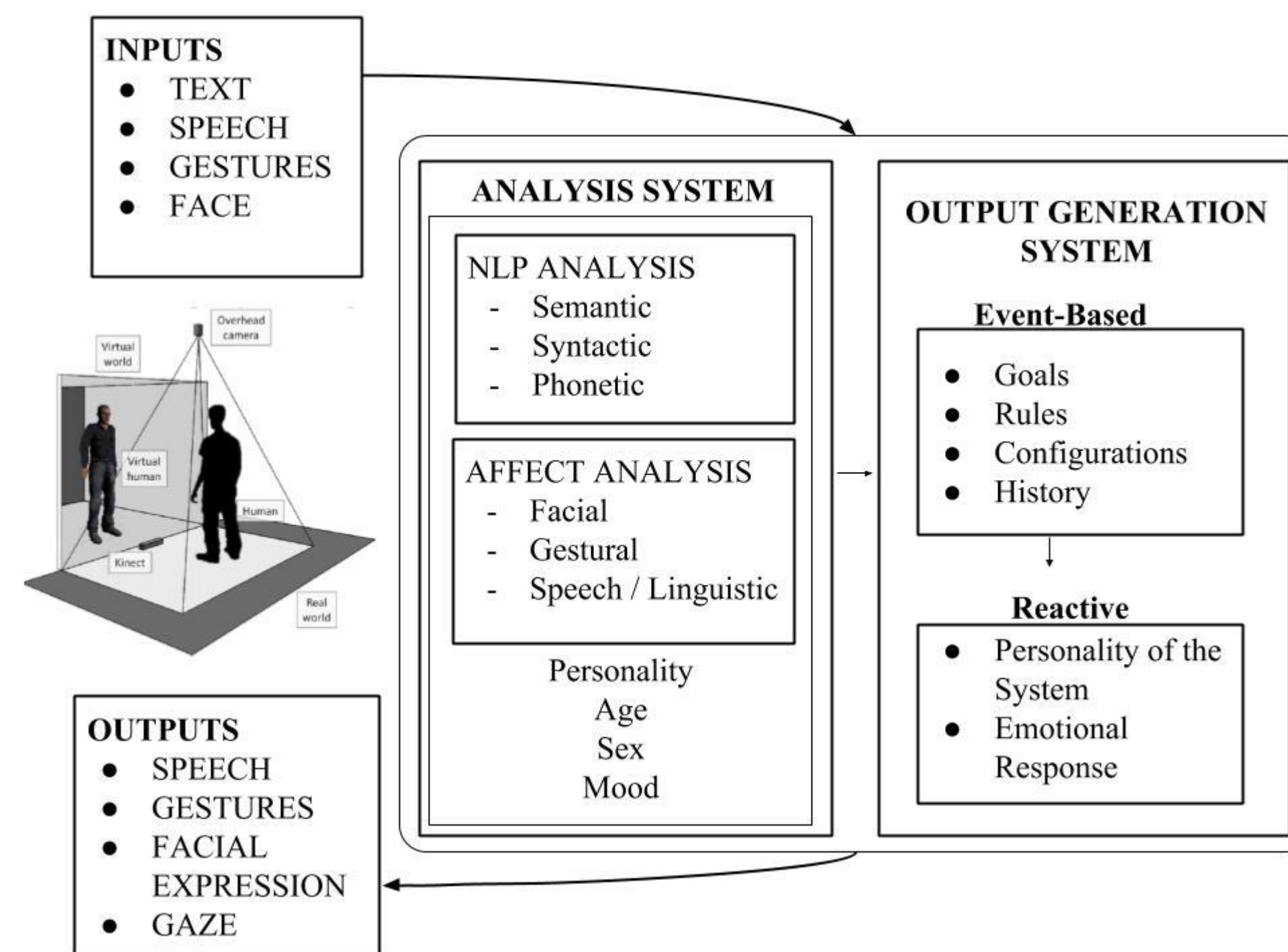
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Our Virtual Character System

Our socially situated virtual character system can perform a set of behavioral acts in response to a range of input received from the user:

- Speech Signals
 - Sentiment Analysis
 - Tone analysis
- Face and Body language
 - Gesture recognition
 - Gaze
 - Eye Tracking
- Bio-sensing

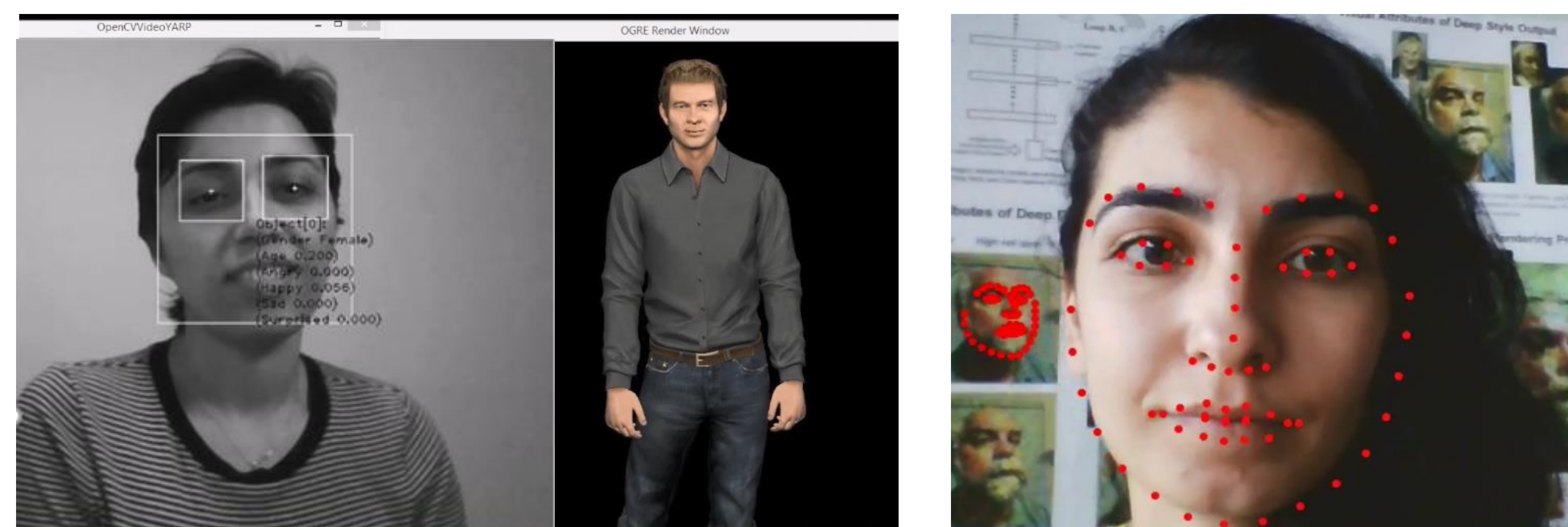
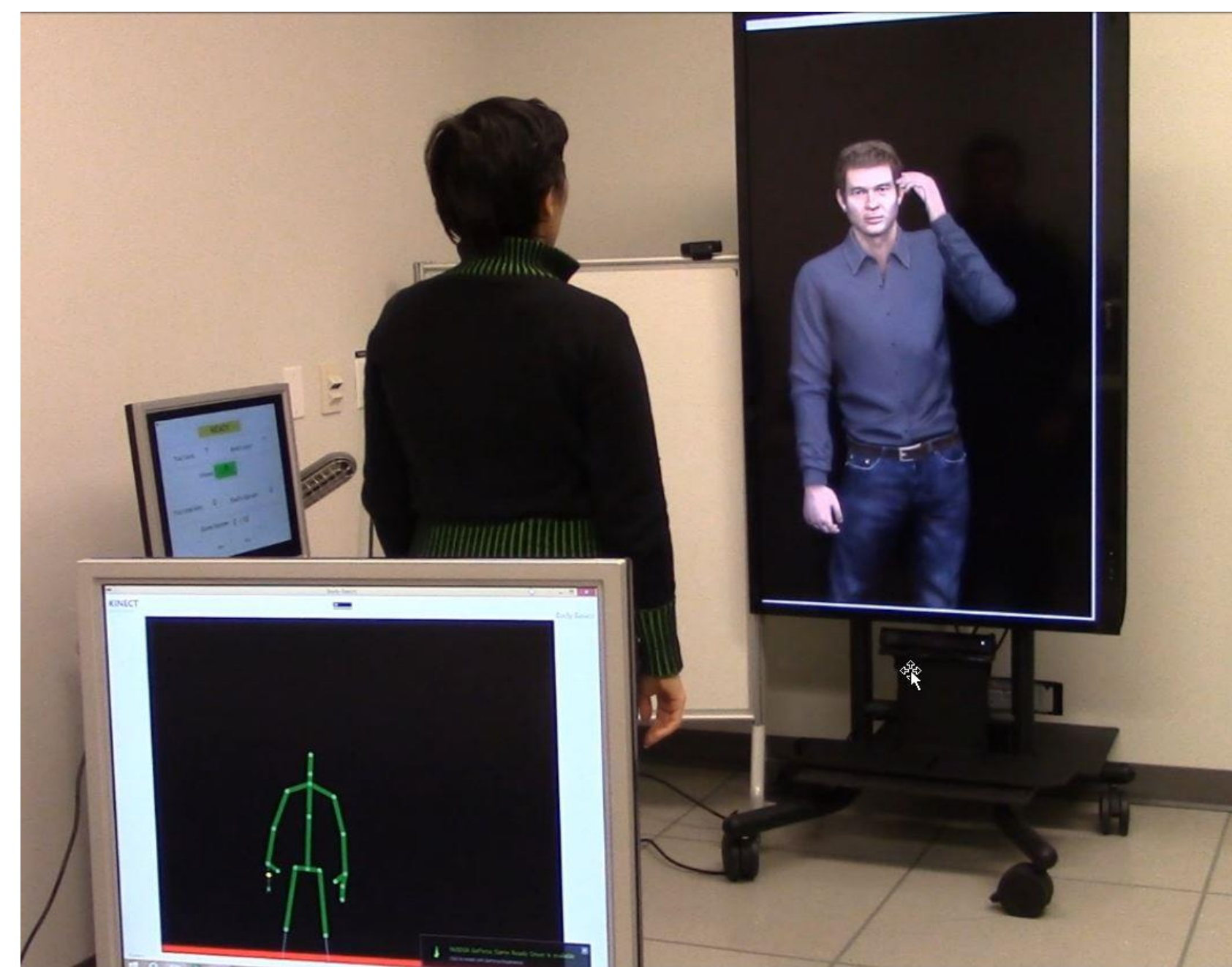
In collaboration with USC Institute of Creative Technologies – Smartbody (Thiebaux et. al. 2008)



Non-verbal Behaviors

Nonverbal behavior such as gaze, facial expression, gesture and posture to give the impression of a specific personality type.

- The strong association between facial expressions and affective states have been studied extensively (Ekman & Oster 1977, Russell et al. 2003).
- Experiments show that the amount of extraversion and emotional-stability that participants attributed to virtual characters depended on a combination of facial expression, gaze and posture and gestures that they exhibited.



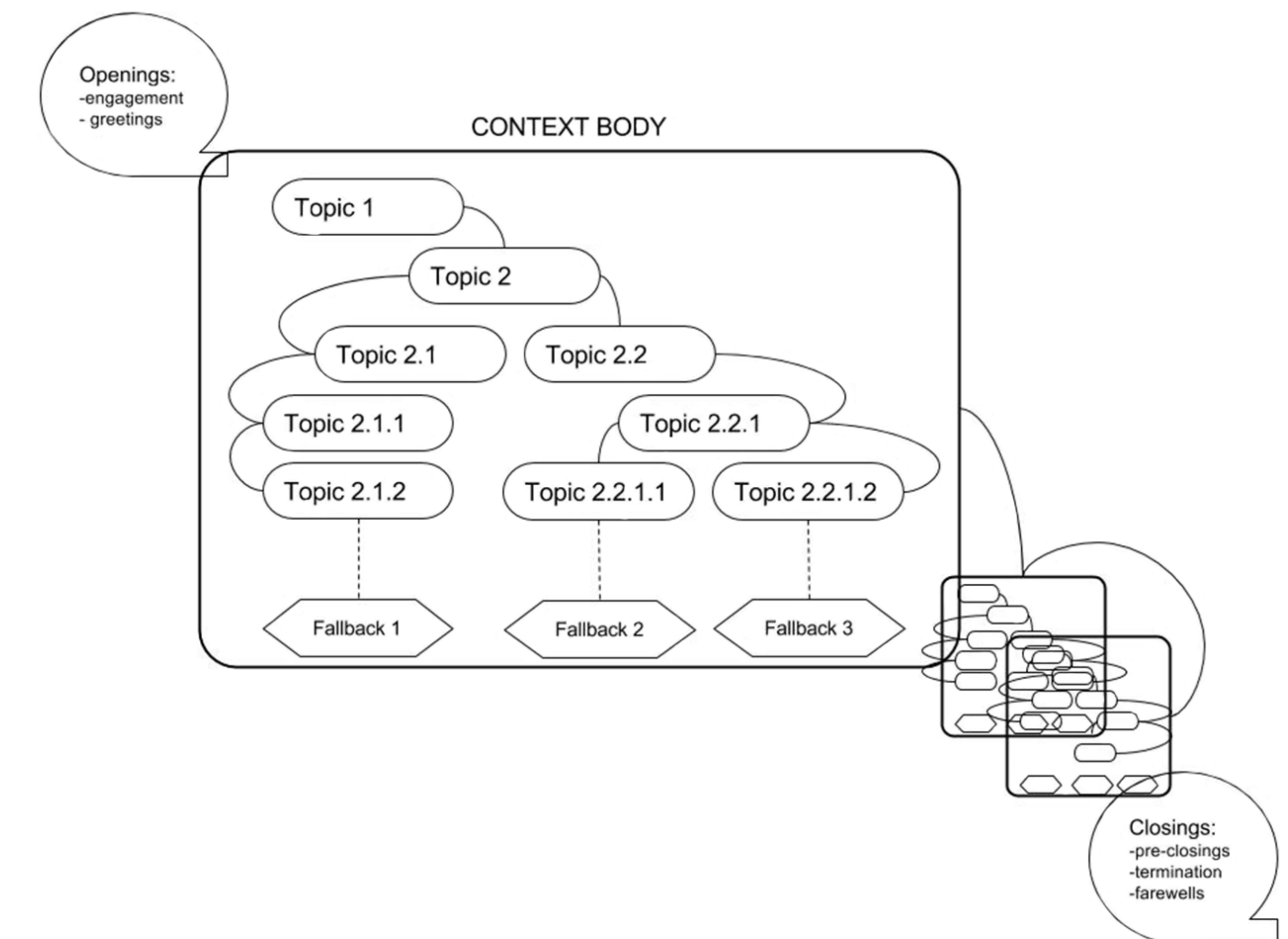
Verbal Behaviors

A combination of acoustic and language information for a more robust automatic recognition of a speaker's emotion (Schuller, 2004) or combine semantic and acoustic features to design a continuous dimensional speech affect recognition (Karadogan, 2012).

- Non-linguistic cues such as pitch, formants, prosodic features such as pitch loudness, speaking rate, rhythm, voice quality and articulation, latency to speak, pauses, as well as combinations
- Linguistic cues from text to perform sentiment analysis

Dialogue Management

The role of a dialogue manager is to understand the intent of the user and provide the most suitable reply depending on the current context in the dialogue flow. The manager processes the input received from the user and matches it with an intent. Intents are topic areas that can be used to control the flow of conversation by acting as a mapping between the user and the set of responses. Depending on the application area, the desired flow of conversation can be built into the dialogue manager.



The output of the dialogue manager will be shaped by:

- Goals of the System (Desired use for the system)
- Information About User (Personality, Preferences, Emotions)
- Personality of the System (Baseline behavior of the agent)

Application Areas

Our system can act as a companion by understanding the emotional status and the wishes of the user; and is able to establish a personal and long-lasting relationship with them. The key components of the system are:

- Getting medical history of the user
- Physical or mental conditions
- Understanding personal preferences
- Providing regular monitoring of the condition of the patient
- Engaging in cognitive, social and physical activities to enhance quality of life

It acts as an integrative personalized virtual coaching system to provide guidance and care to adults through empowerment and motivation in day-to-day activities without attention theft.

Our main application areas in healthcare are:

- Cognitive Behavioral Therapy
- A companion for adults with Autism Spectrum Disorder
- Adults with Cognitive and Mental Impairment

Conclusions & Future Work

- Empathy-Driven systems can provide information about a wide spectrum of information from user goals and needs to personality of the user
- Ethical Issues
- Integrating Components in Real-Time is a challenge
- Long-term relationships needs to be studied

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