Virtual Human Workshop

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Goals of this workshop

- **Motivate the topic of virtual humans**
- **Review fundamental research**
  - Dialogue systems
  - Nonverbal recognition and synthesis
  - Emotion and decision-making
- **Present practical development tools**
- **Provide hands-on experience in building a virtual human**

Why are you here?

- **Grow the "pond"**
  - Steep barrier to enter field
    - Integration of NLP, AI, Animation, Vision, Psychology, Linguistics
    - Tools are limited and rarely interoperate
  - Knowledge is fragmented
    - Research fragmented across disciplines and conferences
      - ACII, IVA, F&G, INTERSPEECH, AAMAS, AIED, TIDES, AIIDE, HRI…
    - Lack of common tools, standards, databases, criteria
  - Consequence
    - Re-invention: YAMS (Yet Another Model Syndrome)
    - Spend all time building the virtual human and can't get to fun stuff
  - You are next generation of virtual human researchers
    - Increase your awareness of each other and, particularly, us

Why are you here?

- **Our funders want you here**
  - Directed to be the “come to” place for virtual human research
  - Goal: build awareness of our expertise and techniques
  - Goal: influence you to use and cite our research
    - Included a list of references that we prefer you to cite

Why are you here?

- **We need alpha testers**
  - This is research software
    - You will run into issues, bugs, lack of documentation
  - We are asking you to help us understand how to improve usability
  - Remember: we're pay you to be here….

Virtual Humans

Autonomous virtual characters that can have meaningful interactions with human users

- **Reason about environment**
- **Understand and express emotion**
- **Communicate through speech & gesture**
- **Play the role of teachers, peers, adversaries**

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Virtual Humans: Enabling Technology

Training

- Cross-cultural negotiation (Swartout et al)
- Health care provider training (Lok et al)

Diagnosis & Assessment

- ADHD Assessment (Rizzo et. al)

Health Interventions

- Autism (Tartaro & Cassell)
- Mental health (Marsela et al)

Basic science

- Methodological tool for psychological research
  Gratch, Blascovich, Bailenson, Bente, Kraemer

Business

- Internet marketing (USAAC)
- Sales and service (IBM)

Overarching Research Themes

- **The social science of virtual humans**
  - **What makes a virtual human seem "real"**

- **Technology of virtual humans**
  - **How to extend the boundary of the possible**
  - **How to make systems rapidly configurable**

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The Social Science of Virtual Humans

Will people treat virtual humans like real people?

But why?

Why use a computer as surrogate for human interaction?

People respond to virtual humans as if they were real

- **Social "Facilitation" - being watched by VHuman can impact performance**
  - Helps if task is easy and agents provide positive feedback
  - Hurts if task is hard or agents provide negative feedback

Slater et al, 1999; Pertaub et al., 2001; Hoyt et al, 2003

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- **Disclosure - People less truthful when talking to virtual human**
  - **Less likely to disclose stigmatized information (HIV positive) than if web form**
- **Trust - increases when system uses anthropomorphic interface**

  Sproull et al. 1996; Walker, et al. 1994; Rickenberg & Reeves, 2000
- **Persuasion – more persuaded by virtual human**
  - especially if character matches user's appearance of behavior
- **Stereotype bias – Whites more threatened by black agents**

  Blascovich et al

But why?

Why use a computer as surrogate for human interaction?

Virtual Humans have unique advantages

- **Standardization**
  - e.g., in education, every student has same experience
- **Abnormal findings**
  - virtual humans can display behaviors that are impossible for human roleplayers: e.g., physical symptoms of brain damage
- **Augmented reality**
  - virtual humans can create situations impossible in real world
    e.g. everyone in audience thinks speaker is looking at them
- **Marketing**
  - As a way to sell computer games (Sims, Mass Effect)

Lok et al.

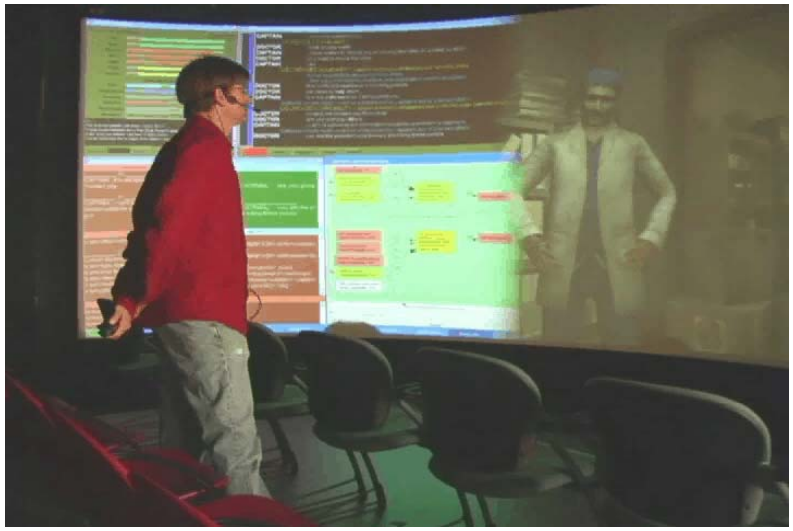
Blascovich et al.

The Technology of Virtual Humans

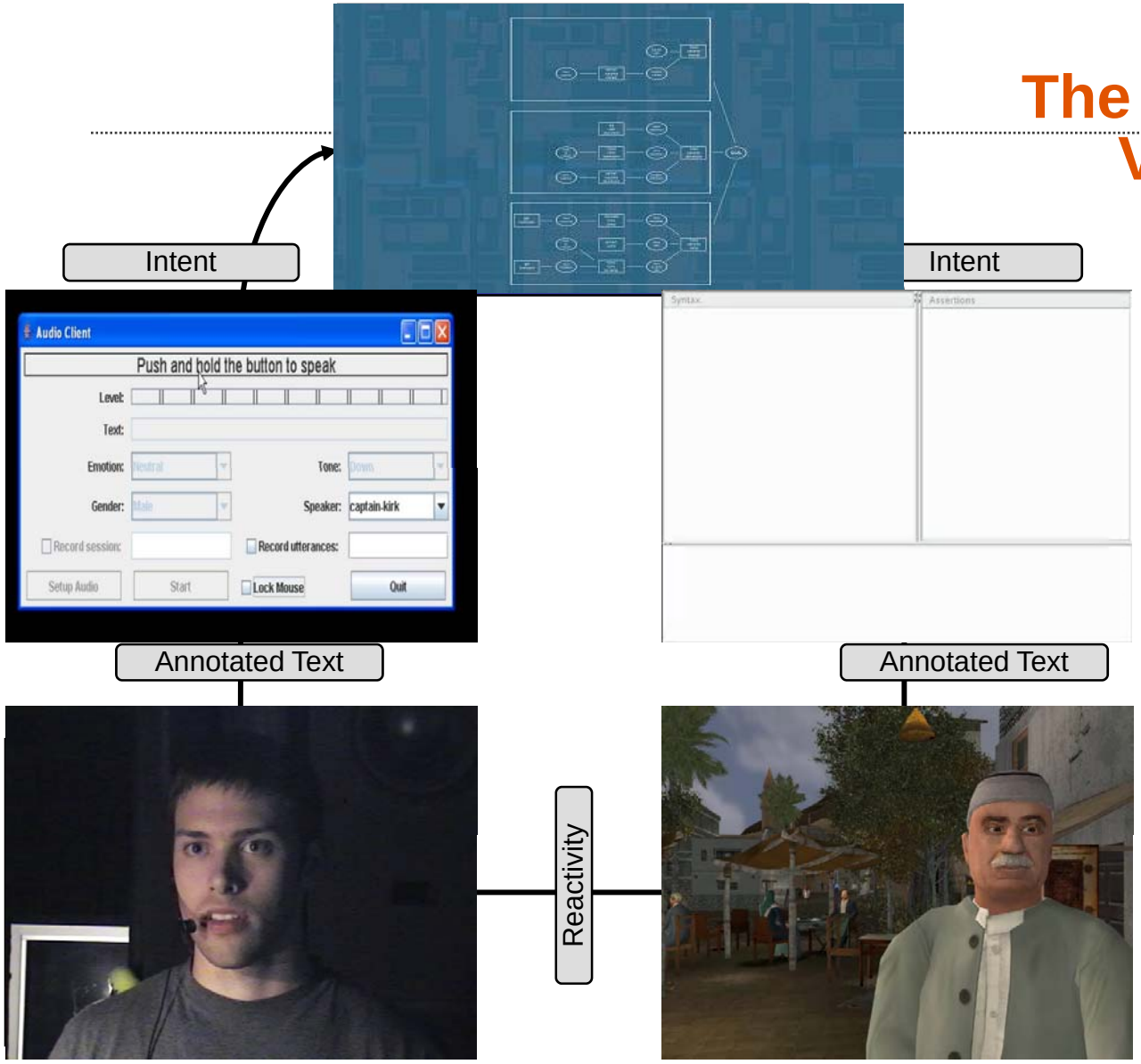
Research Priorities

Extend basic capabilities of Virtual Humans

- **Socio-emotional intelligence**
  - Understanding trainee's emotional and motivational state
  - Support rich social interactions
- **Robust natural language interaction**
  - Improve communicative fluency
  - Multiparty interaction
- **Realistic animations and appearance**
  - Improve expressivity and flexibility
- **Perceptive virtual humans**
  - Recognize user gestures, expressions



The Technology of Virtual Humans



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The Technology of Virtual Humans

More than a sum of parts

Integrated Research Prototypes

Virtual Human Basic Research

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Integration progress: SASO Extended Negotiation

- **Training Goal: Multiparty negotiation**
  - Recognize and respond to variety of negotiation tactics
  - Deal with shifting coalitions
  - Build credibility, solidarity

- **Scenario: SASO**
  - Captain must convince town elder and local doctor to move medical clinic
  - Offers:
    - medical supplies
    - infrastructure

Dissemination and Transition

Integrated Research Prototypes

Virtual Human Basic Research

Transition and Dissemination

Scientific Publications

Workshops & Tutorials

Applied Research and Applications

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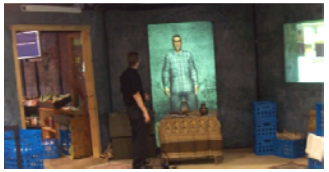
ICT Virtual Human Projects- Research and Apps

Dr. Perez
SASO-ST
SASO-EN

Elder-Al-Hassan
SASO-EN

Minor
Characters

Flatworld
C3IT
Cultural training



ELECT
Bi-Lat

Sgt.
Blackwell

Virtual
Human
System

Research

Training

Marketing

Clinical
Diagnosis

Hassan
Emotional
Dialog
Modeling

Raed
Tactical
Questioning

Rapport
Agent

Justin
Virtual
Patient

Justina
Virtual
Patient

Sgt.
Star

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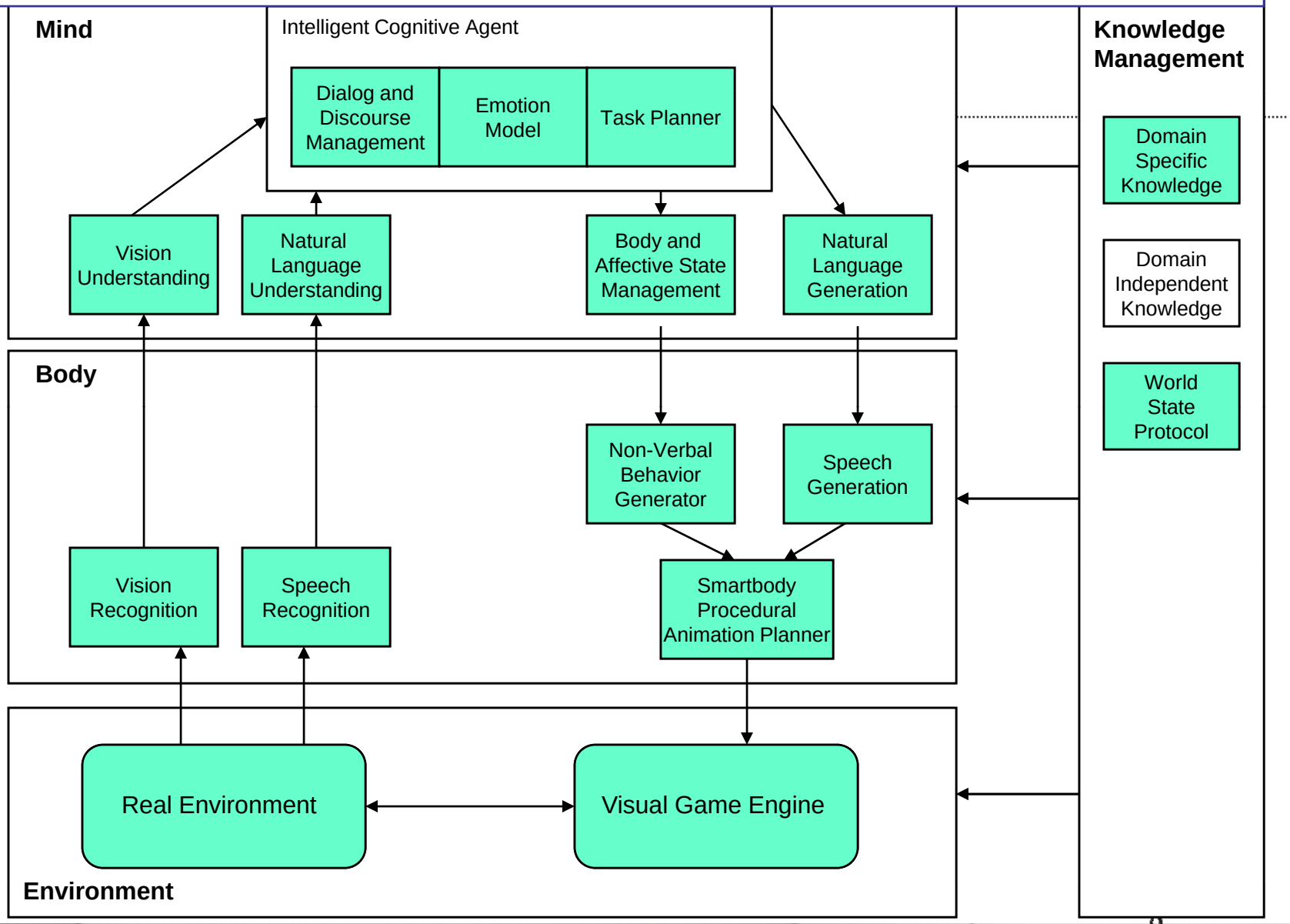
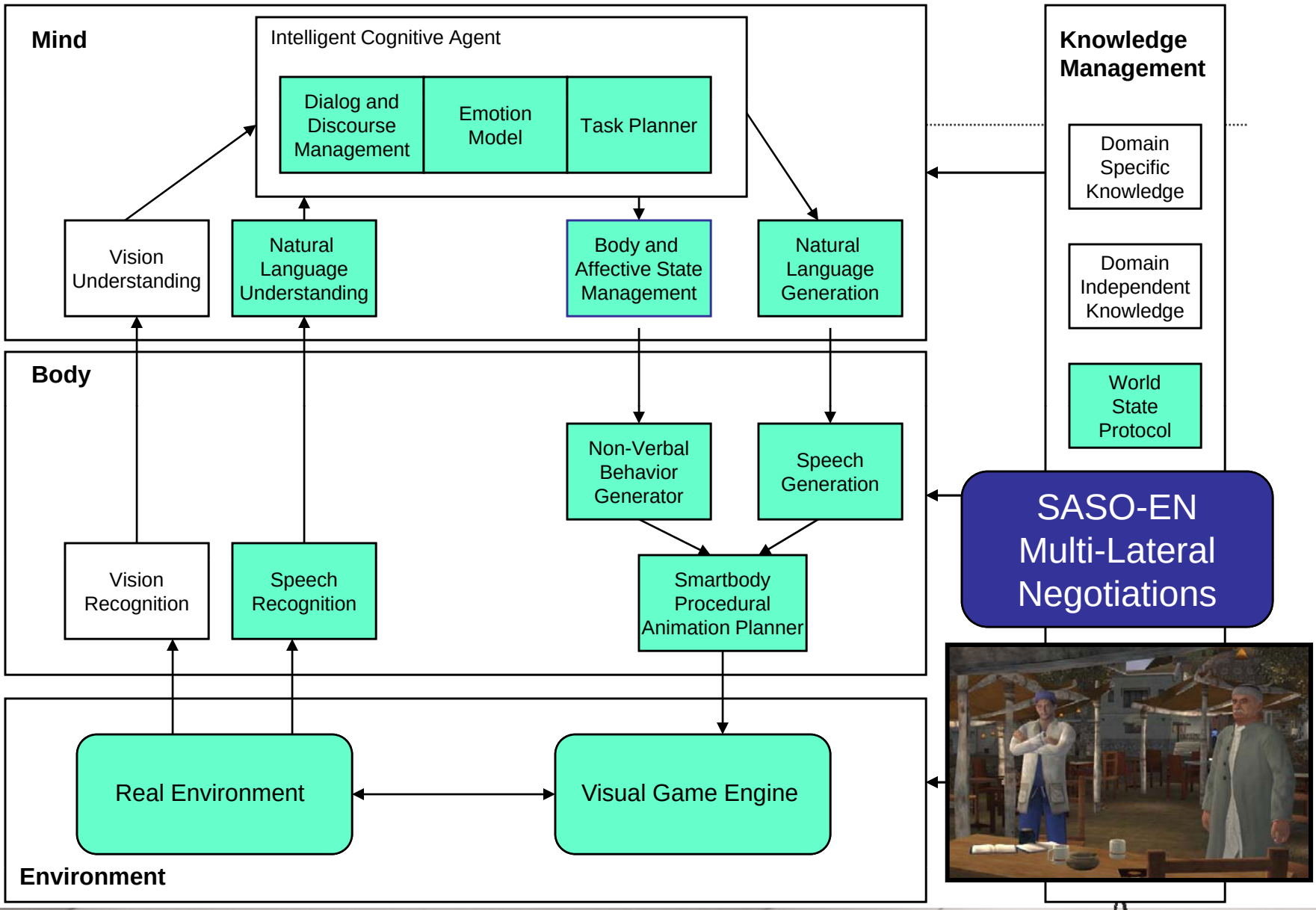
External projects

- **Standards**
  - FML/BML: International interface standard (~15 international inst.)

- **Systems**
  - BML Realizer (RU, Iceland)
  - Sensitive Affective Listener (Paris8, Twente)
  - Vizard (UCSB/Worldviz)
  - Rapport Project (University of Chicago/MITRE)
  - ….

Virtual Human Software Components

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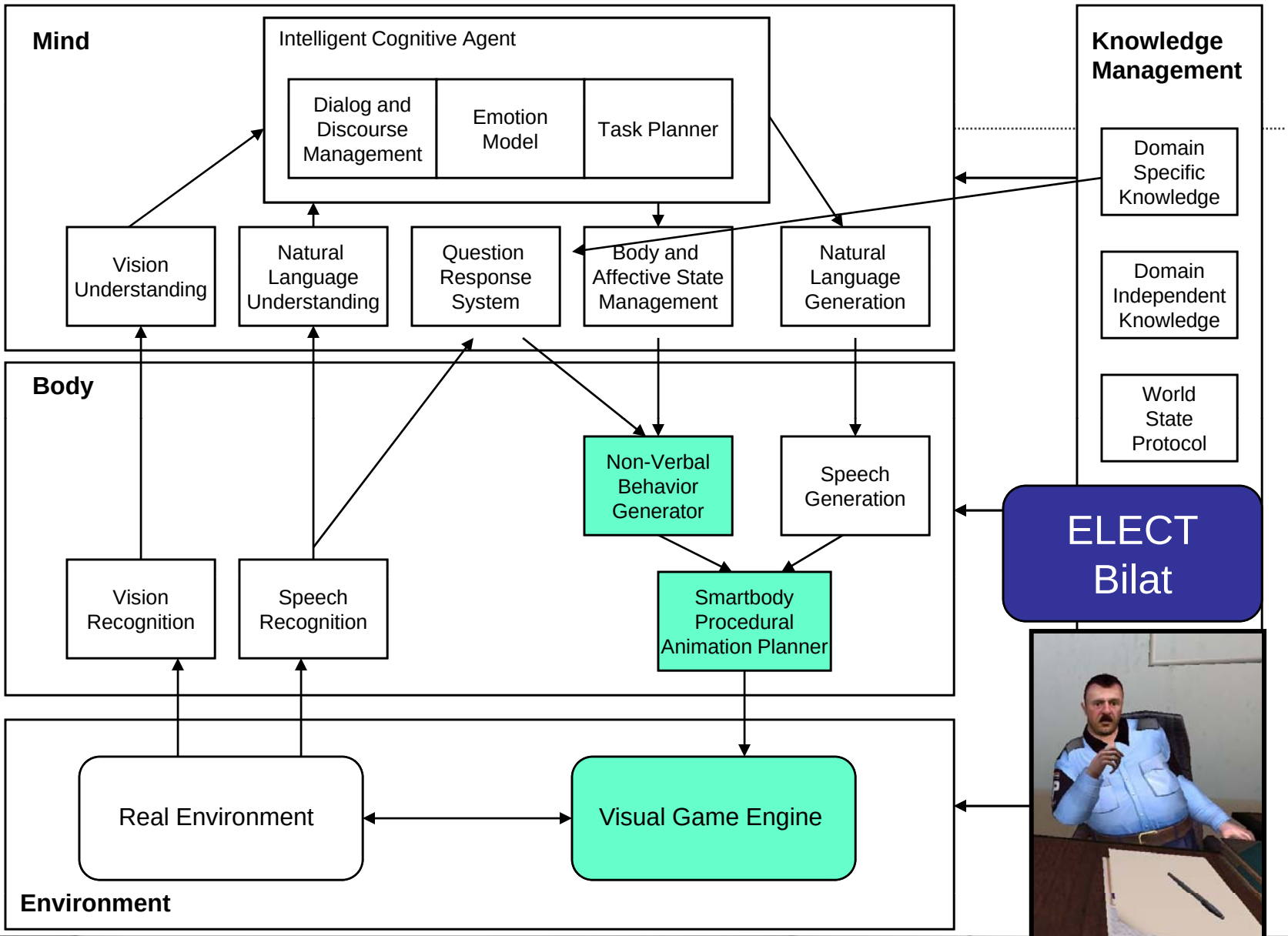
Dialog and Discourse Management
Emotion Model
Task Planner
Vision Understanding
Natural Language Understanding
Body and Affective State Management
Natural Language Generation
Body
Non-Verbal Behavior Generator
Speech Generation
Vision Recognition
Speech Recognition
Smartbody Procedural Animation Planner
Real Environment
Visual Game Engine
Environment
Knowledge Management
Domain Specific Knowledge
Domain Independent Knowledge
World State Protocol
SASO-EN Multi-Lateral Negotiations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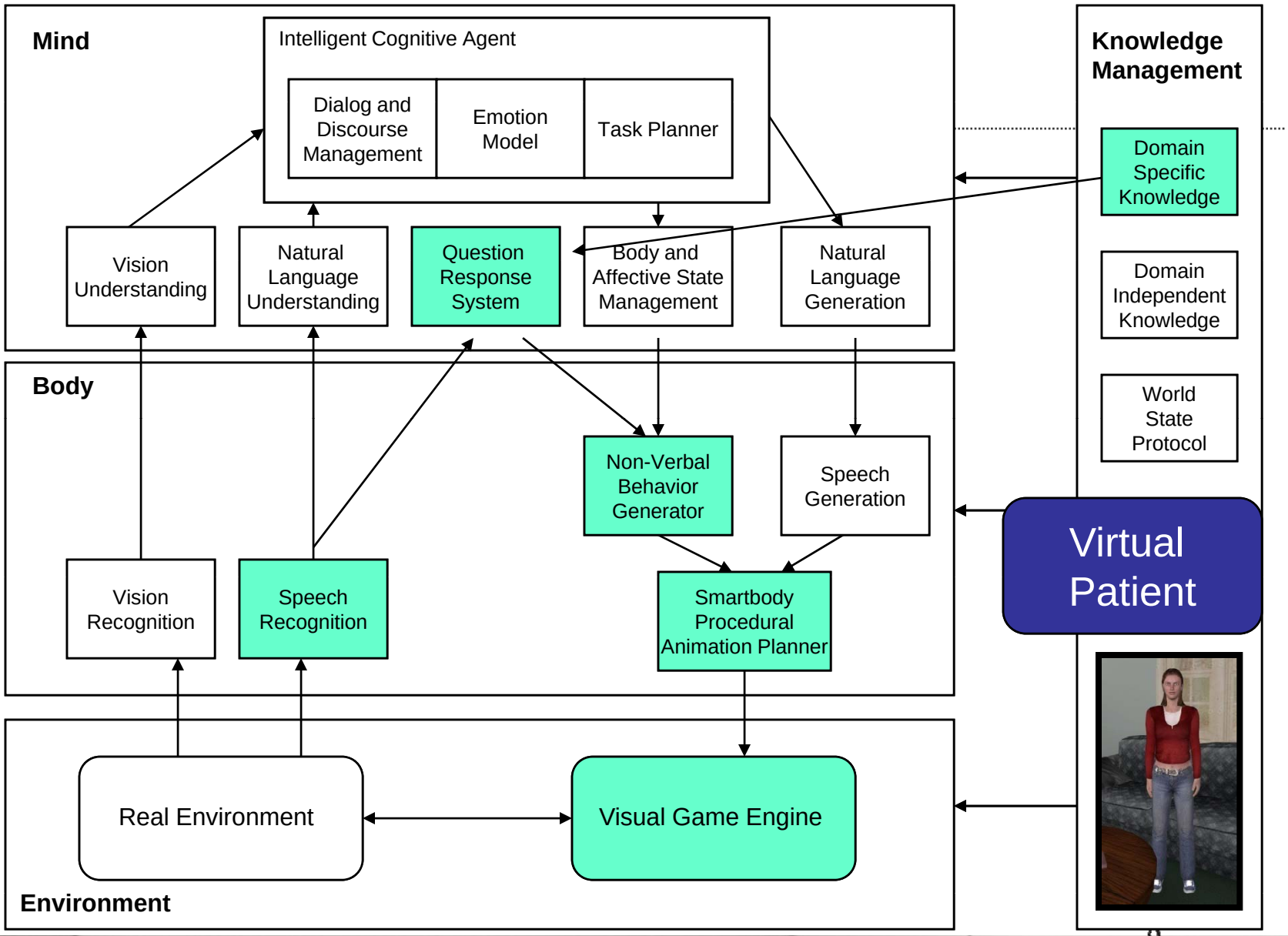
Environment

A “serious game” - Justina the Virtual Patient

Patrick Kenny, Thomas D. Parsons, Jonathan Gratch, Albert A. Rizzo. Virtual Patients for Clinical Therapist Skills Training. *7th International Conference on Intelligent Virtual Agents,* Paris, France, September 2007.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Virtual Patient

Rapport Agent

- **Designed to study impact of nonverbal feedback on rapport building**
  - human speaker tells a story to a silent but attentive listener
  - "Attends" through positive contingent nonverbal feedback
- **Focus on short-term rapport, not long-term relationships**
  (c.f. Cassell&Tepper07)

Video

- **Recognizes and responds to**
  - Gestures, Facial expressions
  - Speech prosody

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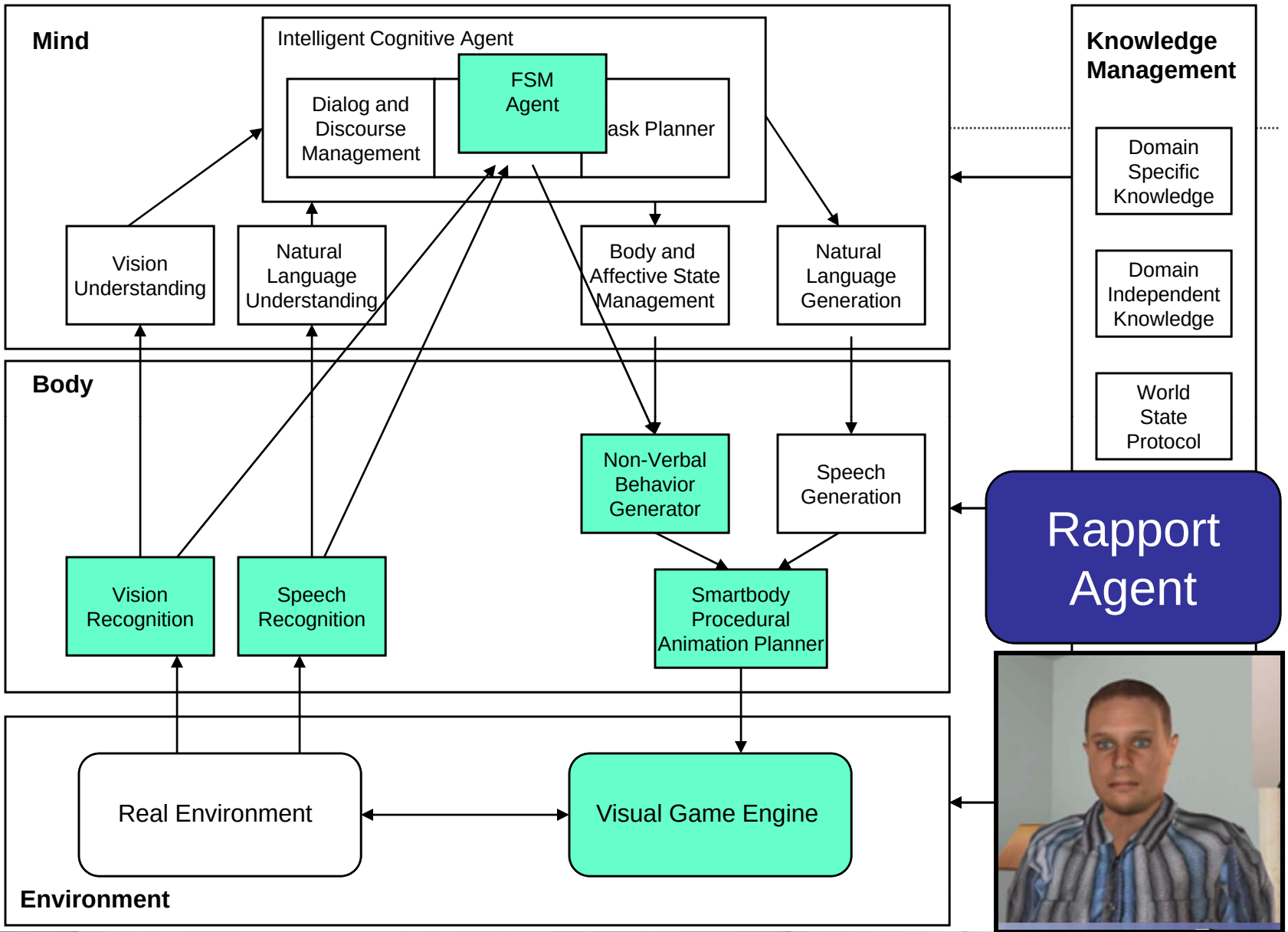
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Virtual human toolkit

- **Goal: Collection of easy to use and interoperable software modules that support virtual human development**
  - Core capabilities (NLP, Cognition, Emotion, Animation, Vision)
  - International standards
  - Authoring tools
- **Status:**
  - Many modules used internally: wide range of handholding required
  - We'll give hands-on with more mature tools
  - Some (but not all) currently available for download
  - Your job
    - Learn and have fun
    - Provide feedback
    - Cite us

Schedule

- **Today (Research)**
  - Overview of steps in creating a virtual character (Kenny)
  - Basic research talks
    - ASR, NLU, Vision, Emotion & Cognition, Behavior synthesis, Authoring
  - Software demonstrations
- **Tomorrow (Toolkit)**
  - TUTORIAL: Language processing
  - TUTORIALS: Nonverbal behavior generation
- **Friday (Play)**
  - LAB: build a virtual human