Pedagogical Agents:

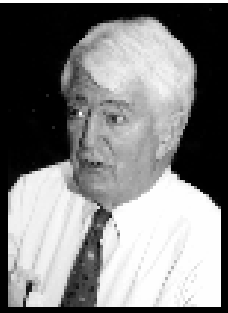
A tool for the Design and Development of Web-based Instruction

Dave Lewis
Doctoral Candidate
Instructional Technology Program
The University of South Florida

Presentation

- History
- Agent Characteristics
- Technology
- Research
- Where is the Research being done?
- Web Examples

Agent



Oliver Selfridge

- Oliver Selfridge

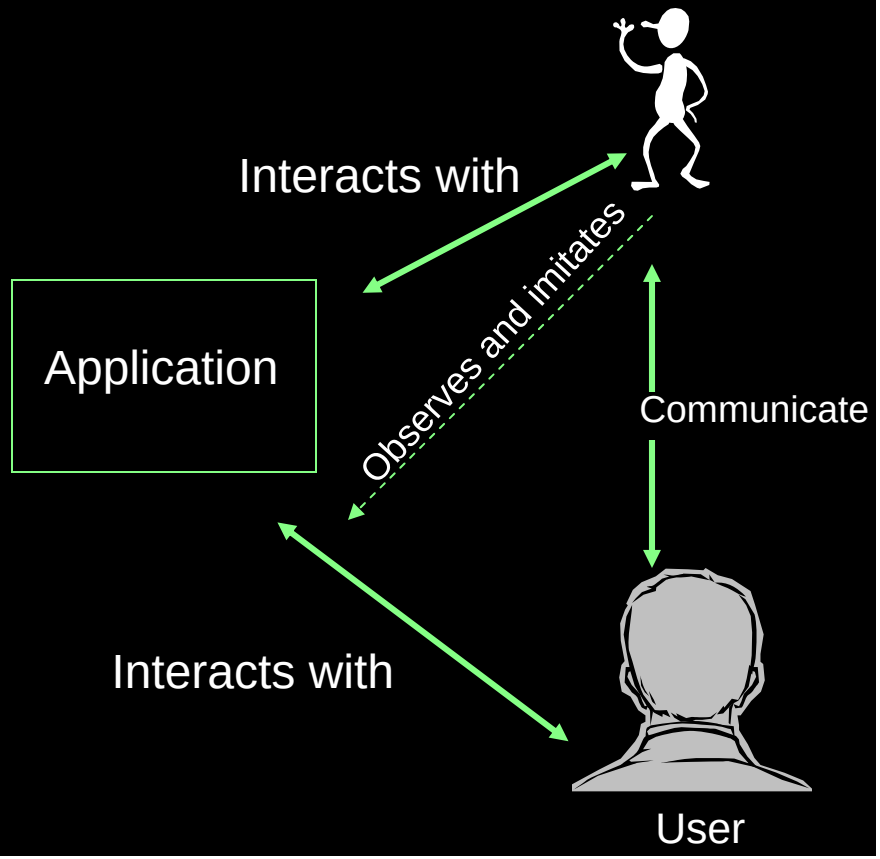
  1958 - Coined the Term “Intelligent Agent”

  - Pandemonium
    - Computer Architecture composed of agents
    - Parallel processing

Interface Agent

Pattie Maes
M.I.T.

"...computer programs that employ AI techniques to provide *active* assistance to a user with computer-based tasks."
(Maes, 1994)



Agent Characteristics

Agent Characteristics

- Embodiment
- Trainable
- Mobile
- Autonomy
- Intelligence

Franklin, S., and Graesser, A. (1997).
Is it an Agent, or Just a Program?: A Taxonomy for Autonomous Agents

Embodiment

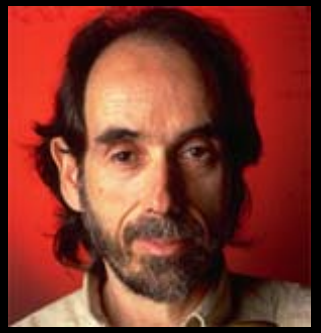
Embodied

Virtual

Physical

Disembodied

Trainable



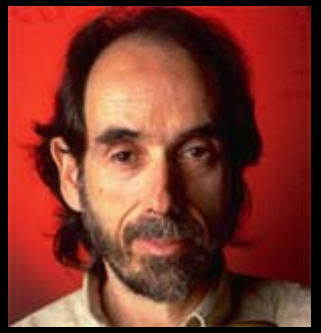
Henry Lieberman
M.I.T.

Can be trained in just like humans

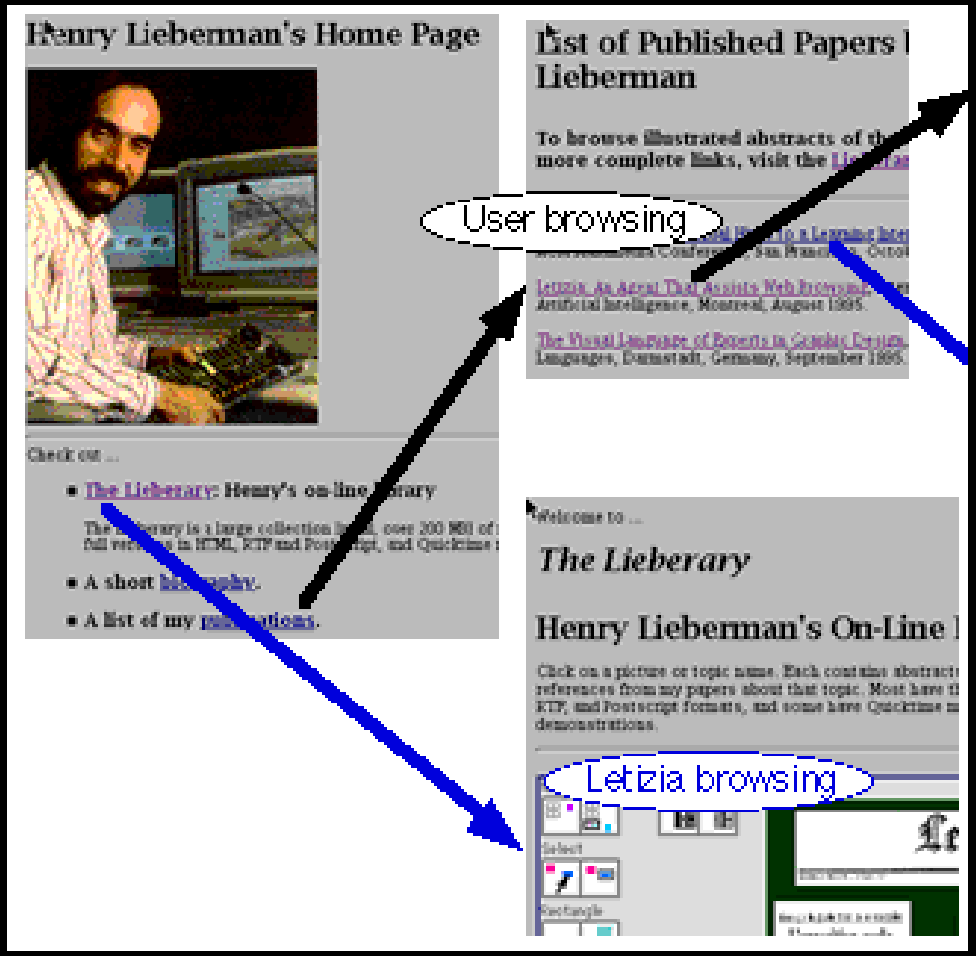
Agents

- build up a memory of user actions
- try to predict actions of users
- Situations are analyzed
- may offer a suggestion or may act

Training Examples

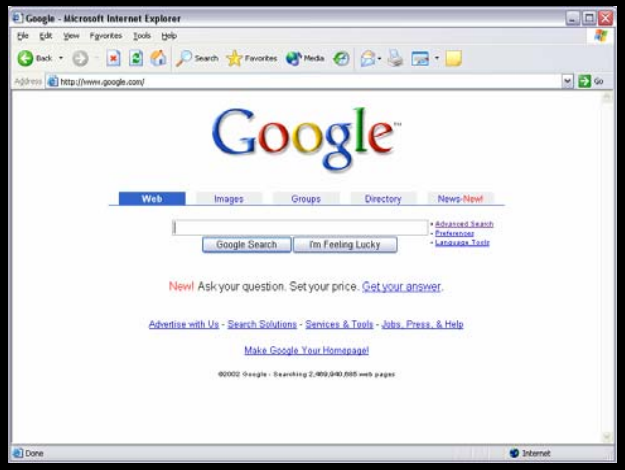


Henry Lieberman
M.I.T.

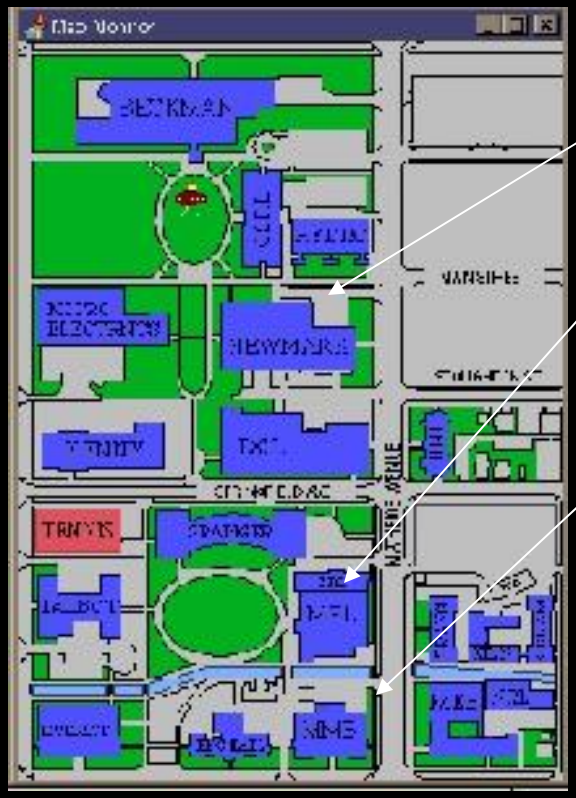


Mobility

- Agents can move across network
- Execute on host machines
- Examples
  - Virus (malicious)
  - Search Engine Bots



Mobility (i.e. HyperCampus)



Library
Service A

Service B
Gymnasium

University
Center
Service C

Customer - *Katashi Nagao*

GPS
Infrared receiver
Personal database

Customer host

Intelligence?

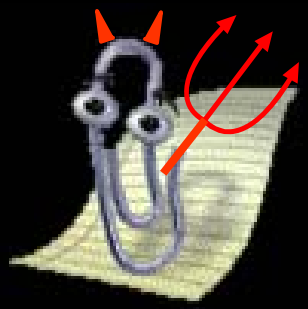
Katherine Isbister

- Perceived Intelligence

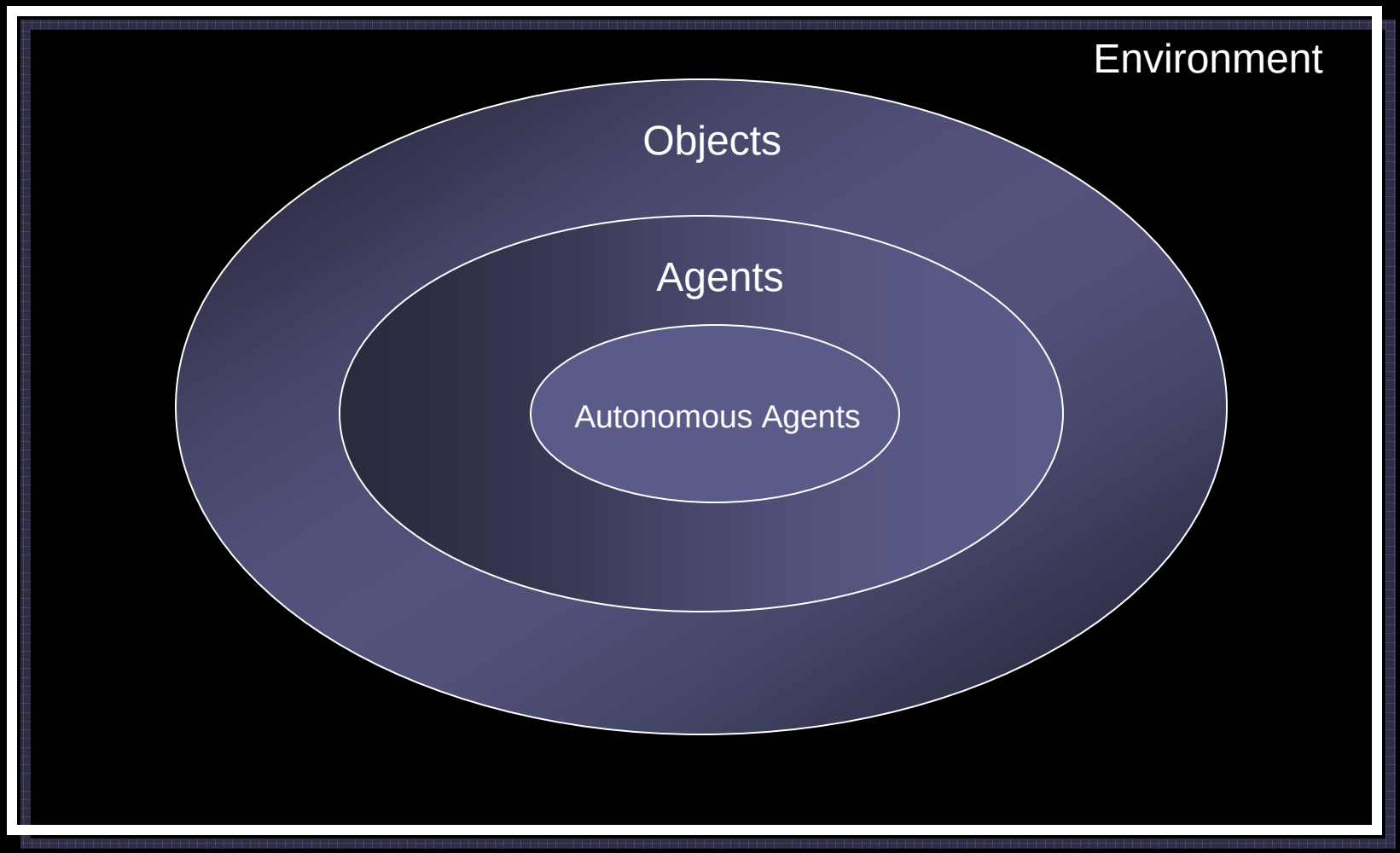
  or

- True Intelligence

Perceived Intelligence

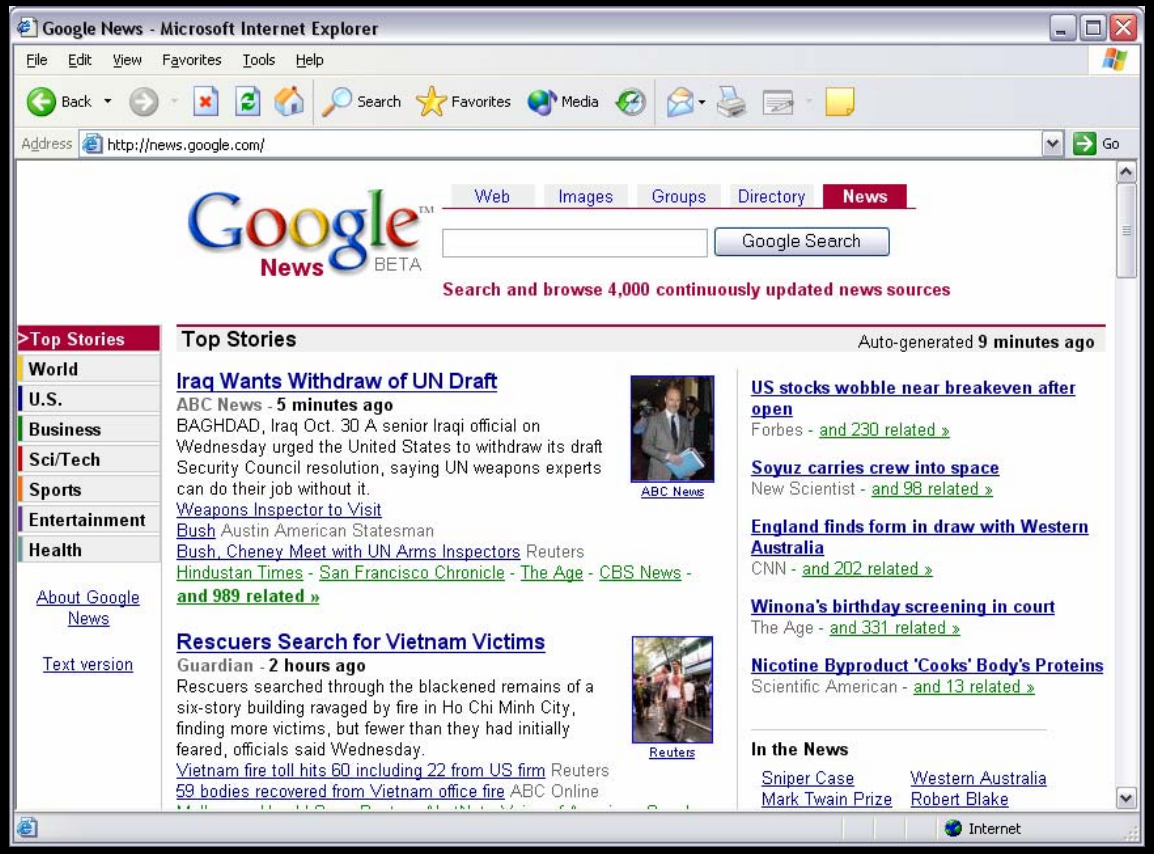


Autonomy



(Luck & d'Inverno, 1995)

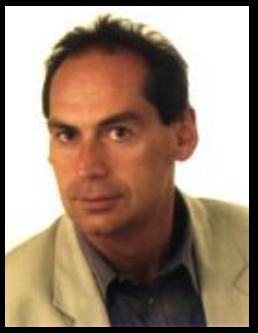
Autonomy - example



Google News

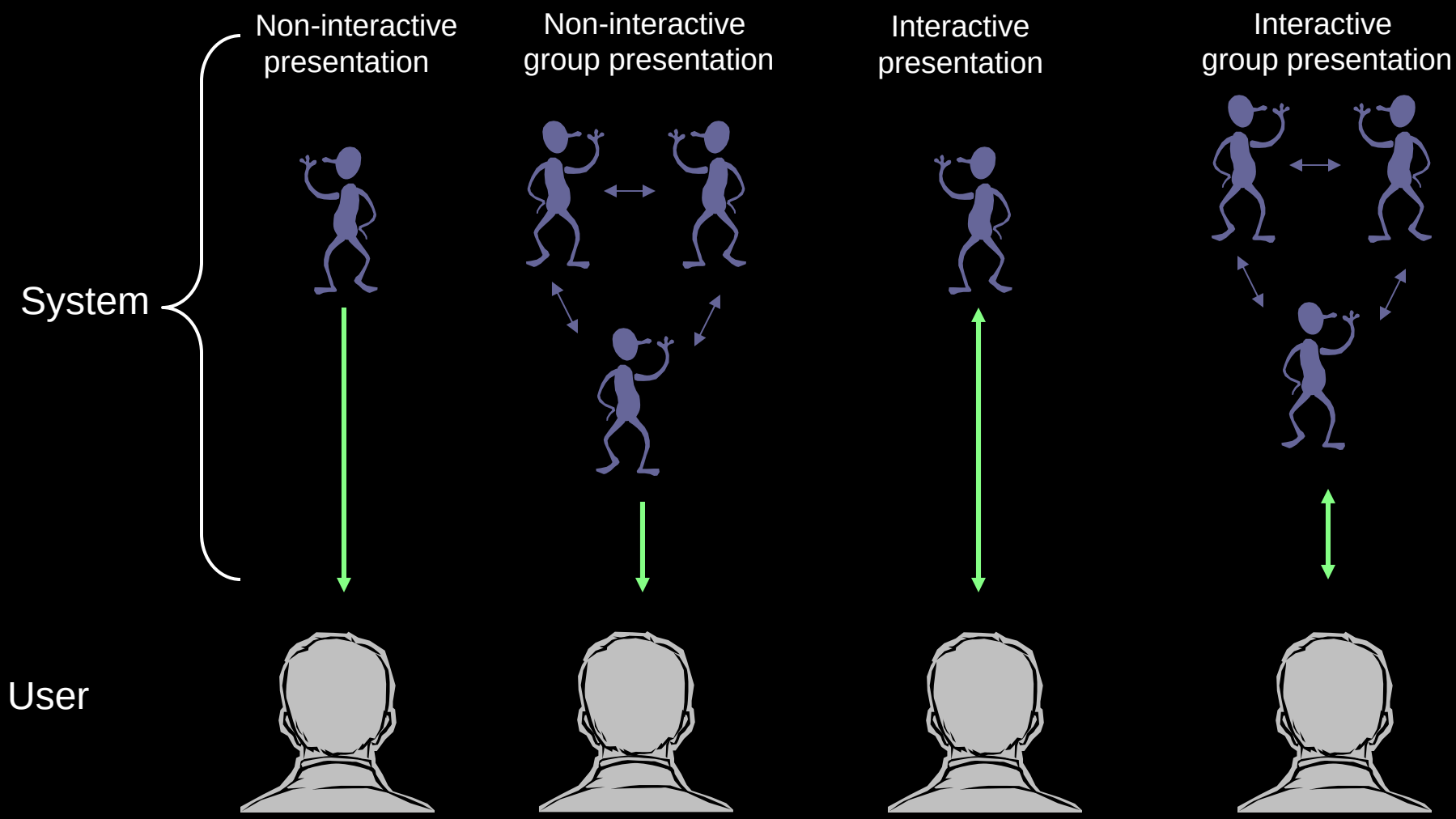
Fictional Character

Autonomy:
Multi-agent Systems



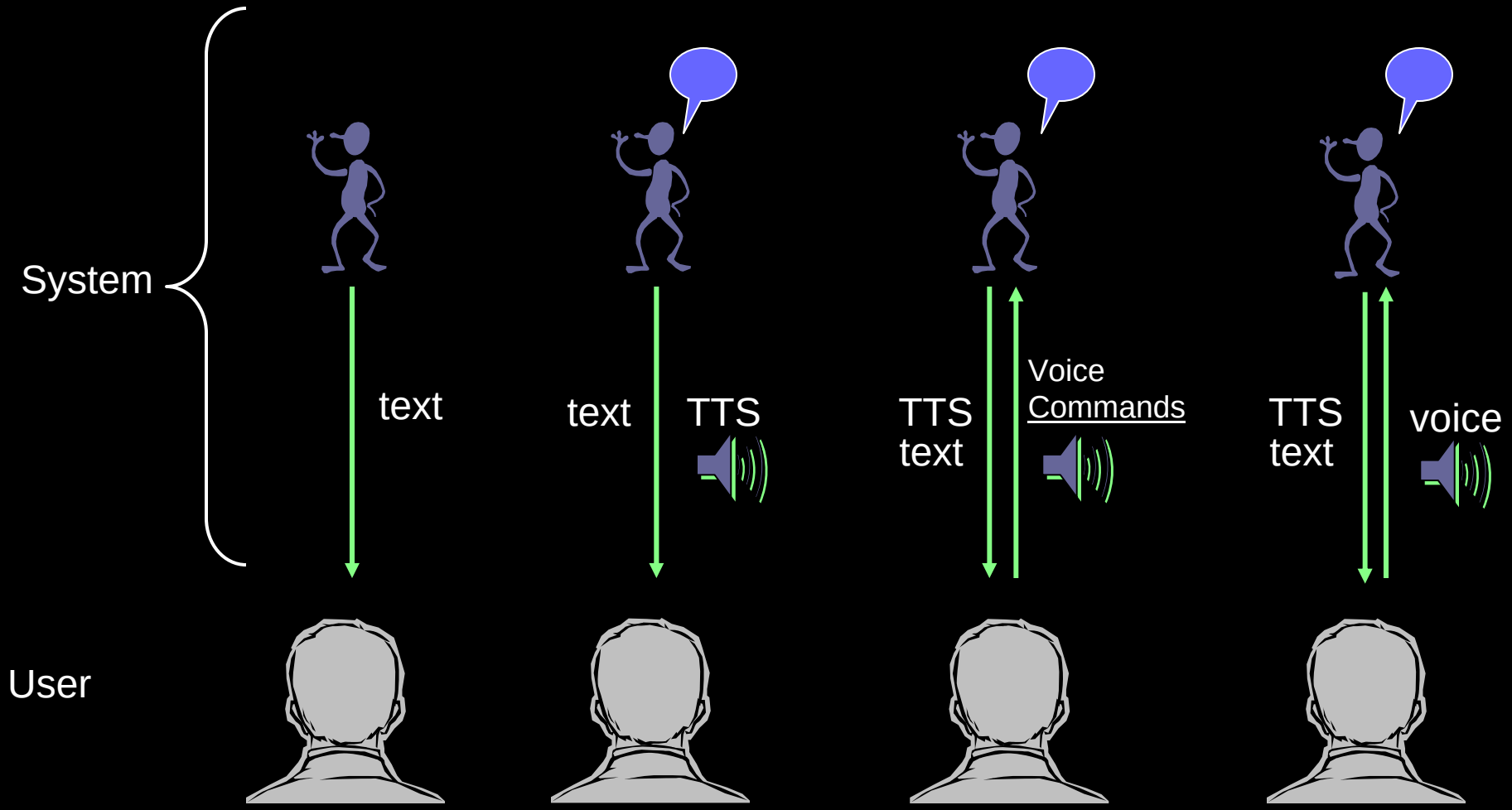
Thomas Rist
German Research Cente
for Artificial Intelligence

Types of Agent-Based Presentations



(Rist, 2002)

Types of Agent-Based Interactions



AutoTutor

THE UNIVERSITY OF MEMPHIS

www.autotutor.org

Tutor Simulation

- simulates the discourse patterns and pedagogical strategies of a typical human tutor
- delivers a dialogue move, the student types a response

Tutors

- Introductory computer literacy
- Physics

AutoTutor

THE UNIVERSITY OF MEMPHIS

www.autotutor.org

Six major components

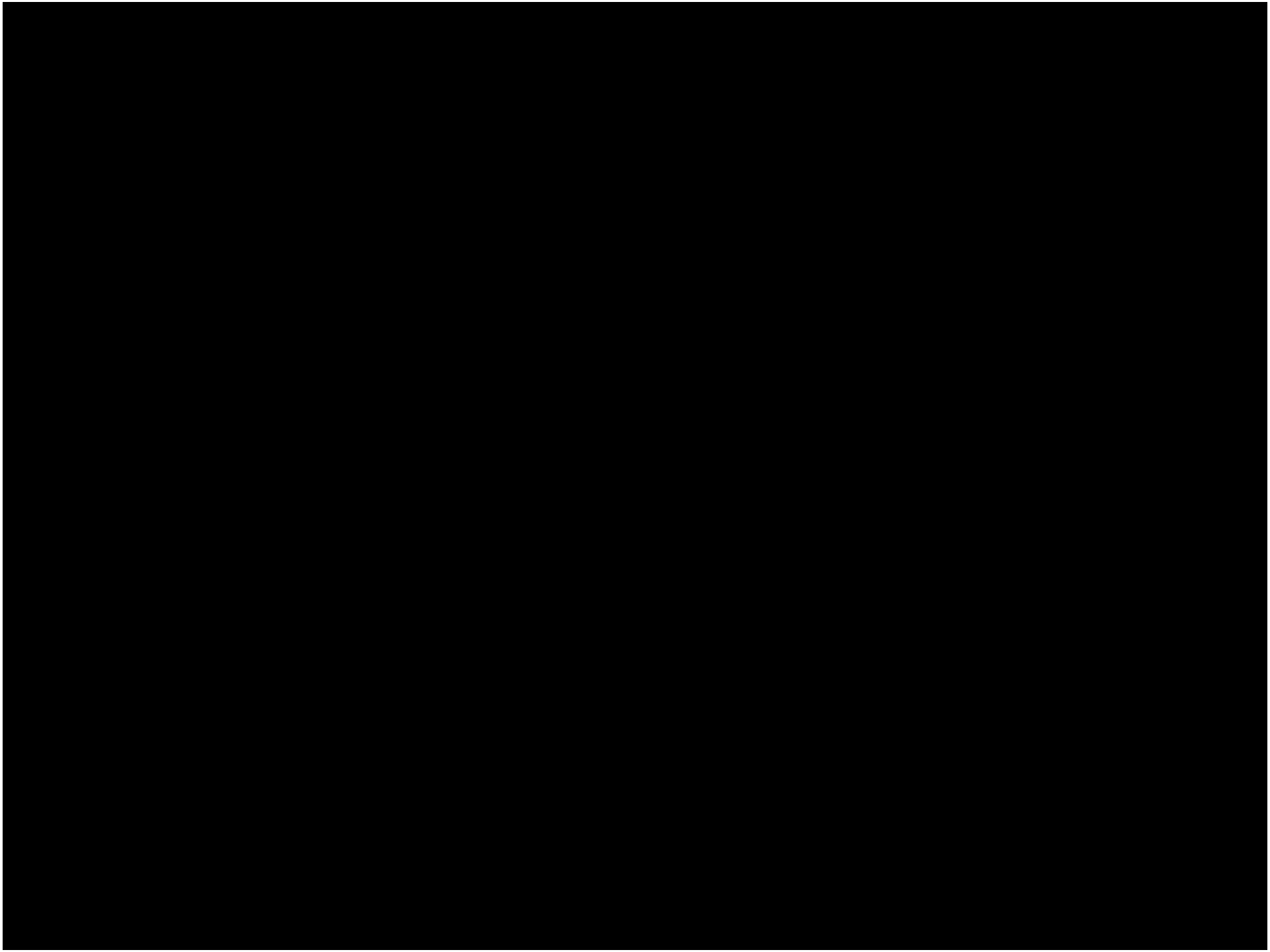
1. curriculum scripts
2. language extraction modules
3. latent semantic analysis (LSA)
4. topic selection rules
5. dialogue move generation rules
6. and the embodied agent

Technology

Microsoft Agent

Microsoft Bob

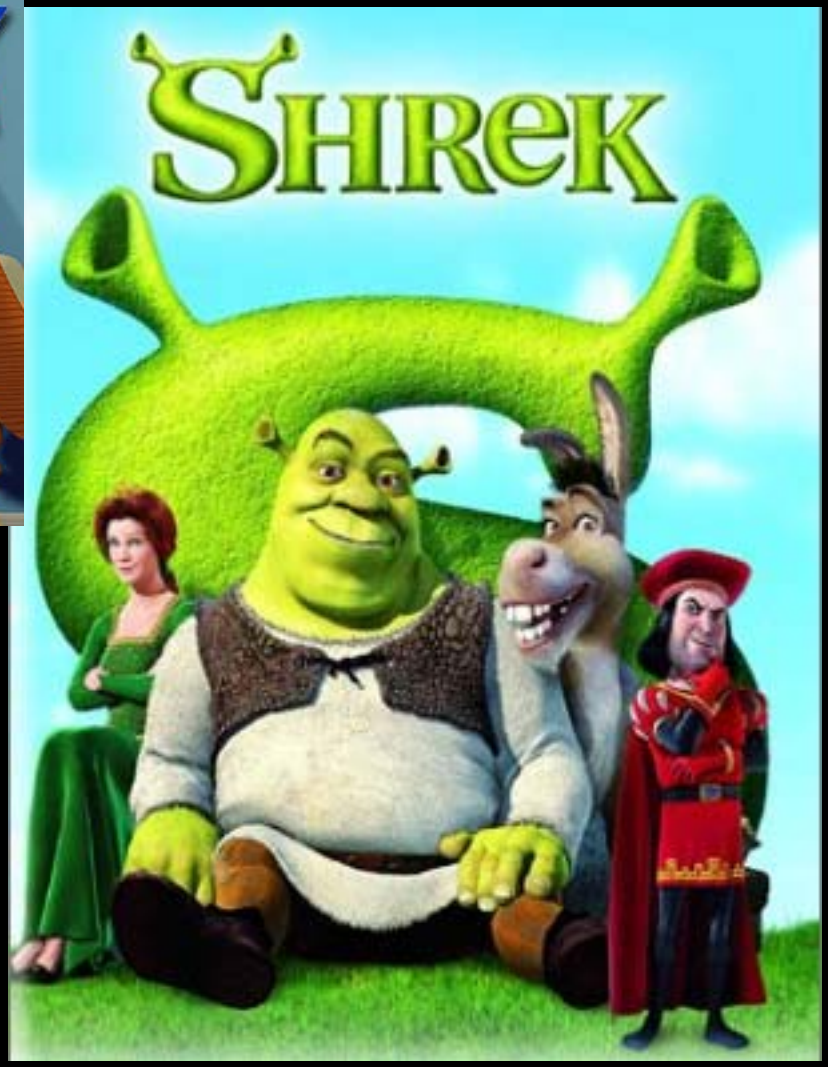
Microsoft Agent



Agent Framework

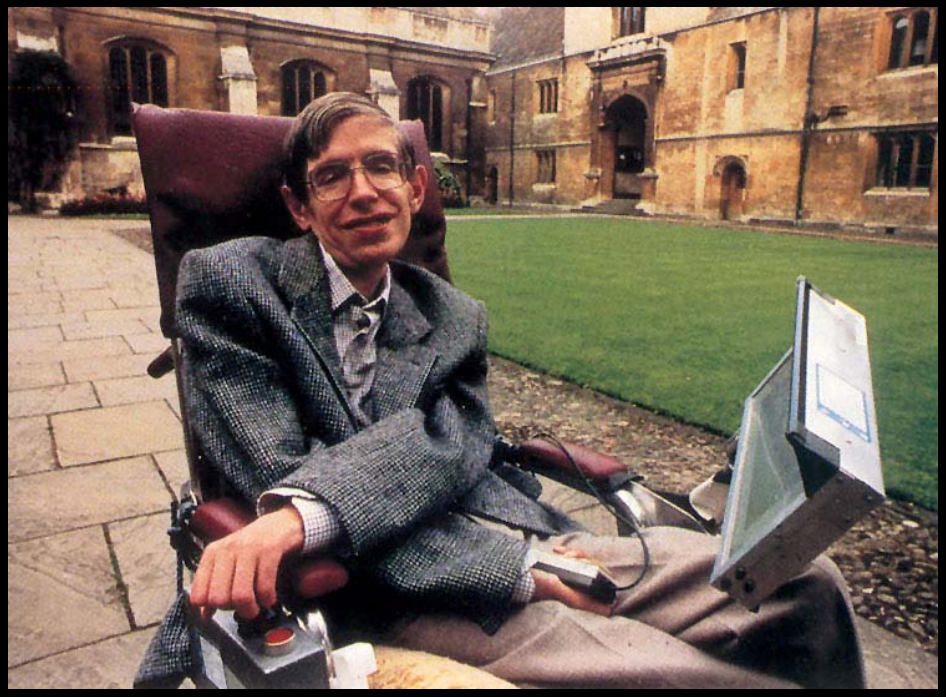
- Three components
  - Visual - Animation
  - Verbal – Text-to-speech (TTS)
  - Programming - VBScript

Animation - Digital Actors



Microsoft Agent Character Editor

Synthetic Speech
Text-to-Speech (TTS)



Dr Stephen Hawking

DecTALK - 1983

How may I help you? – AT&T

Programming

- VBScript
- JavaScript

```
<OBJECT ID="AgentControl" width=0 height=0
 CLASSID="CLSID:D45FD31B-5C6E-11D1-9EC1-00C04FD7081F"
 CODEBASE="#VERSION=2,0,0,0">
</OBJECT>
```

Visual

```
<OBJECT ID="TruVoice" width=0 height=0
 CLASSID="CLSID:B8F2846E-CE36-11D0-AC83-00C04FD97575"
 CODEBASE="#VERSION=6,0,0,0">
</OBJECT>
```

Verbal

```
<SCRIPT language=VBScript>
Sub Window_OnLoad()
        AgentControl.Characters.Load "Merlin",
“C:\WINDOWS\MSAGENT\chars\merlin.acs"
        Set Merlin = AgentControl.Characters("Merlin")
        Merlin.LanguageID = &H409
        Merlin.Show
        Merlin.Speak "Hello and Welcome to the University of
                South Florida!"
        Merlin.hide
End Sub
</SCRIPT>
```

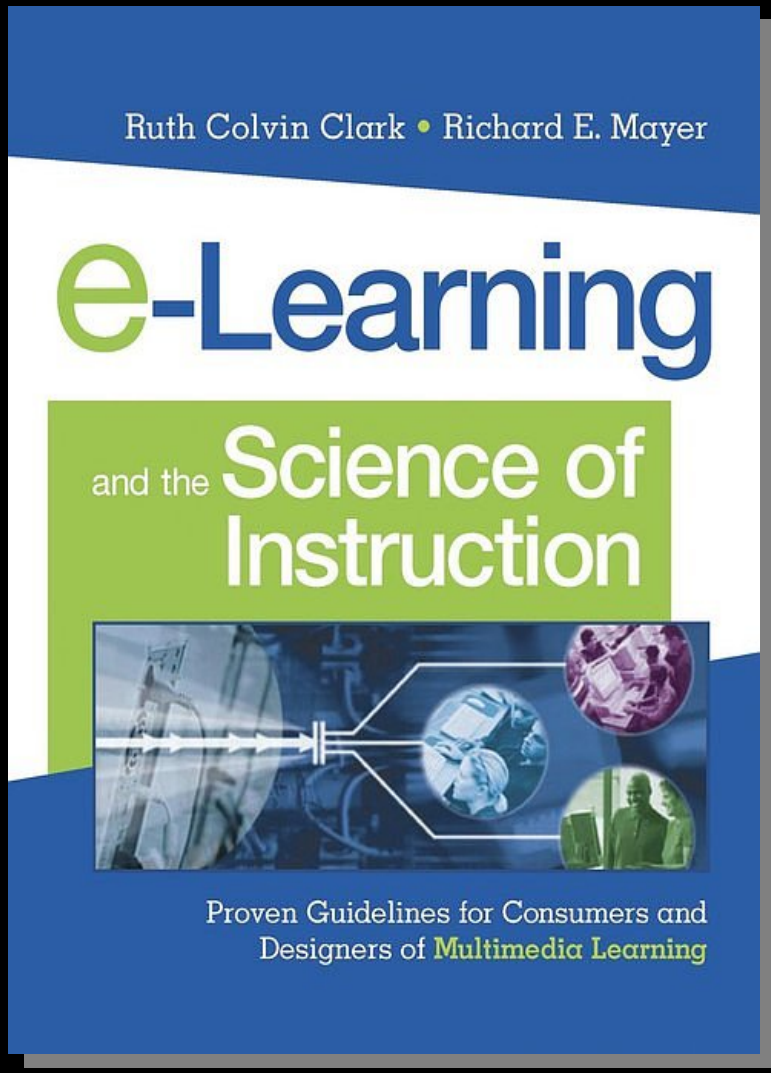
Programming

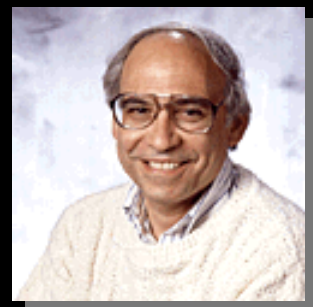
MASH

http://www.bellcraft.com

The **M**icrosoft **A**gent **S**cripting **H**elper

Research





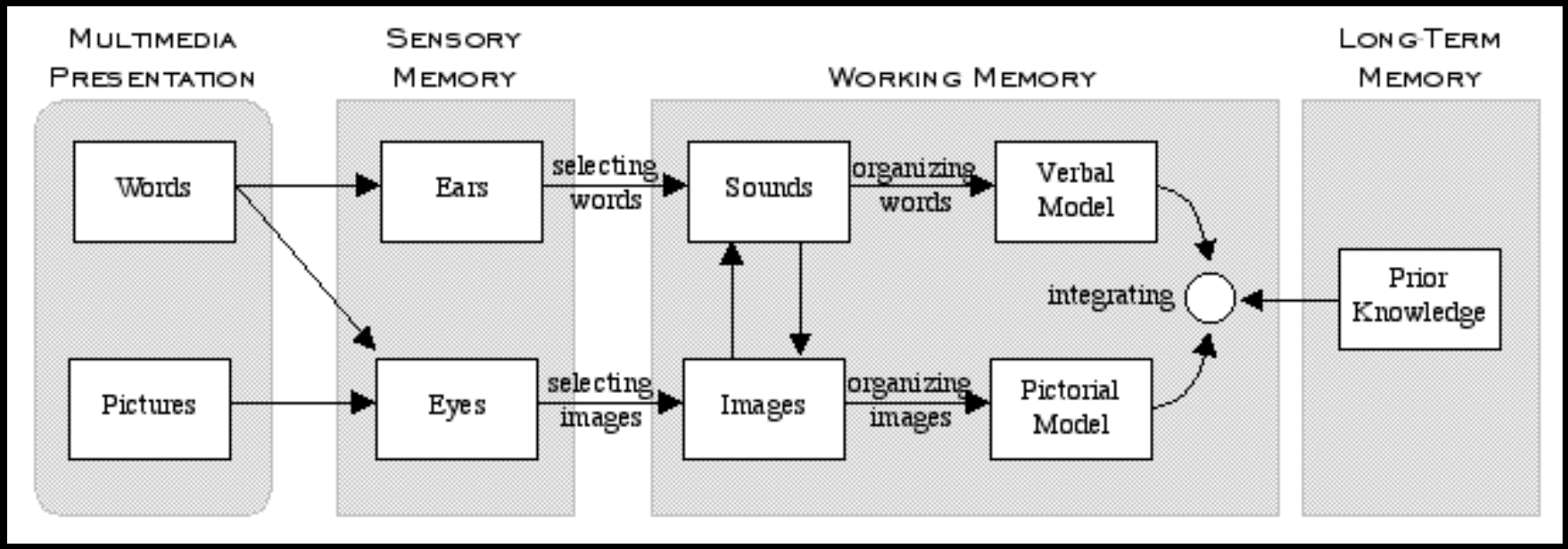
Richard Mayer
University of California, Santa Barbara

The Modality Principle

Dual Coding Theory

- Auditory
- Visual

Multimedia Learning



Anthropomorphism debate?

Ben Shneiderman
University of Maryland

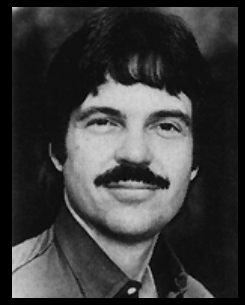
Clifford Nass
Stanford University

1983 - “Direct manipulation”

1993 - Social Responses to Communication Technology

Ben Shneiderman

Direct manipulation vs. Manipulation management



Alan Kay

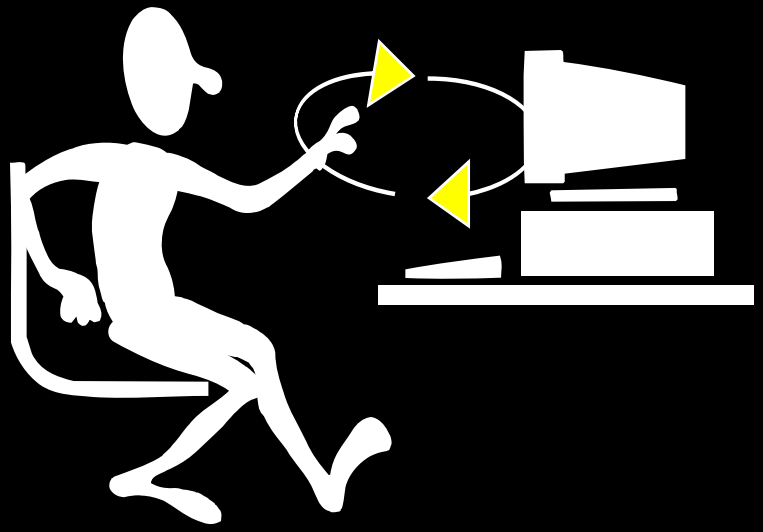
- Coined the term - 1983- “Direct manipulation”
- Alan Kay - “Manipulation management” of the interface (Kay, 1990)

Sketchpad: The First Interactive Computer Graphics

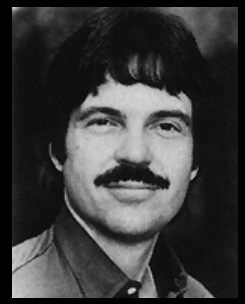
Ivan Sutherland – M.I.T. - Ph.D. Dissertation, 1963

Ben Shneiderman

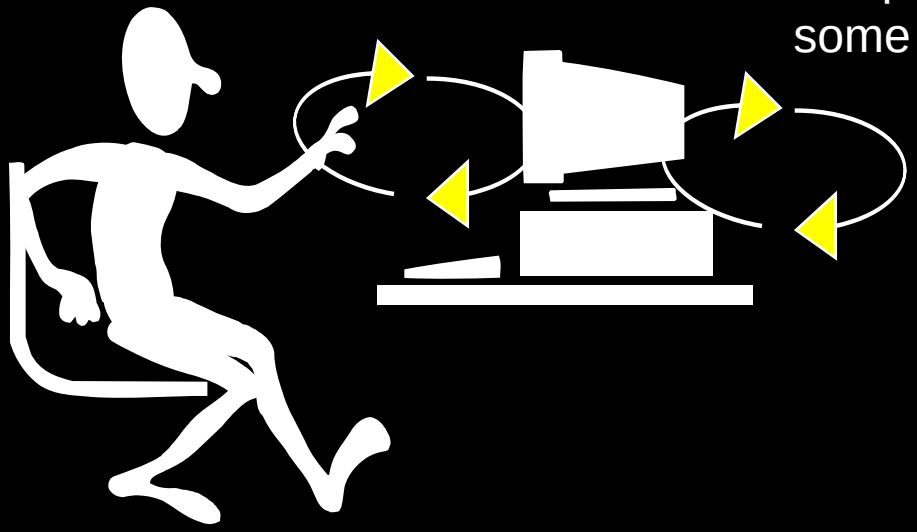
Direct Manipulation



Manipulation Management

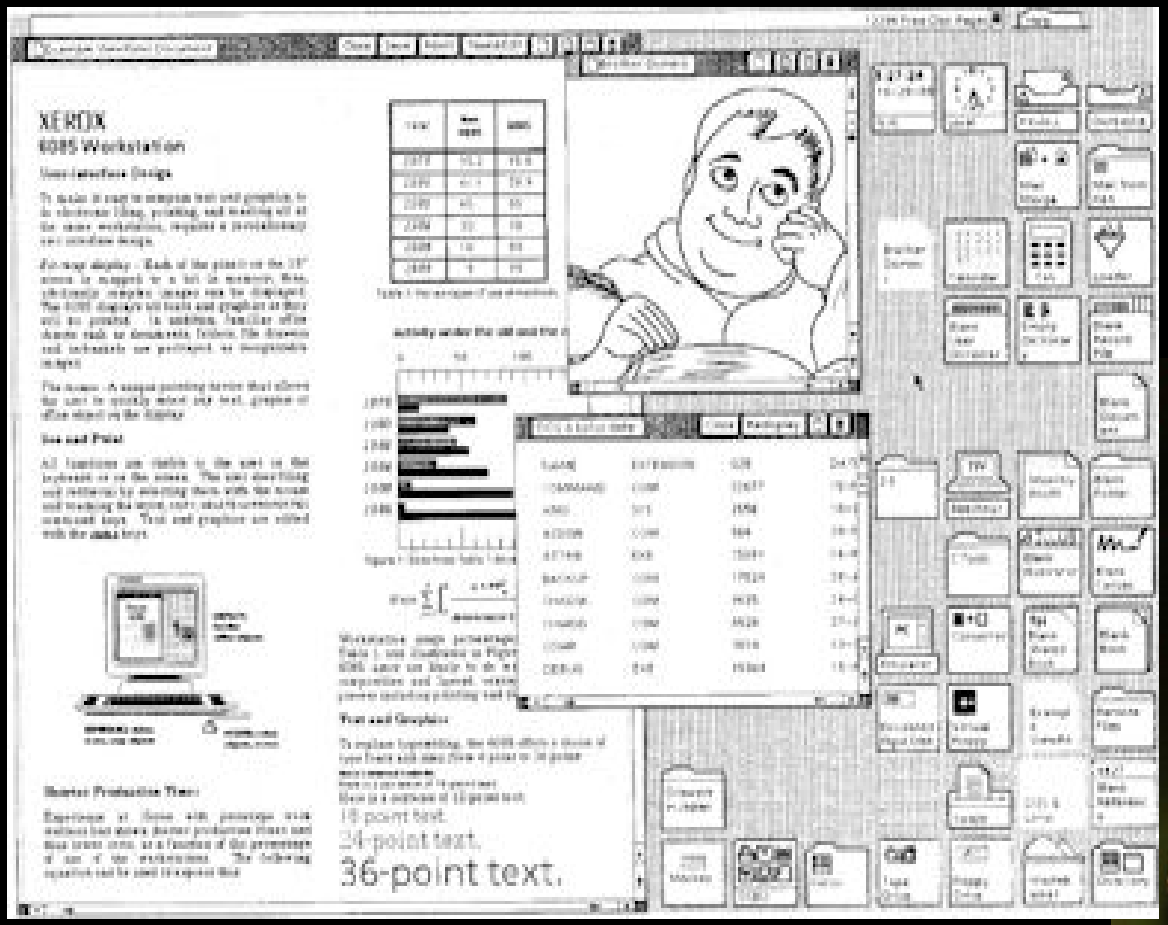


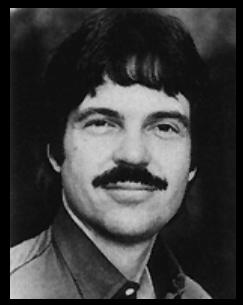
Alan Kay



Computer Automates some process

Xerox Star - 1981

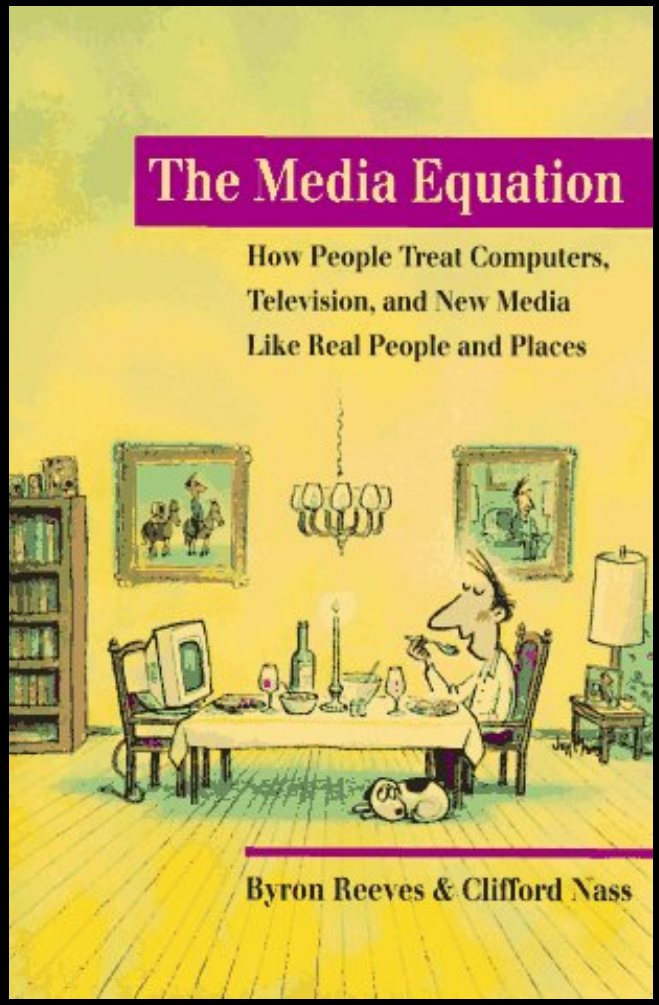




Alan Kay

Social Responses to Communication Technology

Clifford Nass



“Computers Are Social Actors” Paradigm

Clifford Nass

- Humans react to computers as if they were human
- human brains are “tricked” by 21st century technologies into reacted as if they were human

Ethopoeia

Clifford Nass

"Which characteristics of computers encourage which individuals to use which social rules when using a technology?"

Gender and Computers?

Youngme Moon

- 2x2x2x2
- N=40

Subject Gender x Tutor voice:
Male/Female x Evaluator Voice:
Male/Female x Topic: Computers, Love and relationships

- people tend to treat computers differently, depending on the gender of their synthetic "voices."

Gender and Computers?

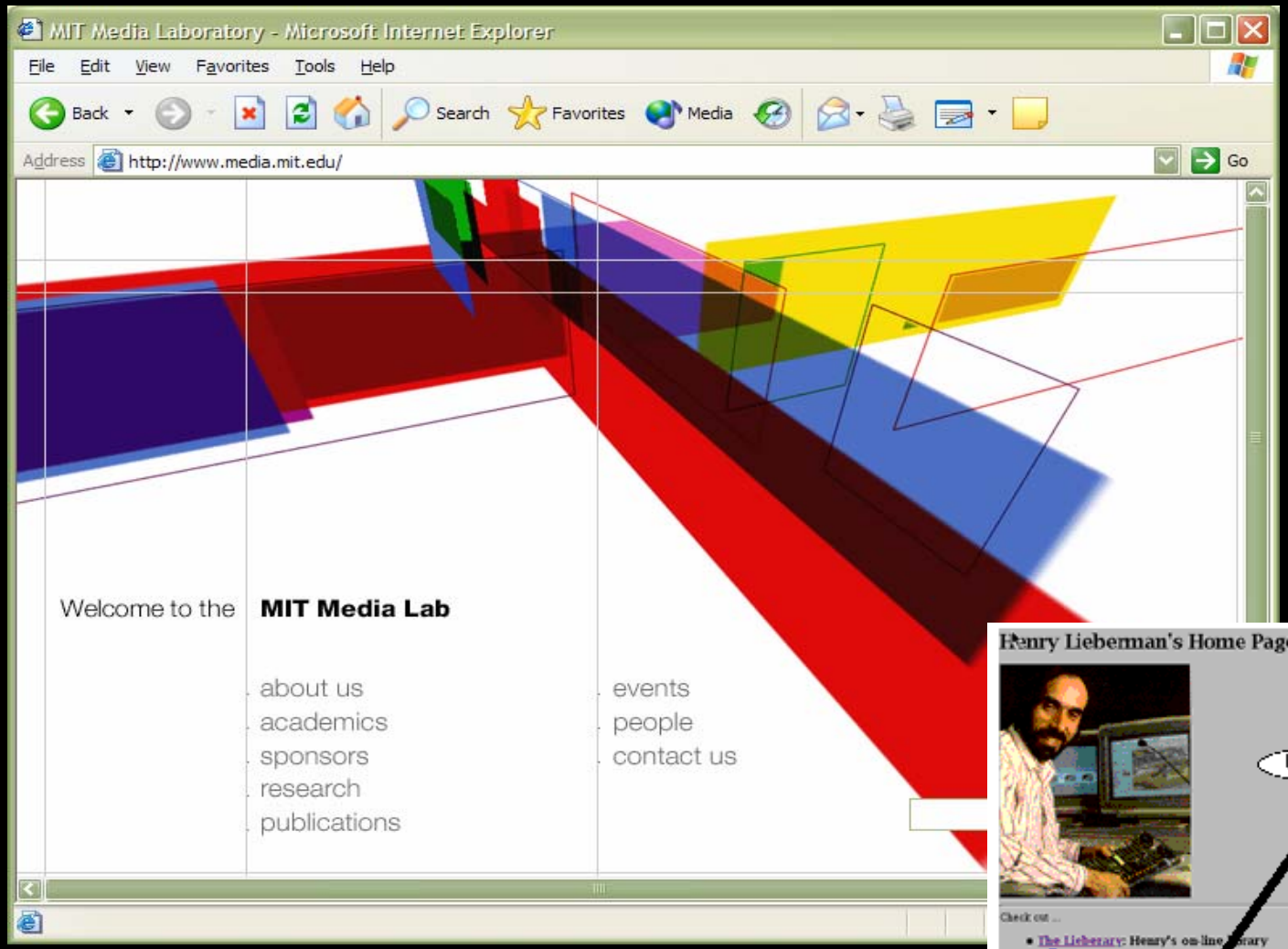
- “women know more about subjects that are typically regarded as ‘feminine’”
  - i.e. Love and relationships
- “men know more about subjects that are typically regarded as masculine” (Nass et al., 1997)
  - i.e. Computers

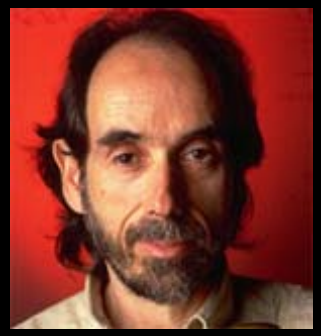
Gender and Computers?

"We are not supporting gender stereotyping but we are identifying something that people designing products should be sensitive about..."

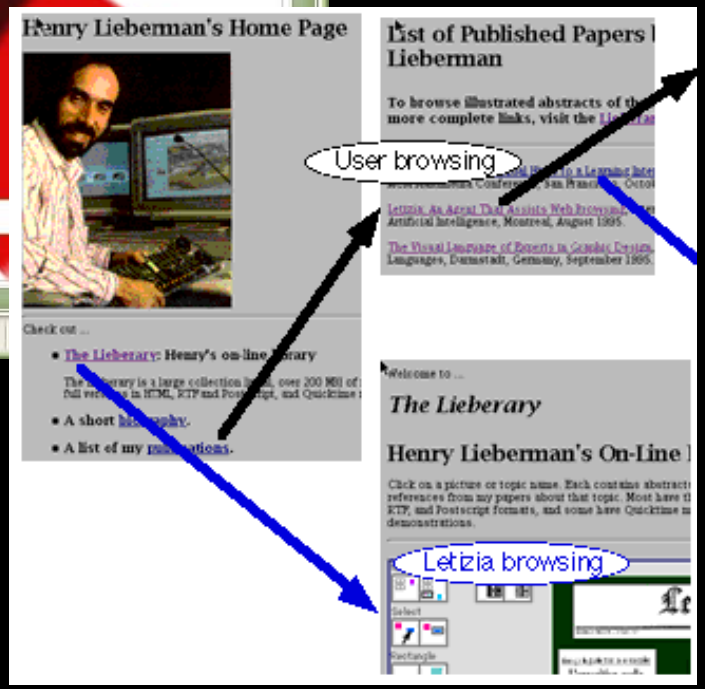
Clifford Nass

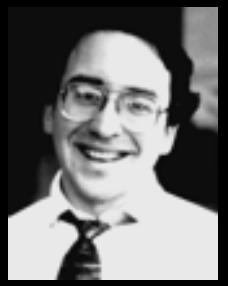
Where is this work being done?





Henry Lieberman
M.I.T.





Clifford Nass
Stanford University

CSLI Center for the Study of Information and Technology -- Stanford University - Microsoft Internet Explorer

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Address http://www-csli.stanford.edu/ Go

CSLI

Stanford University
Center For The Study Of
Language And Information

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The Center for the Study of Language and Information **(CSLI)** is an Independent Research Center founded in 1983 by researchers from Stanford University, SRI International, and Xerox PARC (now just PARC).

CSLI is devoted to research in the emerging science of information, computing, and cognition. This new science had its origins in the late 1970s as computer scientists, linguists, logicians, philosophers, psychologists, and artificial intelligence researchers, seeking solutions to problems in their own disciplines, turned to one another for help.

Featured Research Group

The Stanford Encyclopedia of Philosophy implements the new digital library concept of a "dynamic reference work"---it is a highly customized work-flow system by which the members of an entire discipline can collaboratively maintain a refereed reference work that not only introduces (for beginners) traditional philosophical topics

Upcoming Events

Weekly Calendar of Public Events.

Other events in the local area of interest to the CSLI community.

Information

Staff and phone numbers

Internet

The IntelliMedia Initiative - Microsoft Internet Explorer

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Address http://www.csc.ncsu.edu/eos/users/l/lester/www/imedia/index.html Go

IntelliMedia

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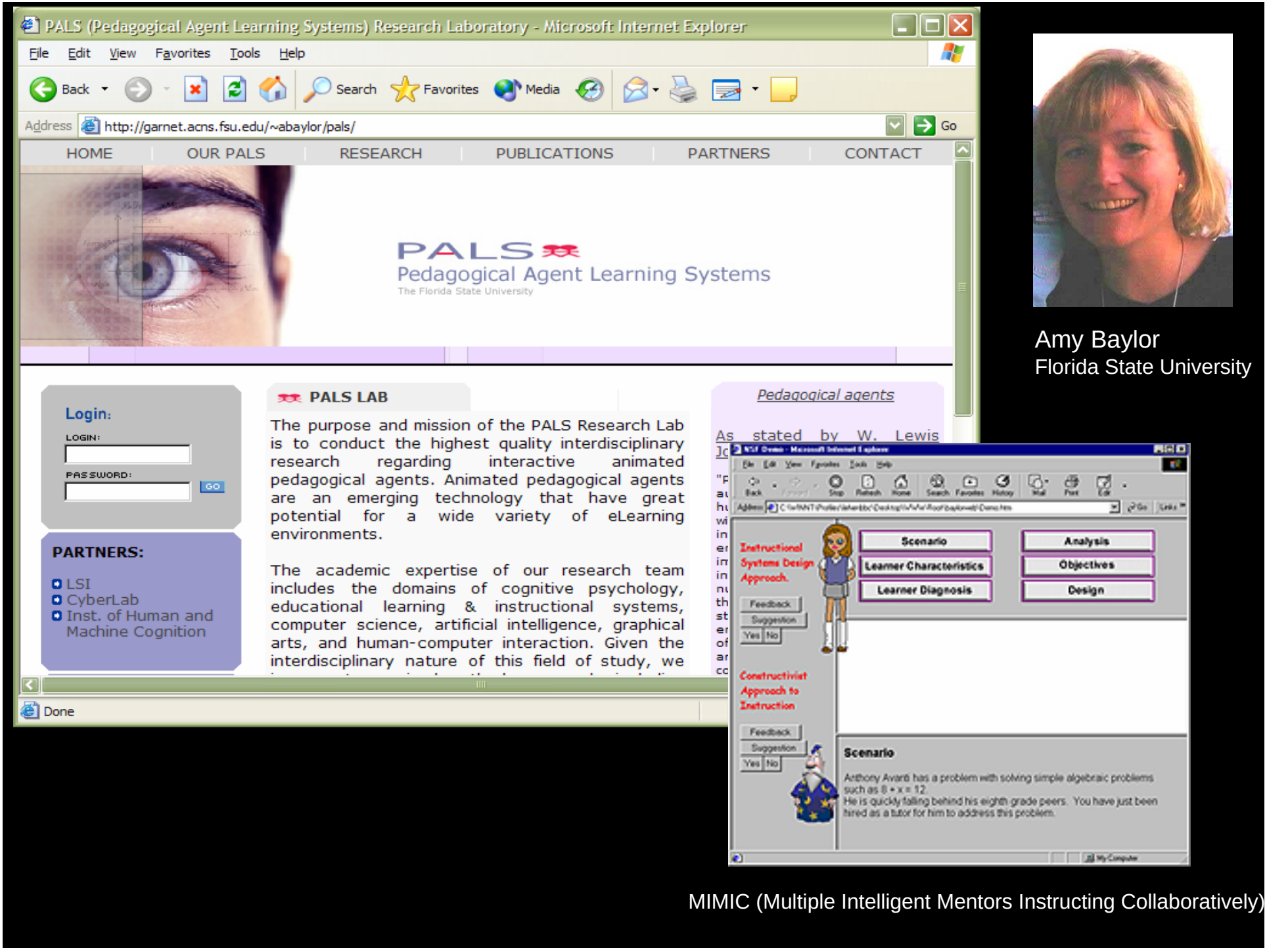
The IntelliMedia Initiative is a large-scale multi-disciplinary research program on intelligent multimedia technologies. By fusing the inferential capabilities of artificial intelligence with sophisticated 3D animation, the IntelliMedia team creates knowledge-based multimedia learning environments and problem-solving environments that are populated by intelligent animated agents. The mission of the IntelliMedia Initiative is threefold, focusing on research, development, and education:

- ***Research*: To conduct multi-disciplinary research on intelligent multimedia technologies combining AI, multimedia design, animation, and cognitive science.**
- ***Development*: To create intelligent multimedia software for K-12, higher education, and just-in-time training and intelligent help systems for corporate and government training.**
- ***Education*: To create a new generation of hybrid computer**

Done

James Lester
North Carolina
State University

Herman-the-bug



Amy Baylor
Florida State University

MIMIC (Multiple Intelligent Mentors Instructing Collaboratively)

Center for Advanced Research in Technology for Education - Microsoft Internet Explorer

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Address http://www.isi.edu/isd/carte/ Go

Center for Advanced Research in Technology for Education

The Center for Advanced Research in Technology for Education (CARTE) is concerned with the development, evaluation, and deployment of new technologies for education. CARTE is part of the Information Sciences Institute at the University of Southern California, a leading developer of technology for education, particularly in the areas of pedagogical agents and intelligent assistants. CARTE was established to encourage new technology development initiatives, and to facilitate the transfer of successful technologies into educational practice.

We at CARTE believe that software and networking technologies will have a broad and dramatic impact on education and training. However, this potential will not be realized without close cooperation between educational technologists and educational practitioners. CARTE personnel assist educators and training specialists in introducing new educational technologies in evaluating their impact on student performance. These studies help to identify technologies that are ready for broad dissemination, and guide further technology development.

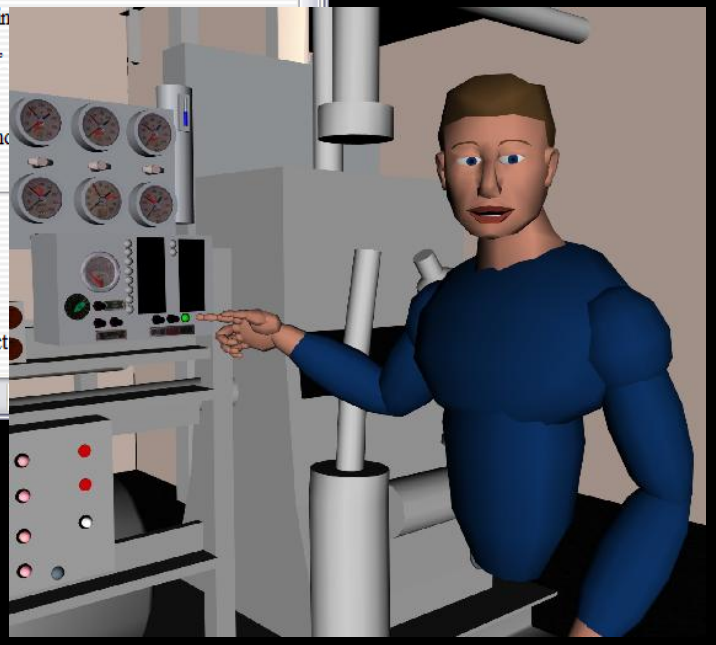
CARTE is a multidisciplinary center that includes artificial intelligence specialists, multimedia designers, cognitive psychologists, and researchers.

CARTE Projects
Updated 1/30/03

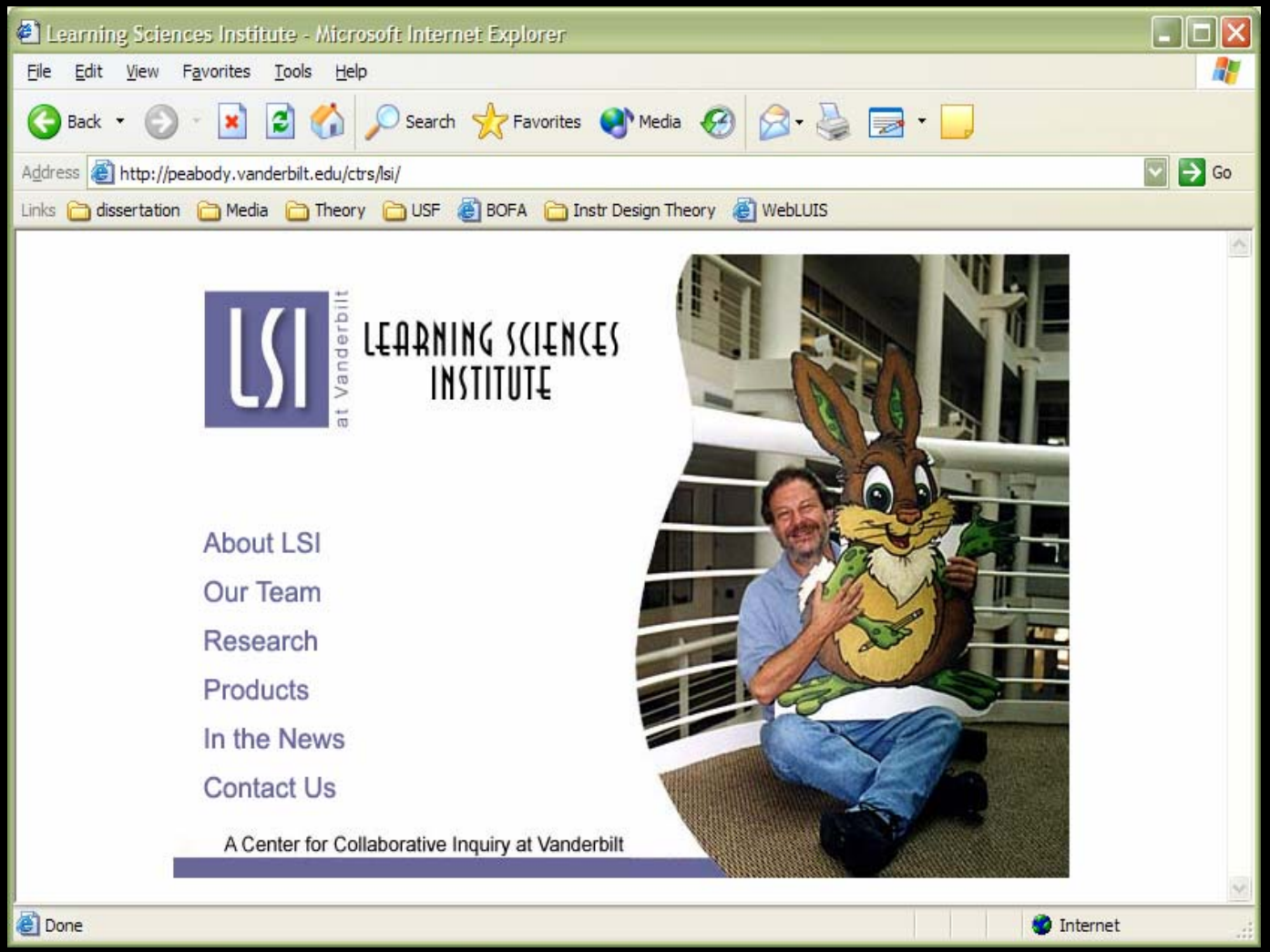
We are currently updating all project pages. The list below is only partial. Please check back soon for more project

Lewis Johnson

University of Southern California



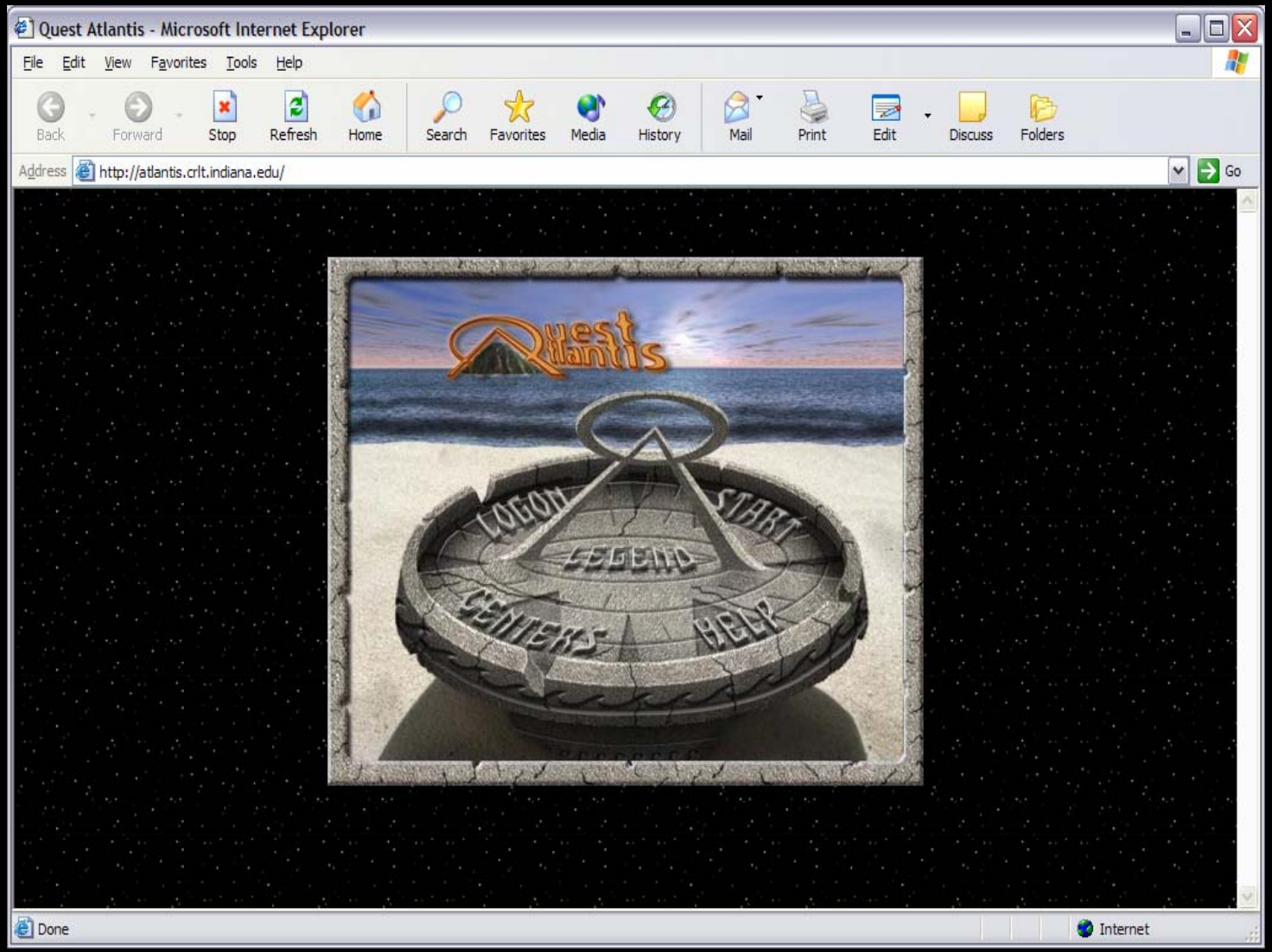
Steve (Soar Training Expert for Virtual Environments)



John Bransford

Nancy Vye
Vanderbilt

INDIANA UNIVERSITY



THE UNIVERSITY OF MEMPHIS

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AutoTutor

trg Tutoring Research Group

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Funding Agencies

Office of Naval Research
National Science Foundation

Contributing Institutions

Institue for Intelligent Systems
CAPR
Tutoring Research Group
University of Memphis
Rhodes College

Welcome to the Autotutor Homepage!

AutoTutor is an intelligent tutoring system developed by an interdisciplinary research team.This team is currently being funded by the Office of Naval Research and the National Science Foundation and is is comprised of approximately 35 researchers from psychology, computer science, linguistics, physics, engineering, and education. The TRG has conducted extensive analyses of human-to-human tutoring, pedagogical strategies, and conversational discourse. This research has provided the empirical and theoretical foundations for developing intelligent tutoring systems that help the students learn by engaging them in a natural language conversation about a particular subject matter. Currently AutoTutor comes in two forms: (1) Why/AutoTutor, a computer tutor on conceptual physics, and (2) AutoTutor, a computer tutor on computer literacy.

Done Internet

Microsoft Speech - Home - Microsoft Internet Explorer

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Microsoft .net Enterprise Servers

Microsoft .NET Speech Technologies

MSDN Webcast

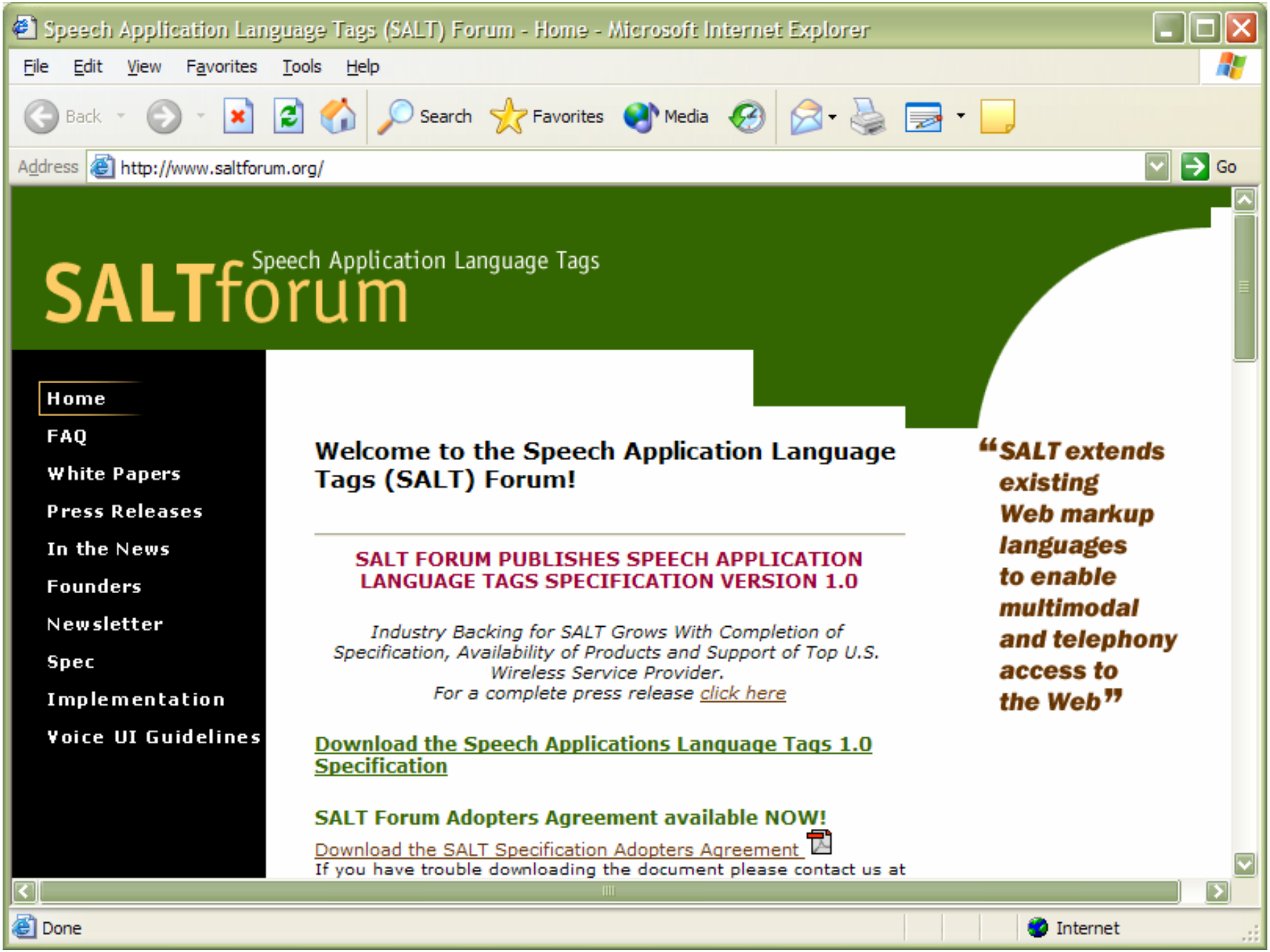
Learn more about Microsoft .NET Speech Technologies and tools by attending our free Web seminar series. Our next sessions are:

MSDN Web Cast: Voice User Interface Design - Purpose and Process
April 29, 2003
11:00 A.M. - 12:30 P.M. Pacific Time
To register for this Web seminar, click here, and click **Enroll in this Event**.

MSDN Web Cast: Building the SALT Ecosystem: A Showcase of SALT-based Browsers
May 1, 2003
10:00 A.M. - 11:30 A.M. Pacific Time
To register for this Web seminar, click here, and click **Enroll in this Event**.

News

- Web Developers Bring Speech Technology to the Mainstream With SALT
- Microsoft Releases New Features, Enhancements to .NET Speech SDK; Announces Technical Preview of .NET Speech Platform And Joint Development Program
- Intel and Microsoft Collaborate on Development of Speech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For a complete press release click here
Download the Speech Applications Language Tags 1.0 Specification
SALT Forum Adopters Agreement available NOW!
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"SALT extends existing Web markup languages to enable multimodal and telephony access to the Web"
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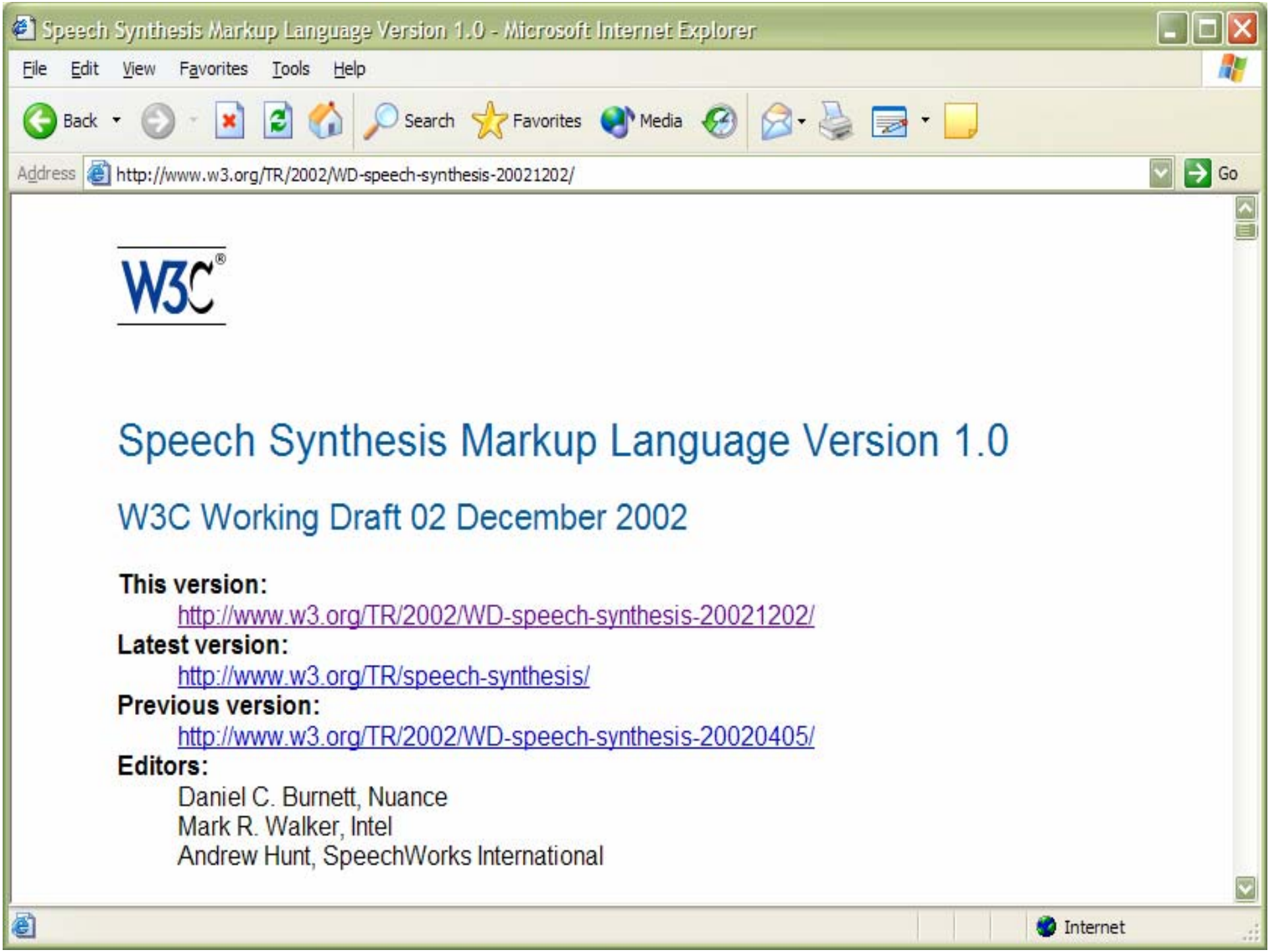
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W3C Working Draft 02 December 2002
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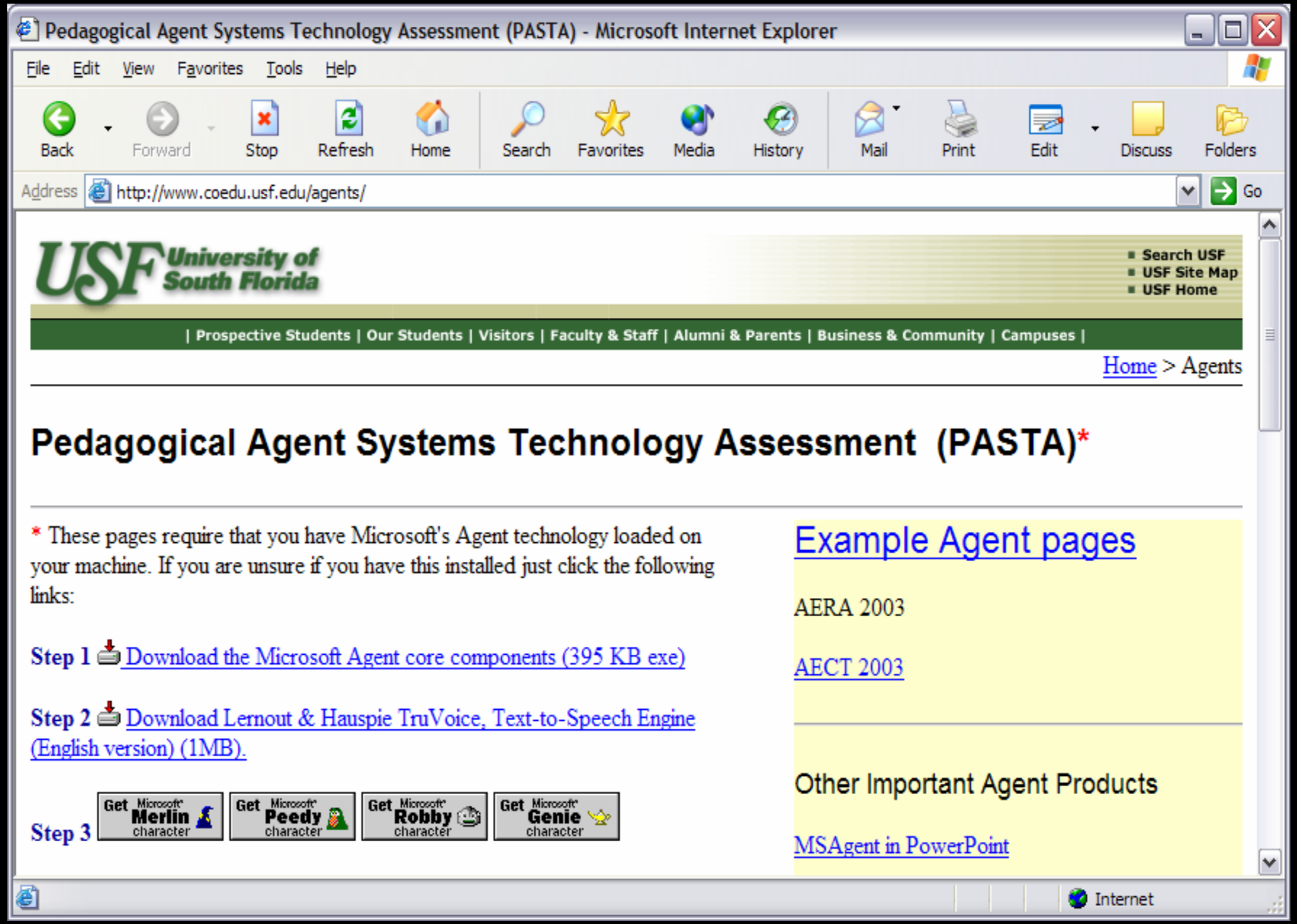
Editors:
Daniel C. Burnett, Nuance
Mark R. Walker, Intel
Andrew Hunt, SpeechWorks International
Internet


Pedagogical Agent Systems Technology Assessment (PASTA) - Microsoft Internet Explorer
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Summary : Pedagogical Agents

- are a tool for
  Instructional Designers and Developers
- provide the user with automated
  active assistance

- Interface agents can use voice and animation
- Promote Transfer
- Humans treat computers (agents) as if they were human

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Web Sites

Our Site:

Http://www.coedu.usf.edu/agents/

Other sites

Nass

http://murl.microsoft.com/videos/stanford/CS547/991029_OnDemand_100_100K_320x240.htm

- M.I.T. Agent Group
  http://agents.media.mit.edu/index.html
- Agents that Reduce Work and Information Overload - Pattie Maes
- Is it an Agent, or just a Program?: A Taxonomy for Autonomous Agents - Franklin and Graesser