Automated Avatars:

Animating Conversation in Online Games using “Spark”

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Outline

- Introduction
- Motivation
- Related Work
- Approach
- SPARK
- Evaluation
- Conclusion

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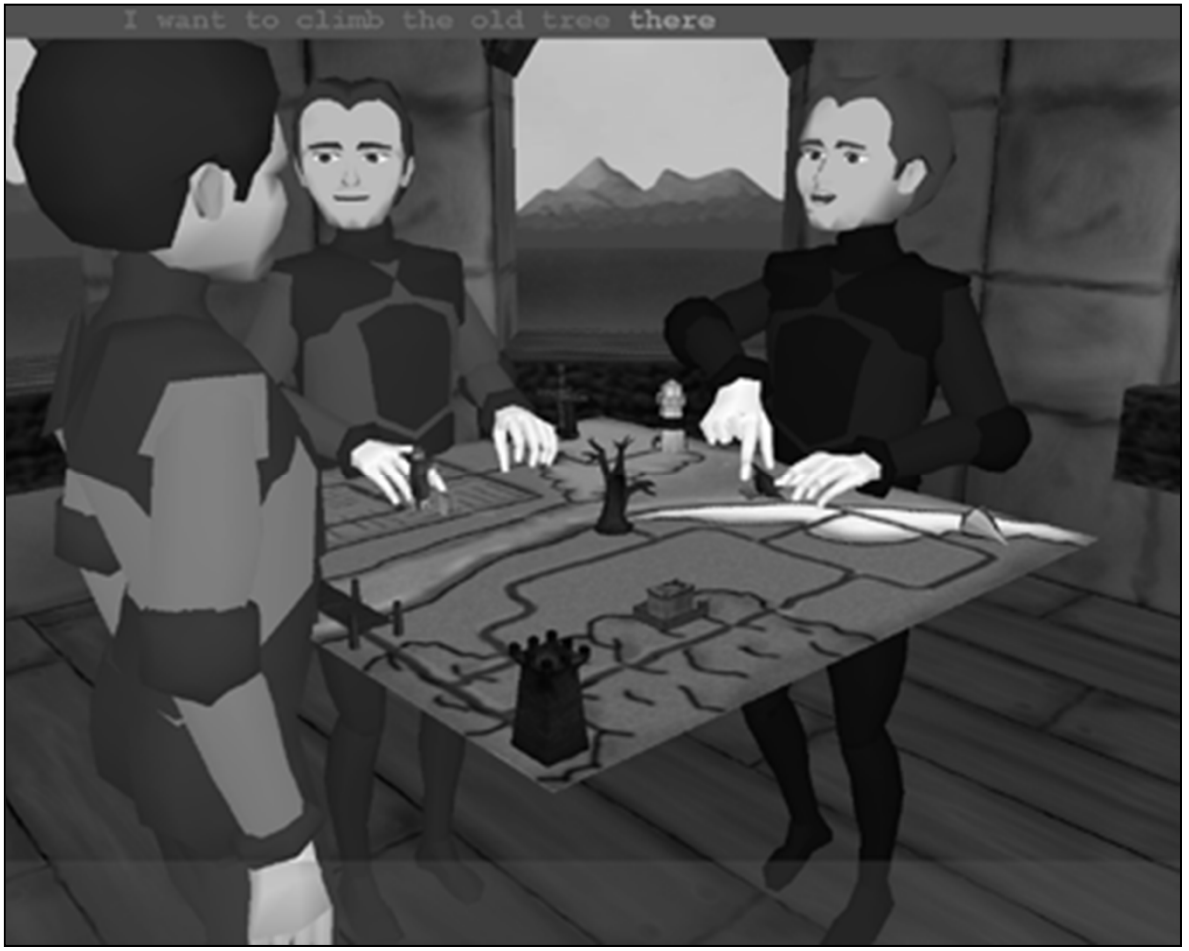
Introduction: Avatars



Avatar representing players in Spark

Introduction: Presence

- The feeling of presence in the game world is affected by:

Avatar interaction

Control overhead

Introduction: Presence

- The feeling of presence in the game world is affected by:

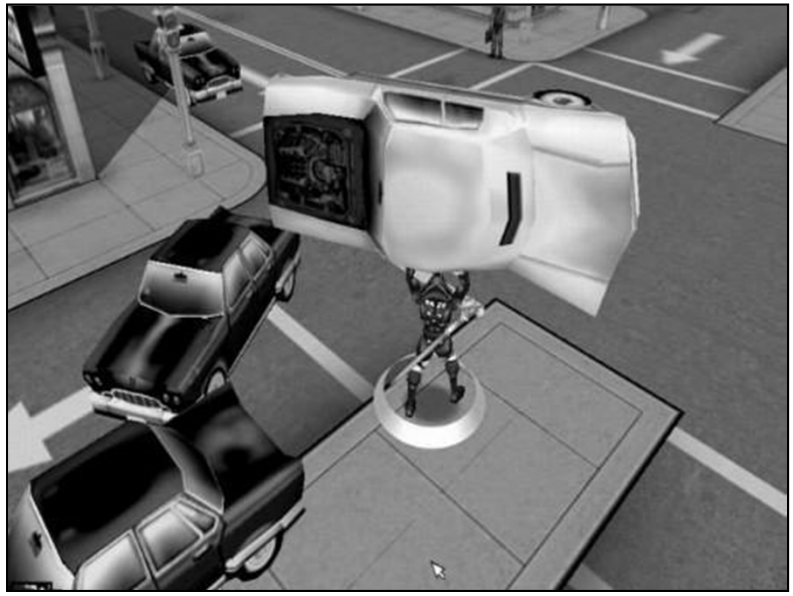
⇧ Avatar interaction

⇧ Control overhead

Introduction: Smart Avatars

- Avatars that can react believably to the game world on their own, increase sense of presence while reducing control overhead.

Death by Karma Physics ™



Tantrums in Freedom Force ™

Introduction: Smart Avatars

- Different game types rely on different types of avatar smarts
  - Shooters
    - Dealing and receiving death…
  - Adventure
    - Reaching and grabbing objects…
  - Social games
    - Having conversations?

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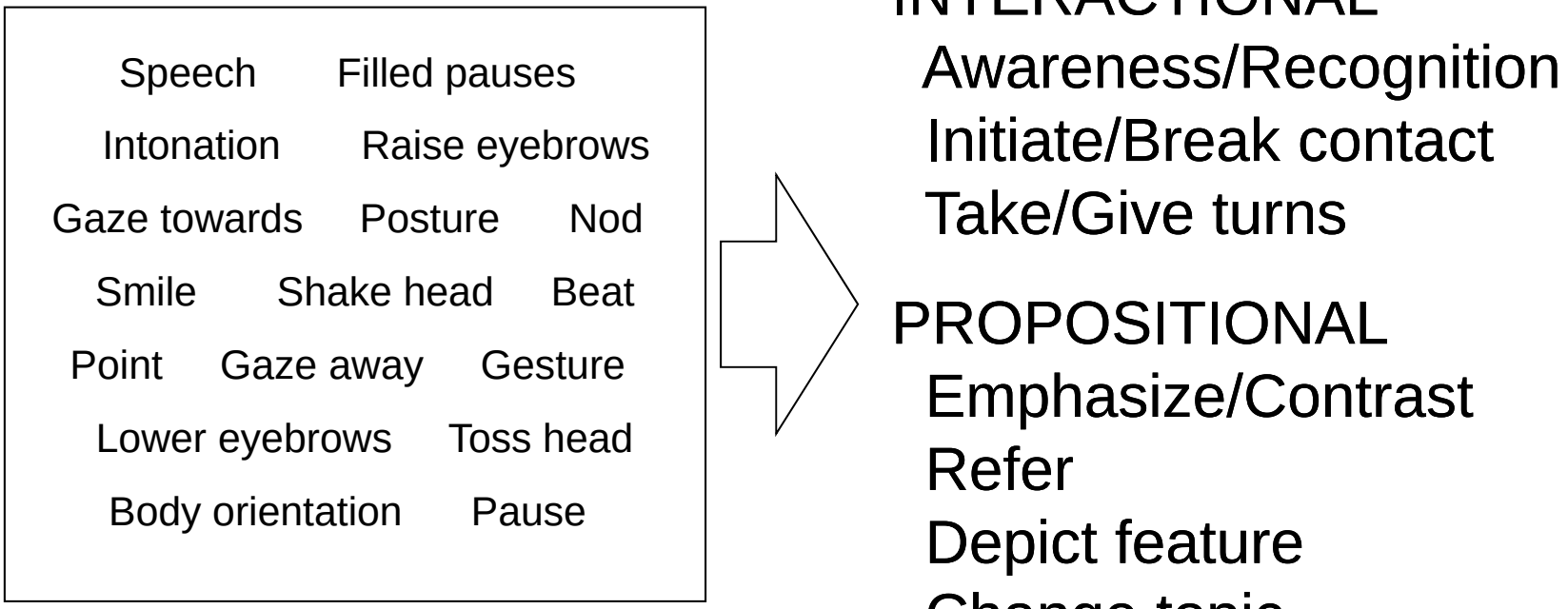
Motivation: Face-to-Face

Motivation: Face-to-Face

- When interacting face-to-face, humans naturally integrate:
  - speech
  - intonation
  - hand gestures
  - facial displays
  - eye gaze
  - head movement
  - body posture

Motivation: Face-to-Face

- These behaviors serve functions

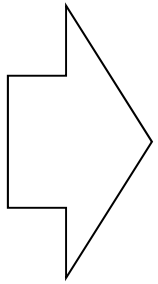


INTERACTIONAL
- Awareness/Recognition
- Initiate/Break contact
- Take/Give turns

PROPOSITIONAL
- Emphasize/Contrast
- Refer
- Depict feature
- Change topic
- Request/Give feedback

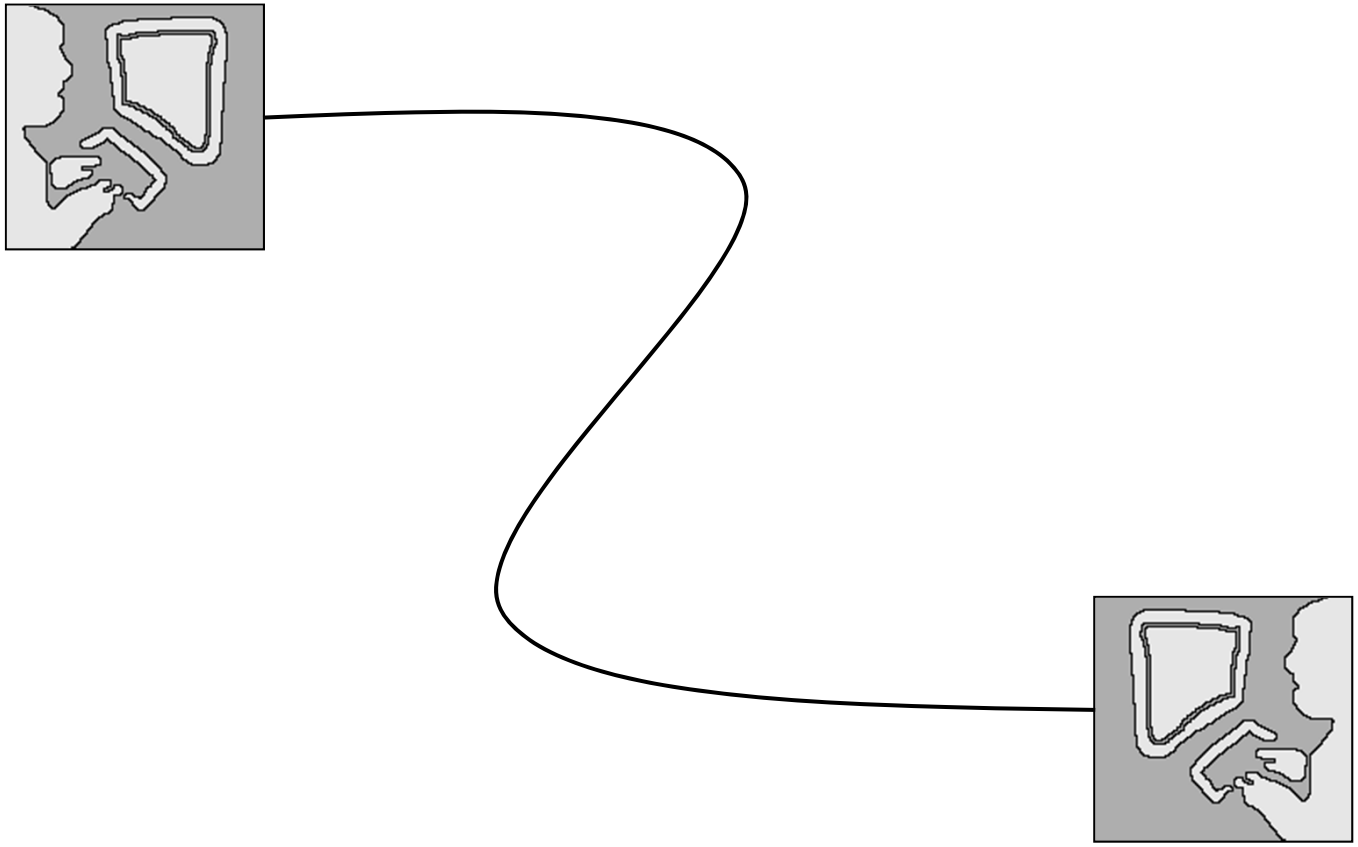
Motivation: Face-to-Face

- These behaviors serve functions



INTERACTIONAL	
Awareness/Recognition	(Goffman 1963)
Initiate/Break contact	(Kendon 1990)
Take/Give turns	(Duncan 1974)
PROPOSITIONAL	
Emphasize/Contrast	(Argyle 1973)
Refer	(Bavelas 1995)
Illustration	(McNeill 1992)
Change topic	(Kendon 1990)
Request/Give feedback	(Chovil 1991)

Motivation: Avatar Conversation



Are these functions served?

Motivation: Avatar Conversation

The Avatar doesn't even know you're talking!

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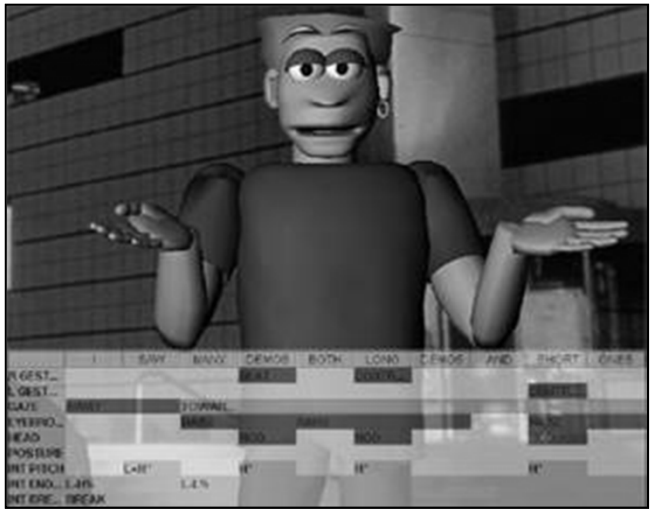
Related Work

Interactional behaviors:

BodyChat

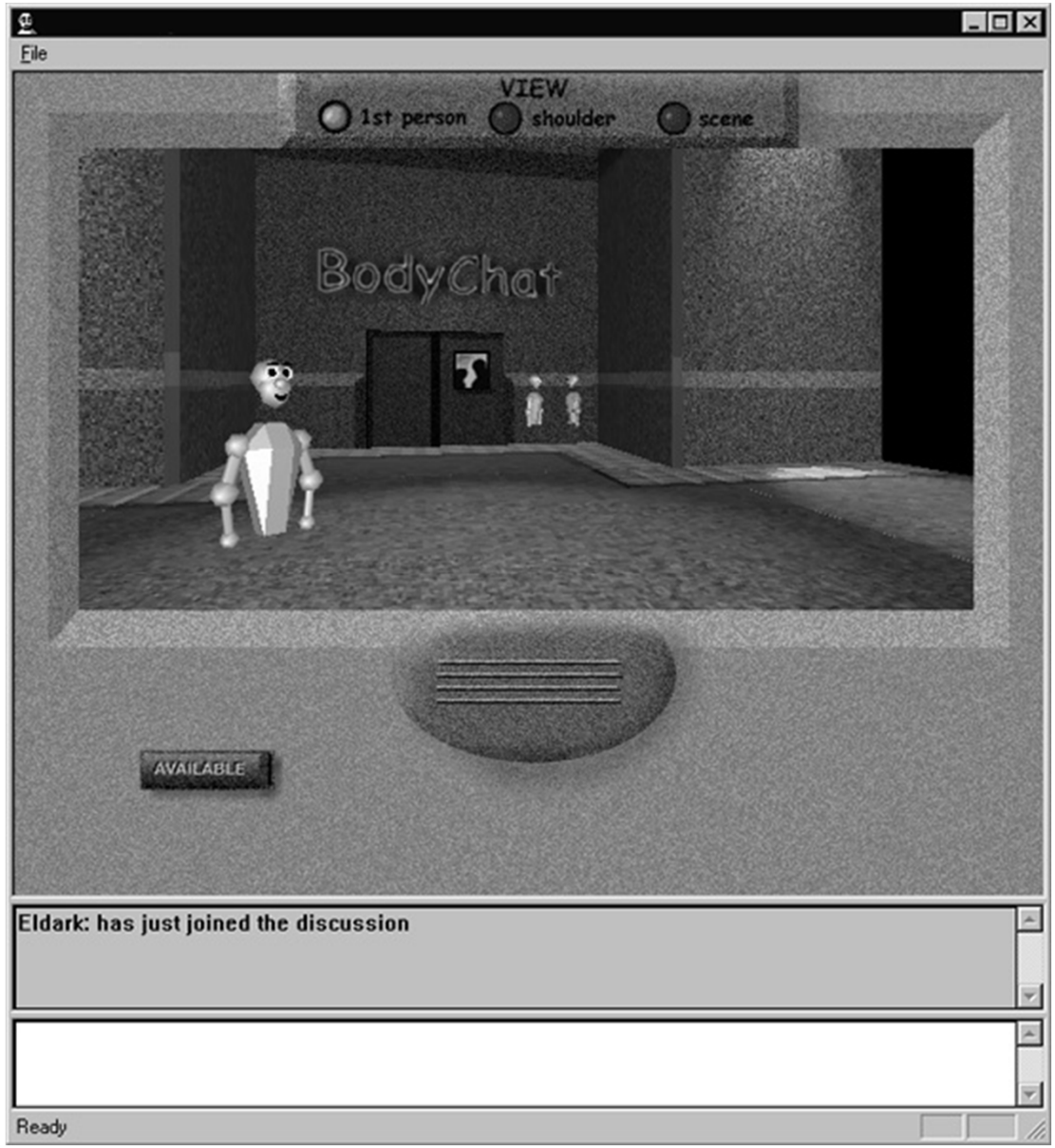
(Vilhjálmsson & Cassell, 1998)



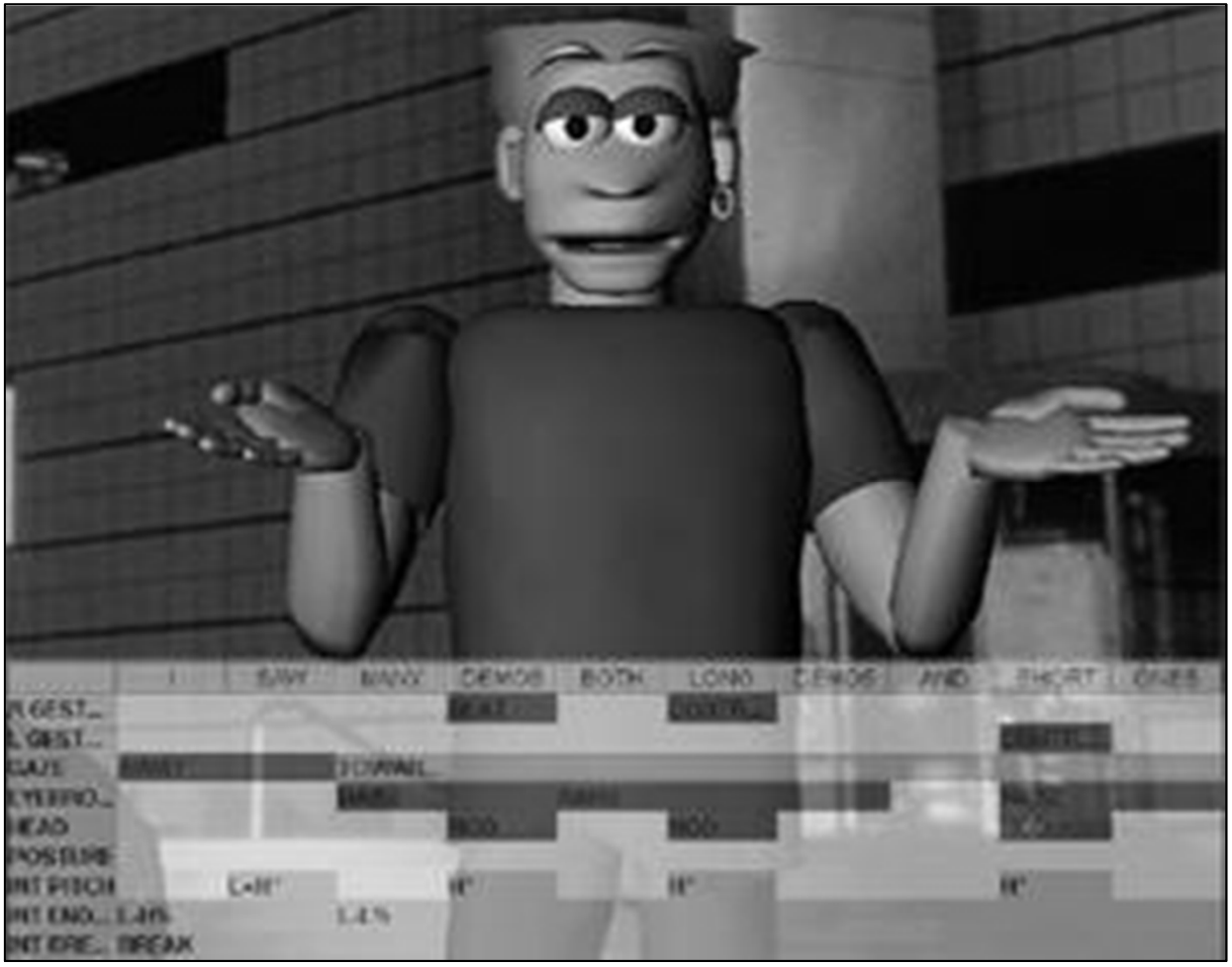
Propositional behaviors:

BEAT

(Cassell, Vilhjálmsson & Bickmore, 2001)



BodyChat in 1997



BEAT in 2000

Related Work

Comic Chat

(Kurlander, Skelly, et al., 1996)

MOOse Lodge

(Shi et al., 1999)

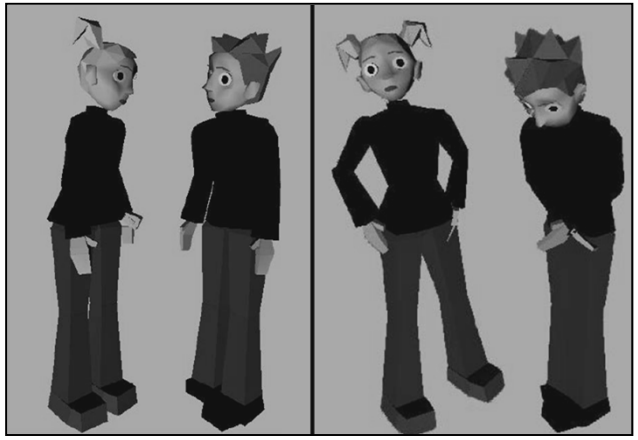
3dMe Emote

(3dMe Inc., 2002)

There

(There Inc., 2003)

Demeanour



(Gillies, Ballin & Dodgeson, 2004)

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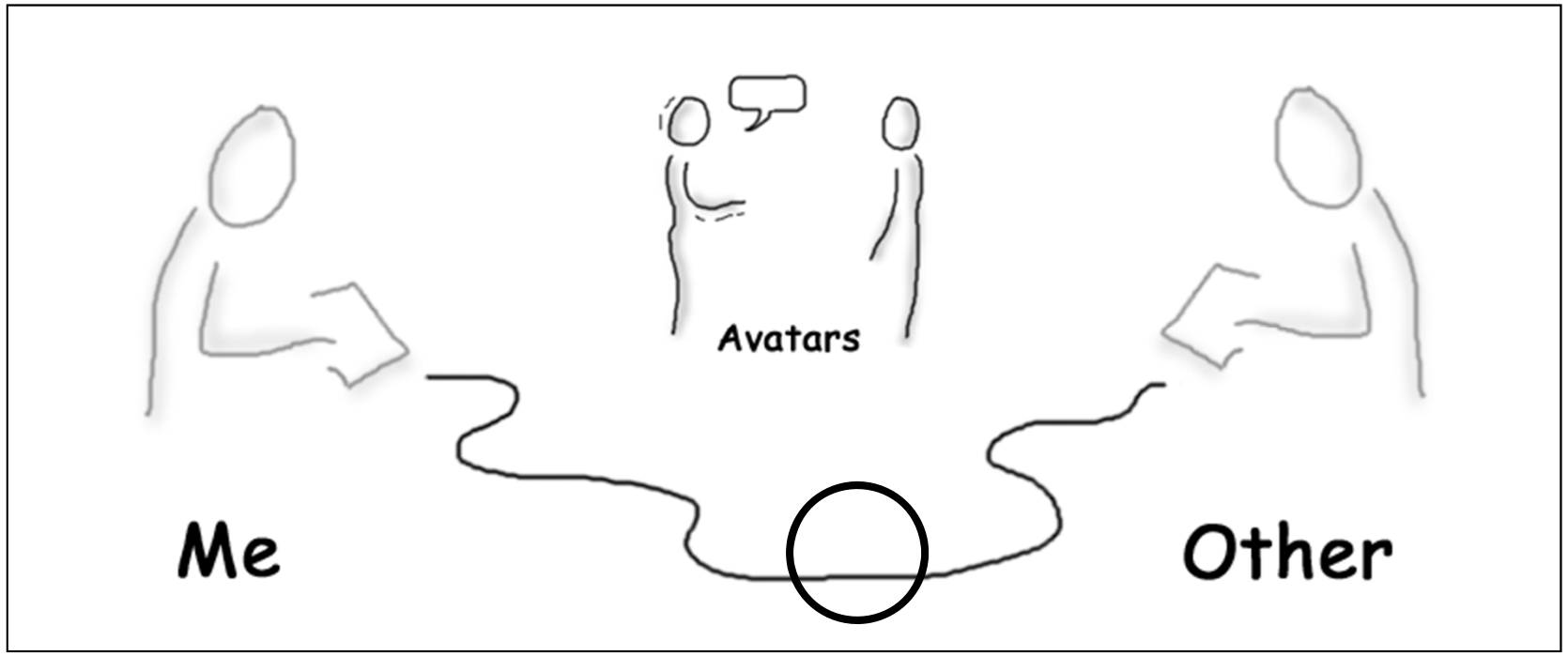
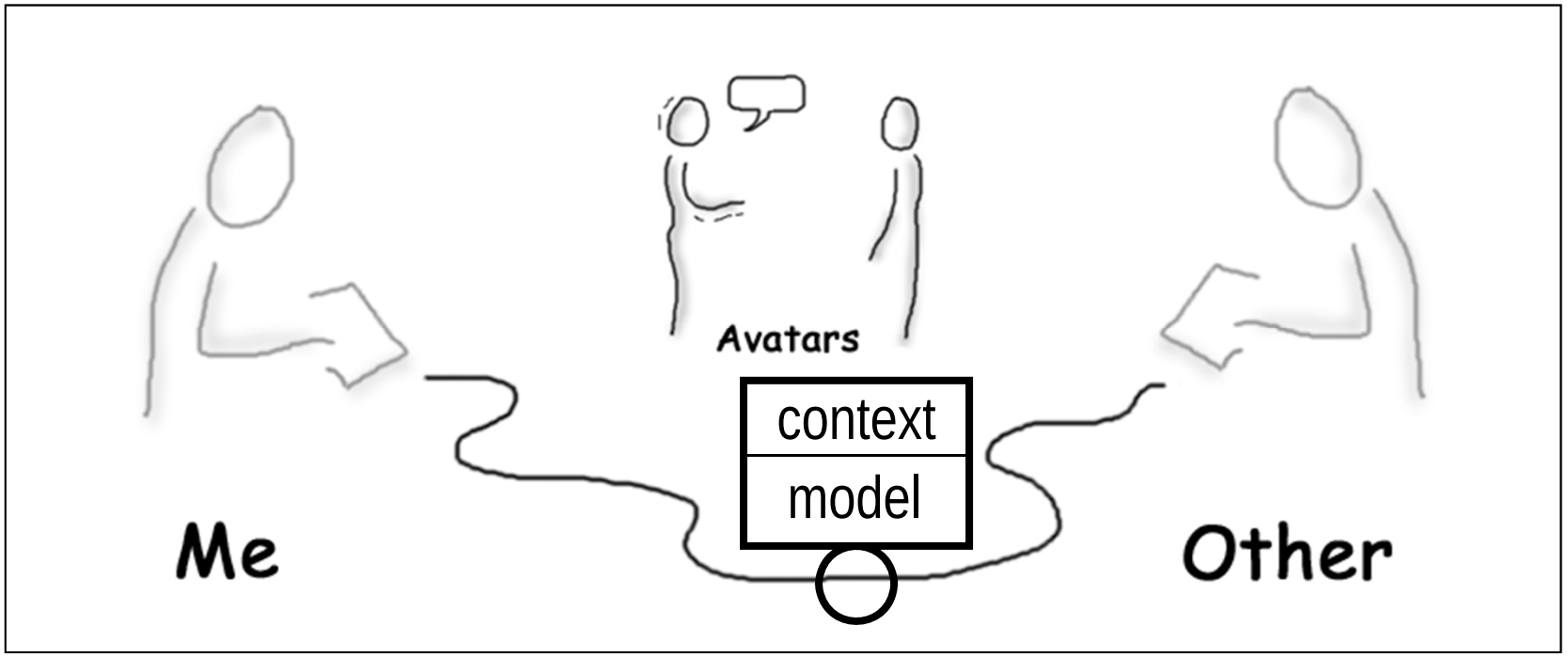
Approach: Monitoring

- Avatars can produce the appropriate nonverbal behaviors by monitoring the chat channel



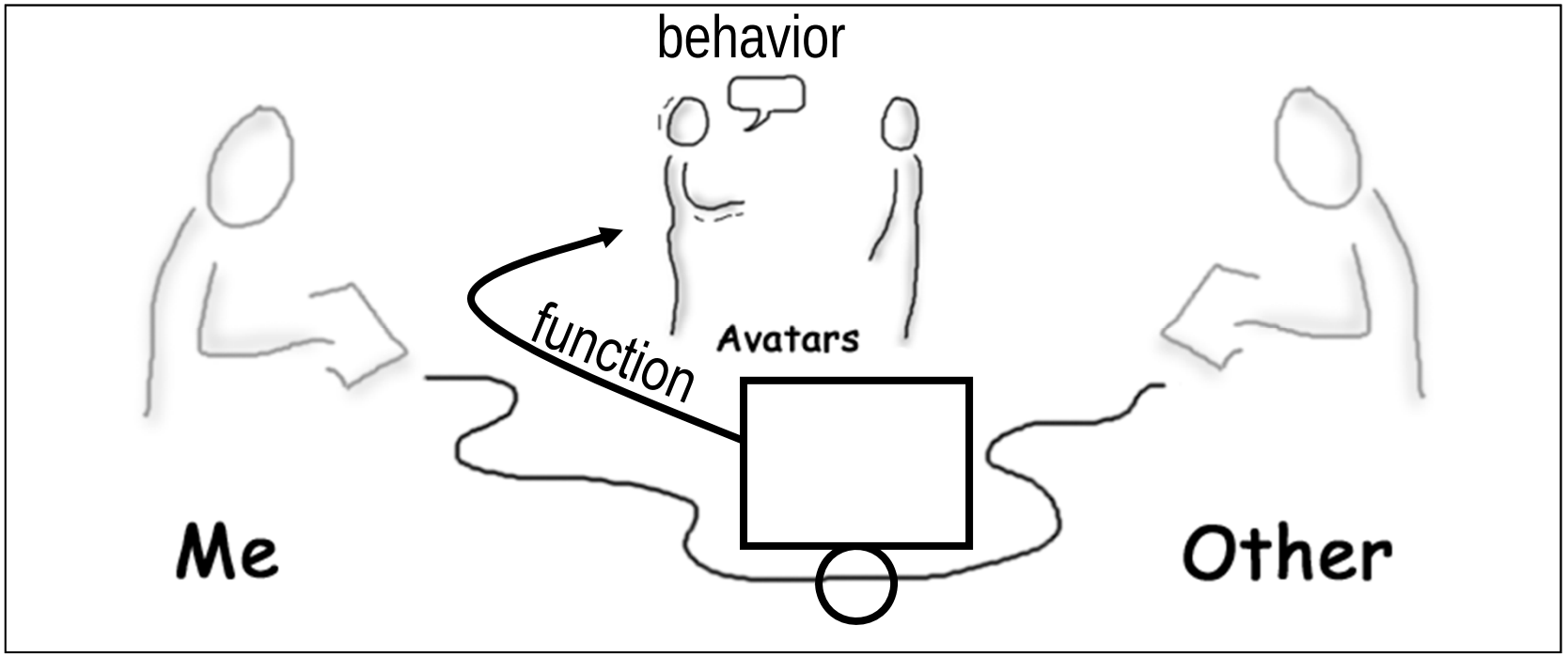
Approach: Monitoring

- The monitoring needs a model of communication and a dynamic discourse context



Approach: Production

- The monitoring can result in a <u>functional</u> description from which supporting <u>behavior</u> is produced



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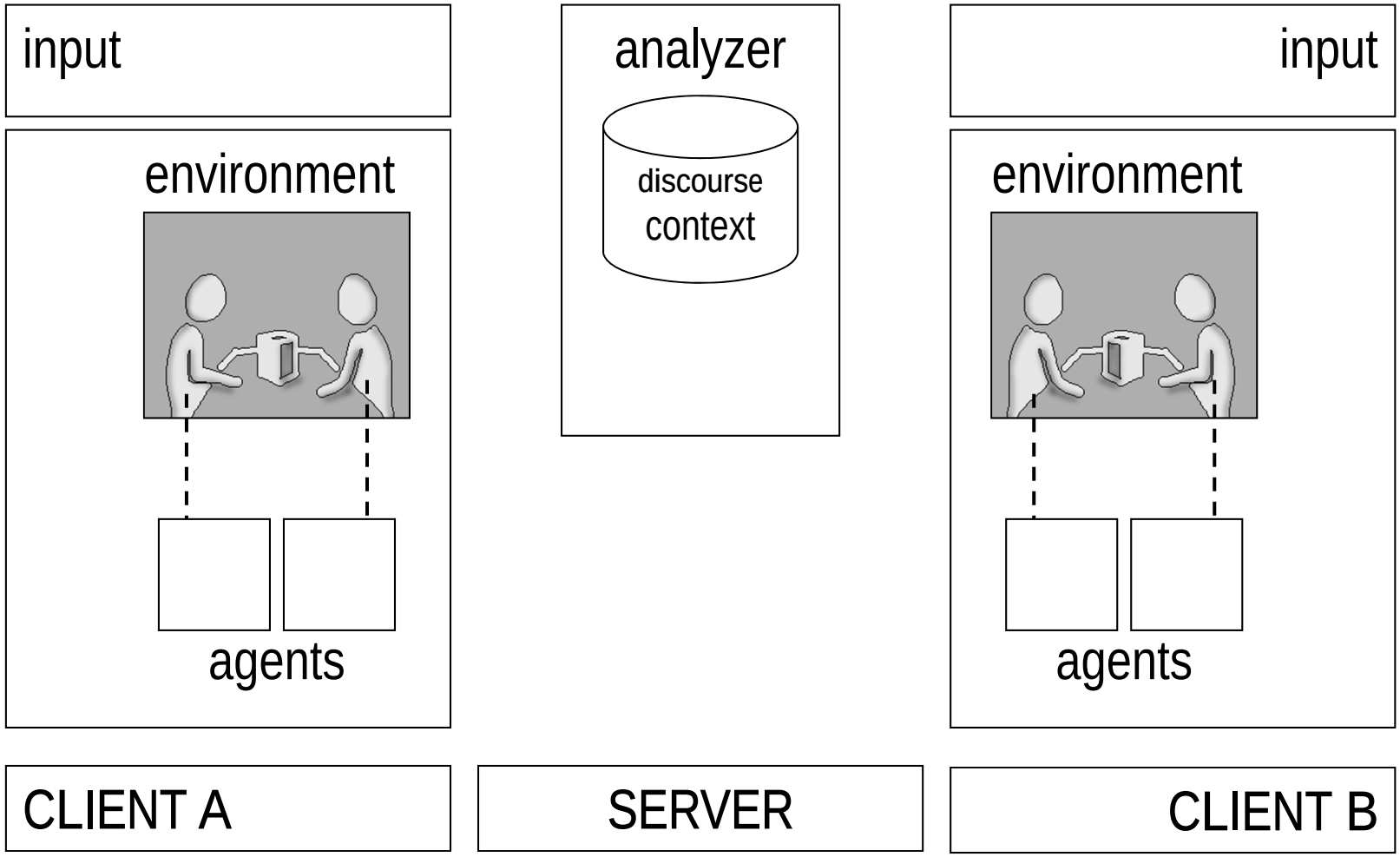
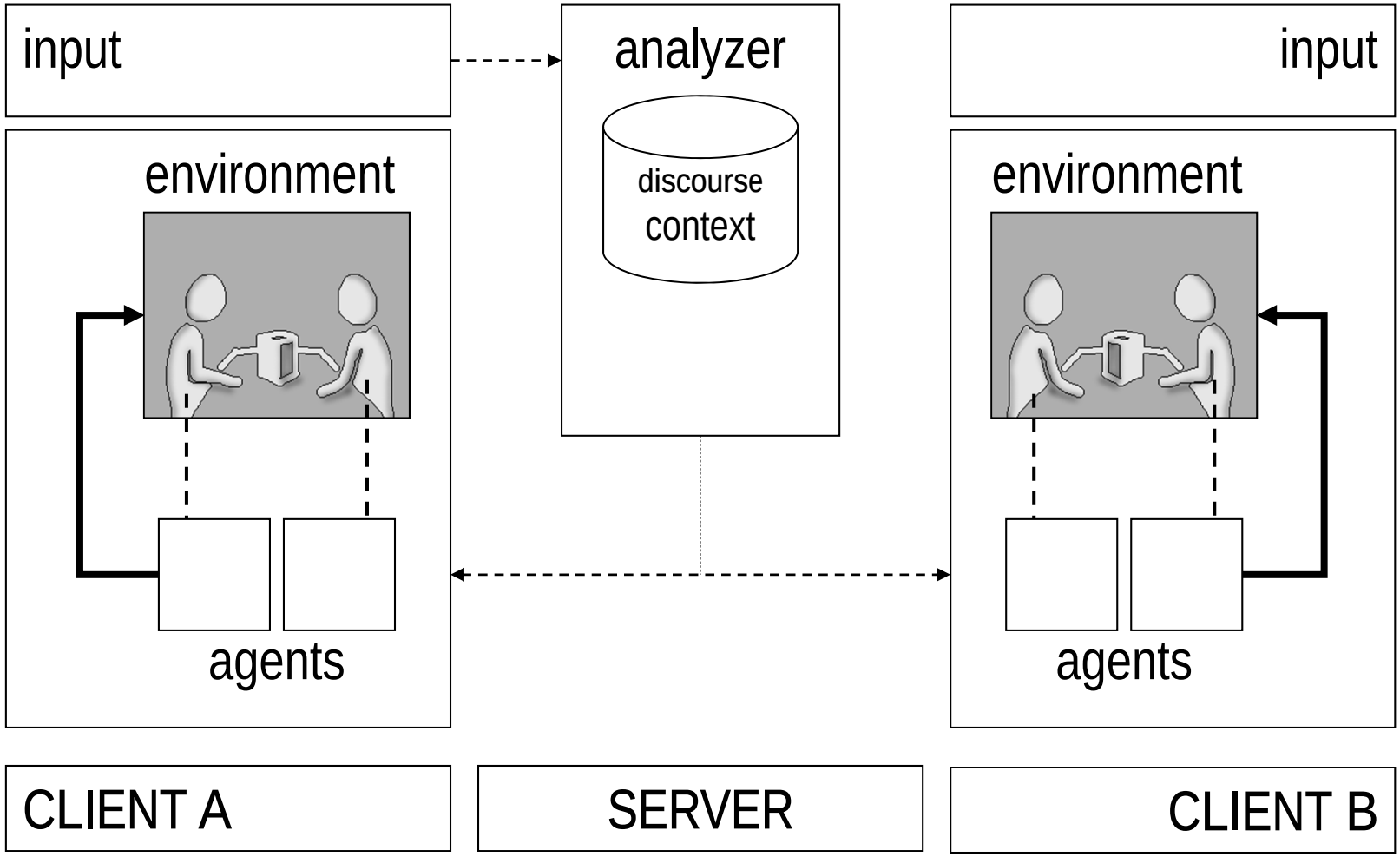

input
analyzer
input
environment
discourse
context
environment
agents
agents
CLIENT A
SERVER
CLIENT B

SPARK


input
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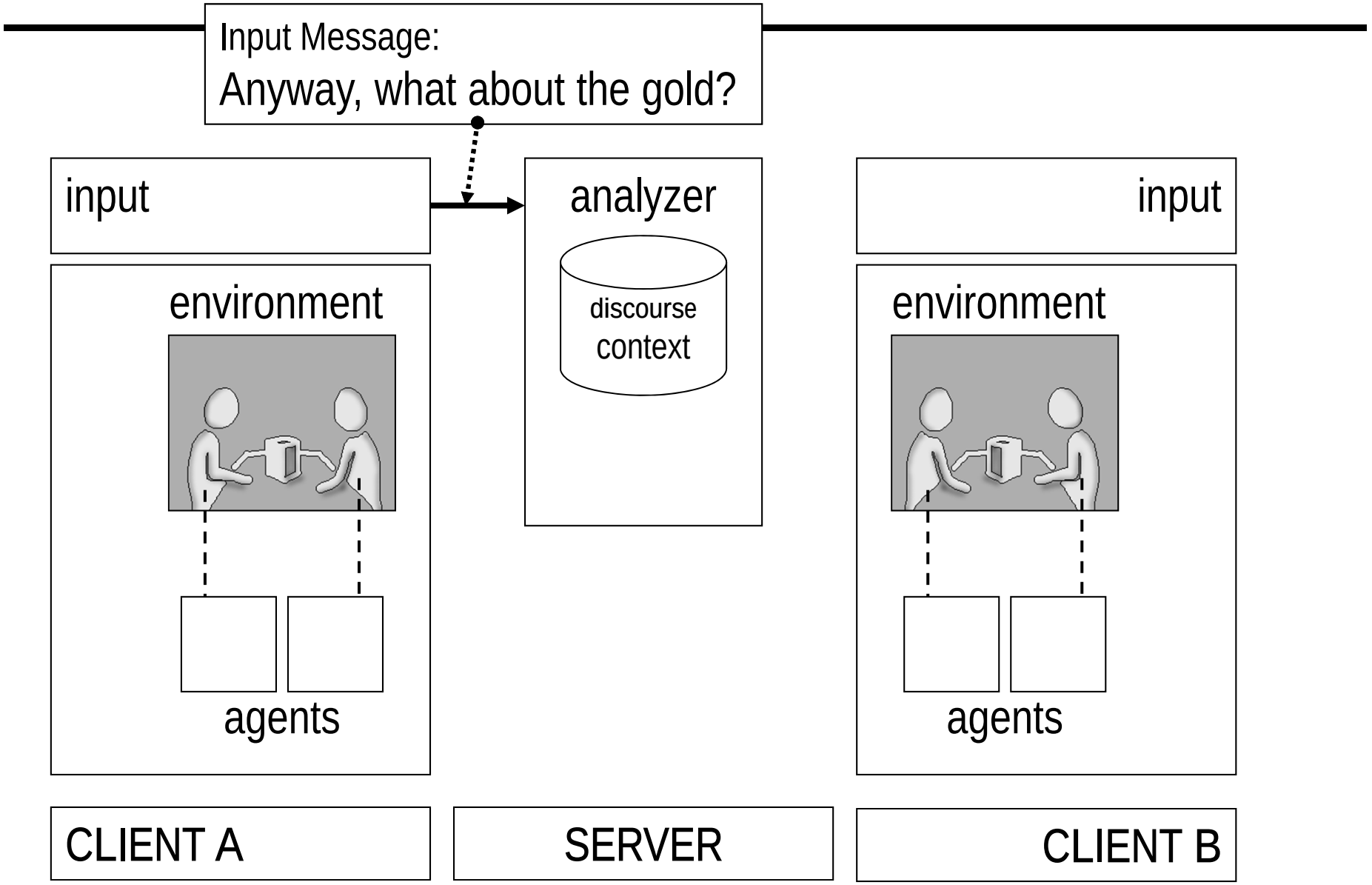
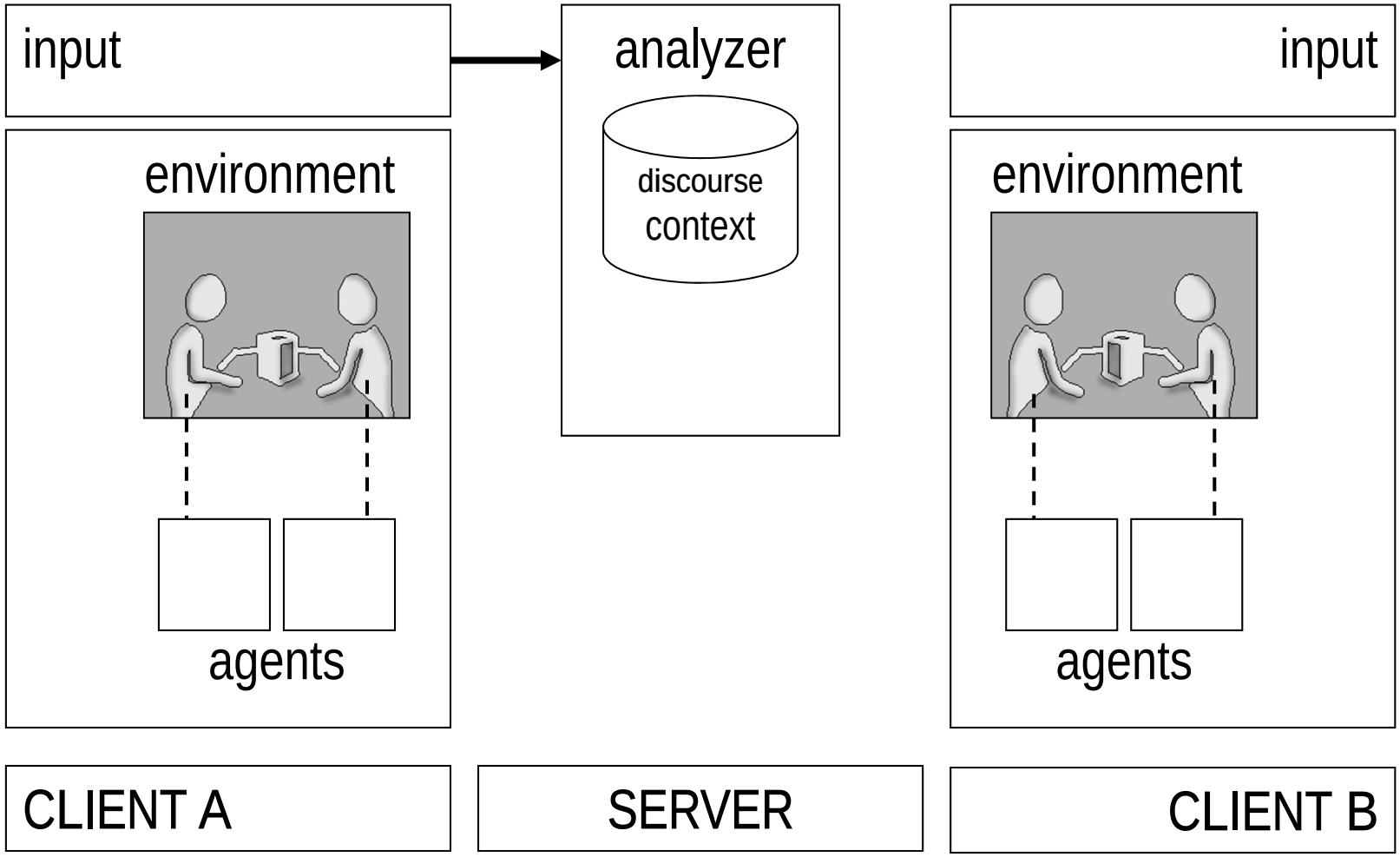
discourse
context
environment
agents
agents
CLIENT A
SERVER
CLIENT B

SPARK


Input Message:
Anyway, what about the gold?
input
analyzer
input
environment
discourse
context
environment
agents
agents
CLIENT A
SERVER
CLIENT B

SPARK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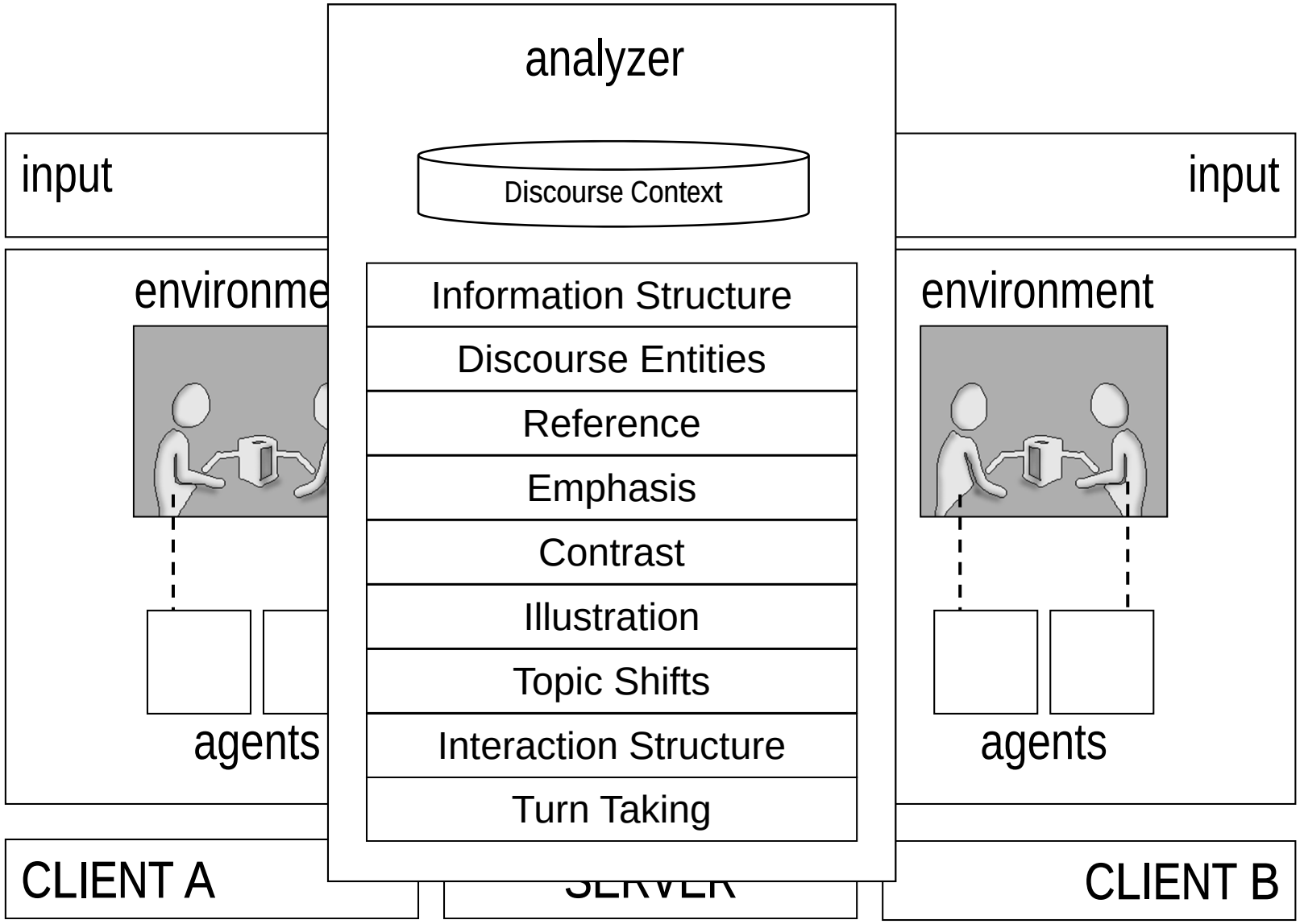
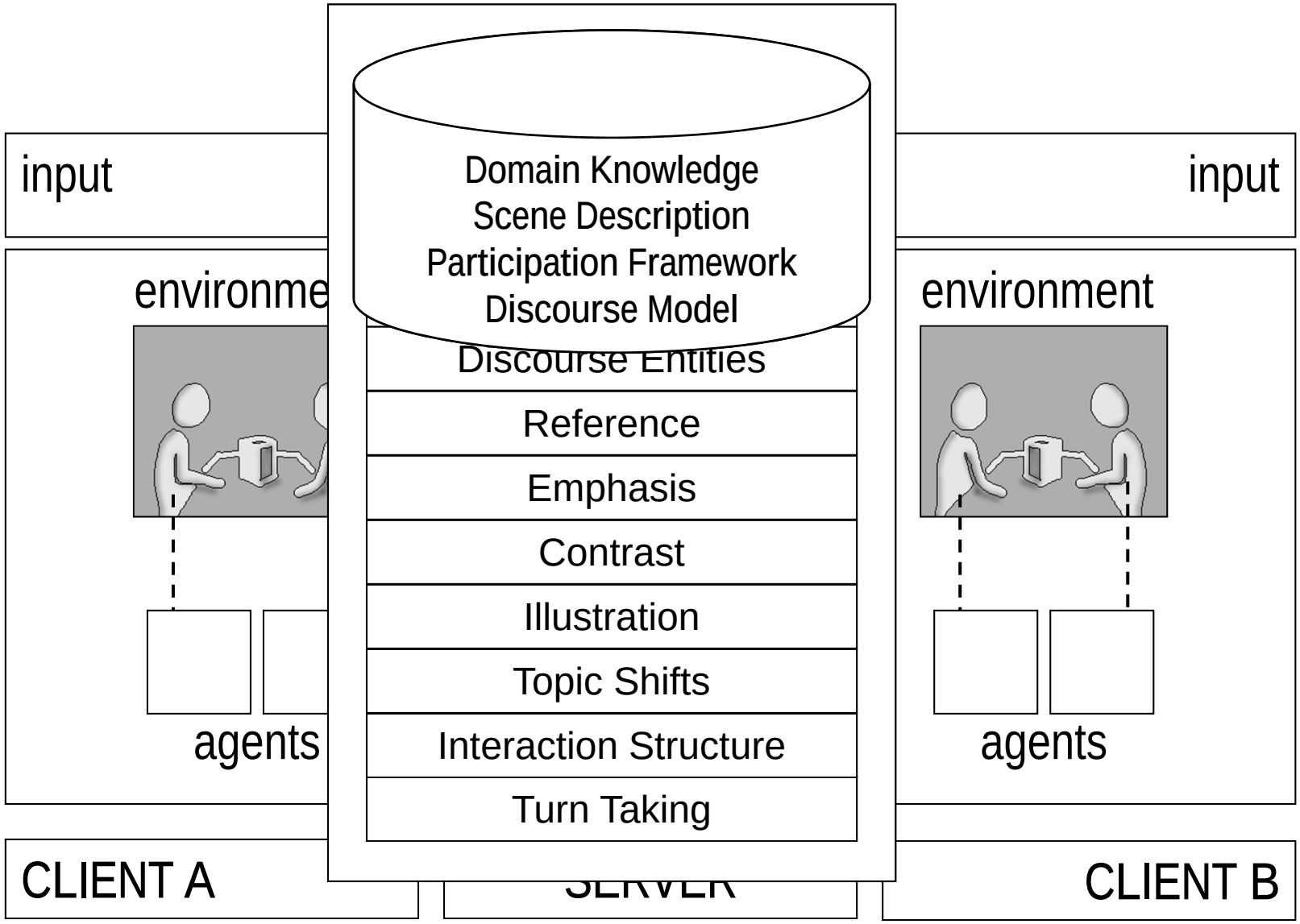
analyzer
input
environment
discourse
context
environment
agents
agents
CLIENT A
SERVER
CLIENT B

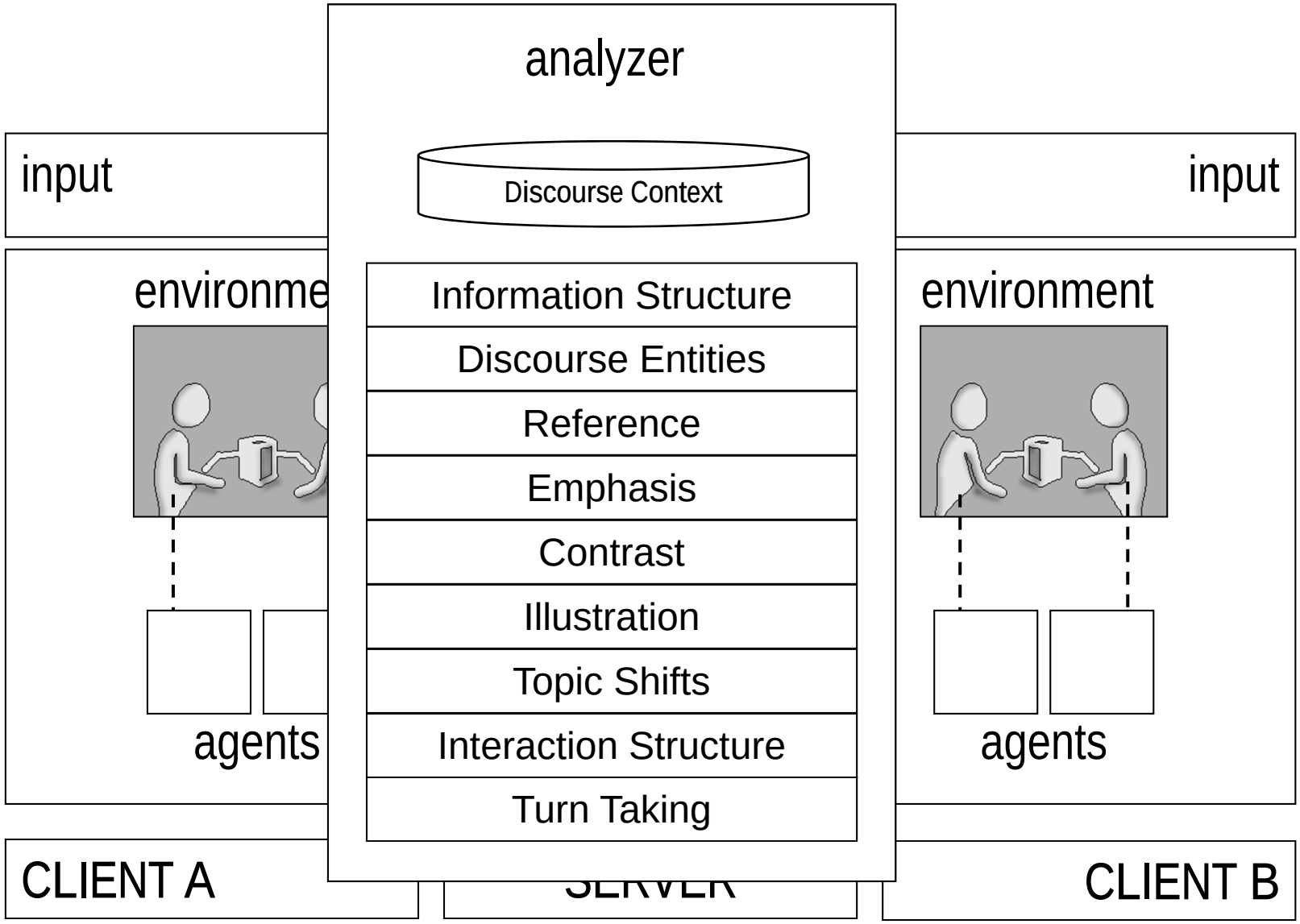
SPARK


analyzer
Discourse Context
Information Structure
Discourse Entities
Reference
Emphasis
Contrast
Illustration
Topic Shifts
Interaction Structure
Turn Taking
input
input
environme
environment
agents
agents
CLIENT A
CLIENT B

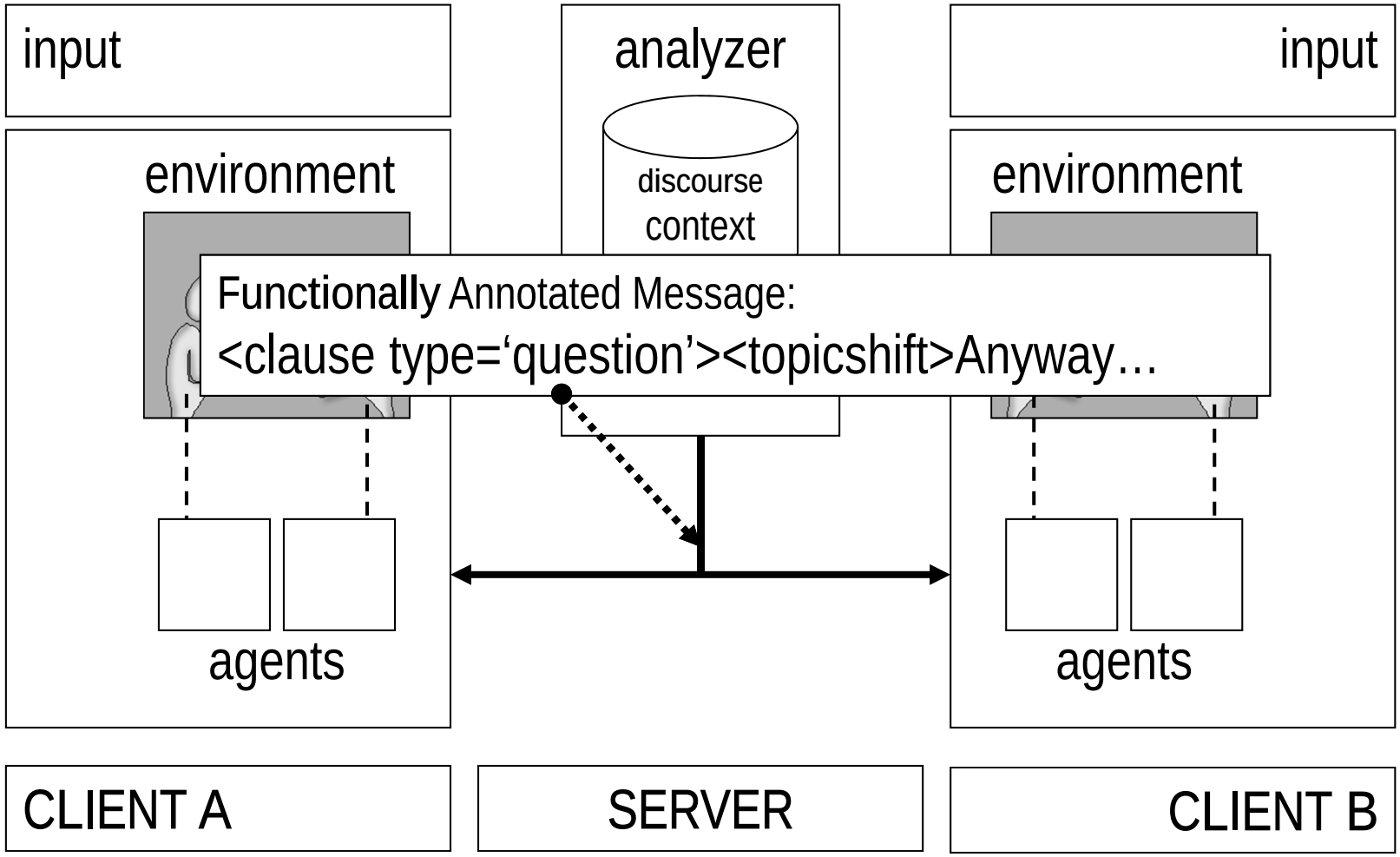
SPARK


input
input
Domain Knowledge
Scene Description
Participation Framework
Discourse Model
environme
environment
Discourse Entities
Reference
Emphasis
Contrast
Illustration
Topic Shifts
Interaction Structure
Turn Taking
agents
agents
CLIENT A
SERVER
CLIENT B

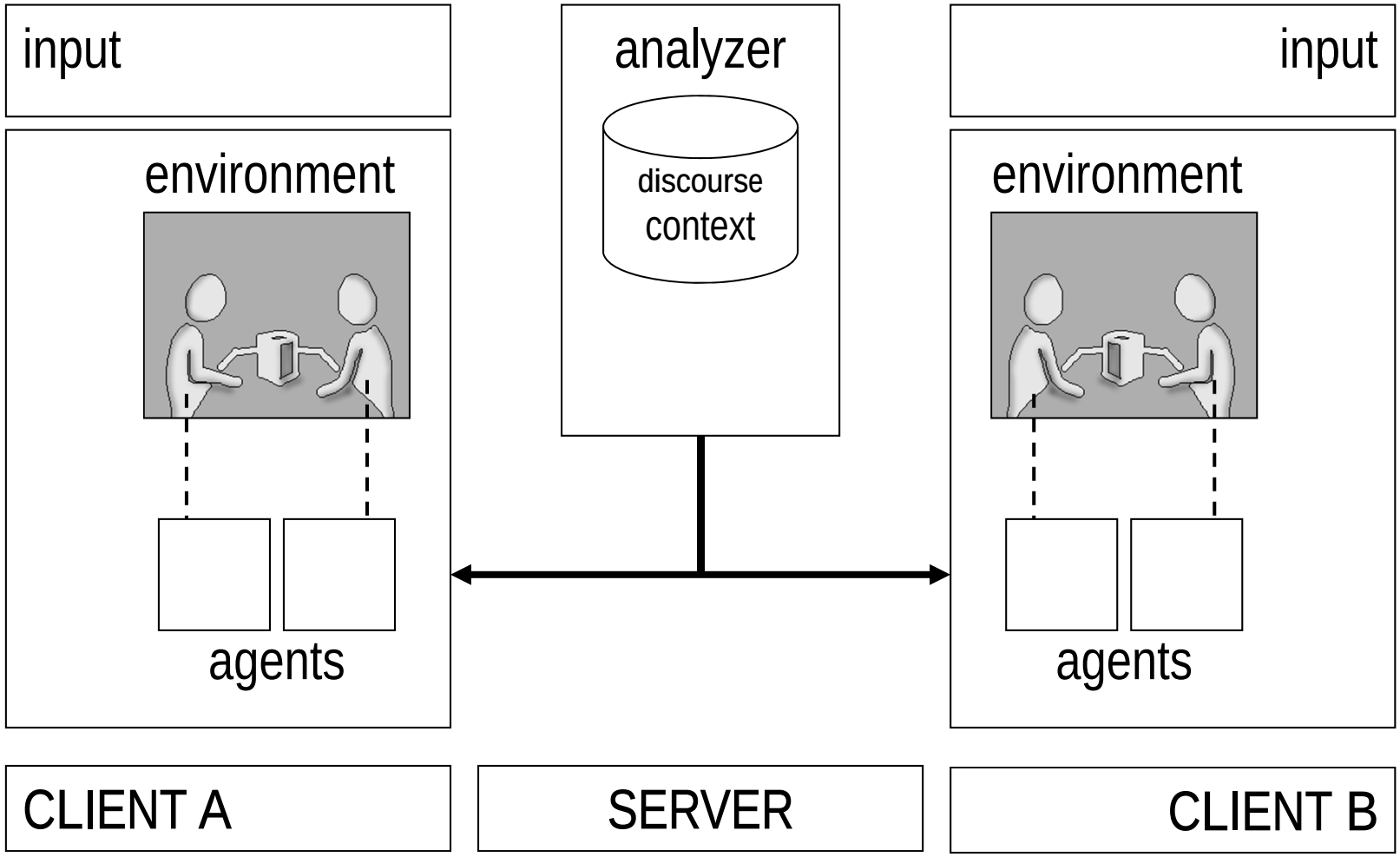
SPARK


analyzer
Discourse Context
Information Structure
Discourse Entities
Reference
Emphasis
Contrast
Illustration
Topic Shifts
Interaction Structure
Turn Taking
input
input
environme
environment
agents
agents
CLIENT A
CLIENT B

SPARK


input
analyzer
input
environment
discourse
context
environment
Functionally Annotated Message:
<clause type='question'><topicshift>Anyway…
agents
agents
CLIENT A
SERVER
CLIENT B

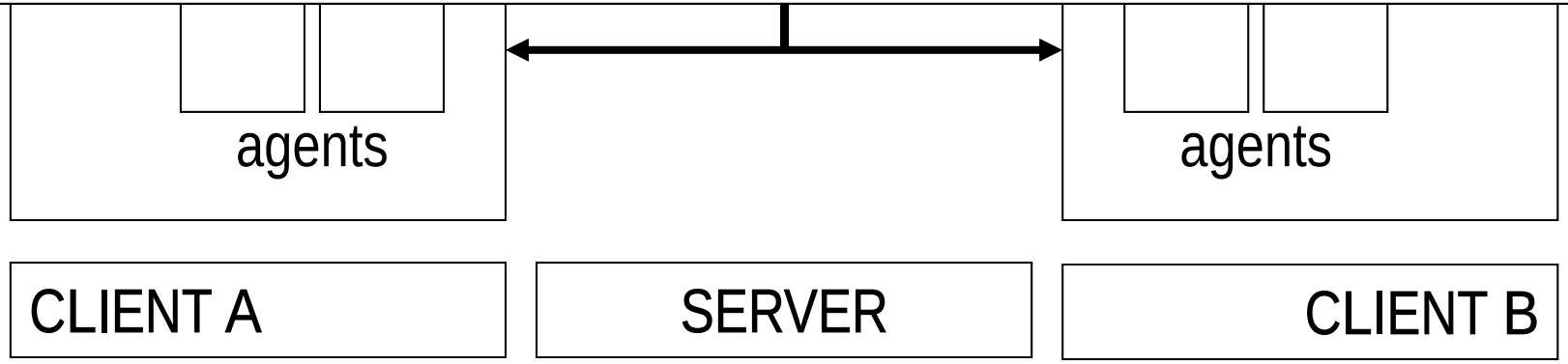
SPARK


input
analyzer
input
environment
discourse
context
environment
agents
agents
CLIENT A
SERVER
CLIENT B

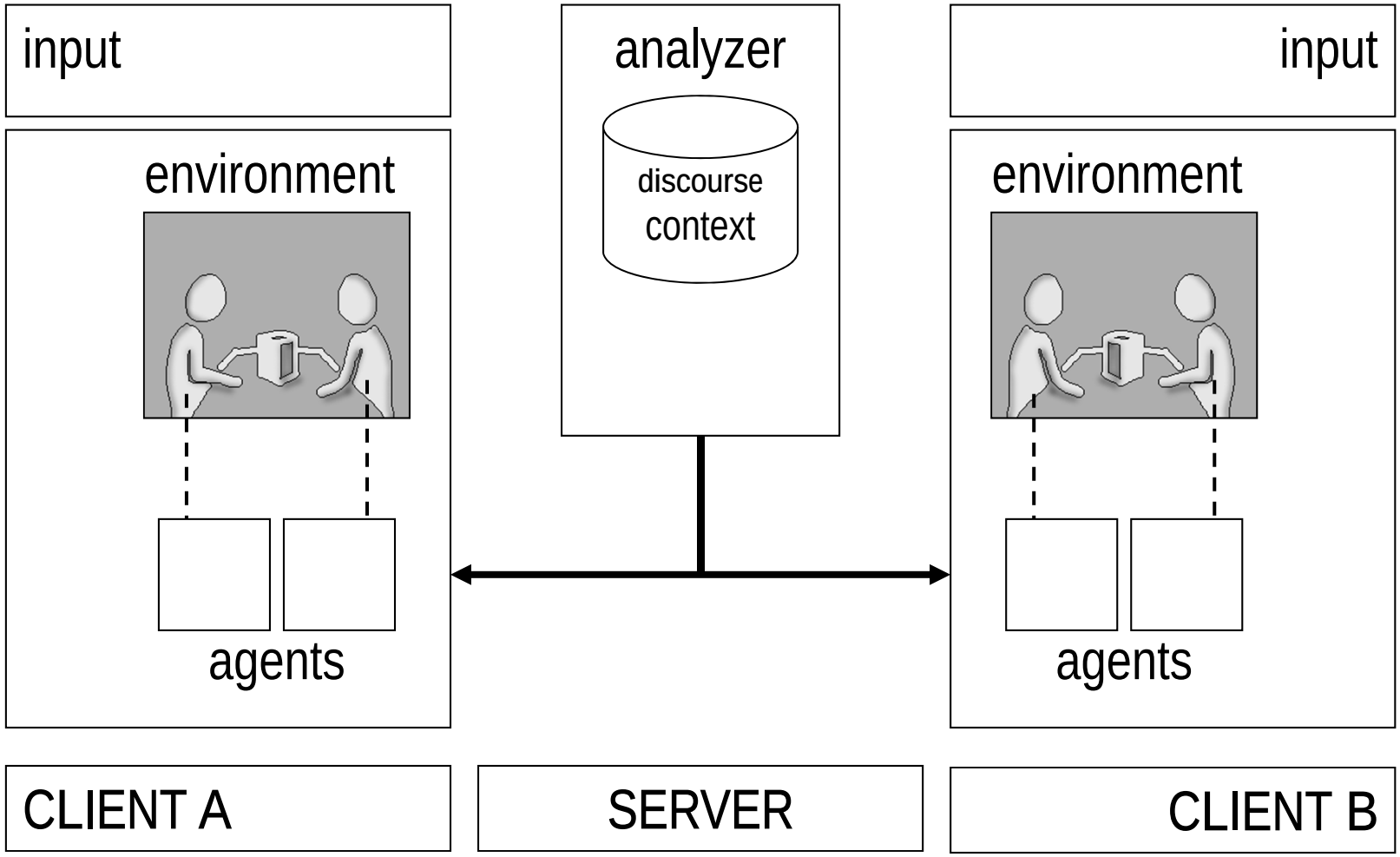
SPARK

Speaker Avatar Agent – Behavior Generators

Function Markup	Behavior Markup	Research
EMPHASIS[@TYPE='WORD']	<HEADNOD> <GESTURE_RIGHT TYPE="BEAT">	(Argyle) (McNeill)
EMPHASIS[@TYPE='PHRASE']	<EYEBROWS>	(Chovil)
GROUNDING[@TYPE='REQUEST']	<GAZE TYPE="GLANCE" TARGET="{@T}">	(McClave)
CLAUSE[@TYPE='QUESTION']	<EYEBROWS>	(Chovil)
TURN[@TYPE='GIVE']	<GAZE TYPE="LOOK" TARGET="{@T}">	(Duncan)
TURN[@TYPE='TAKE']	<GAZE TYPE="AWAY">	(Duncan)
Etc.	Etc.	Etc.



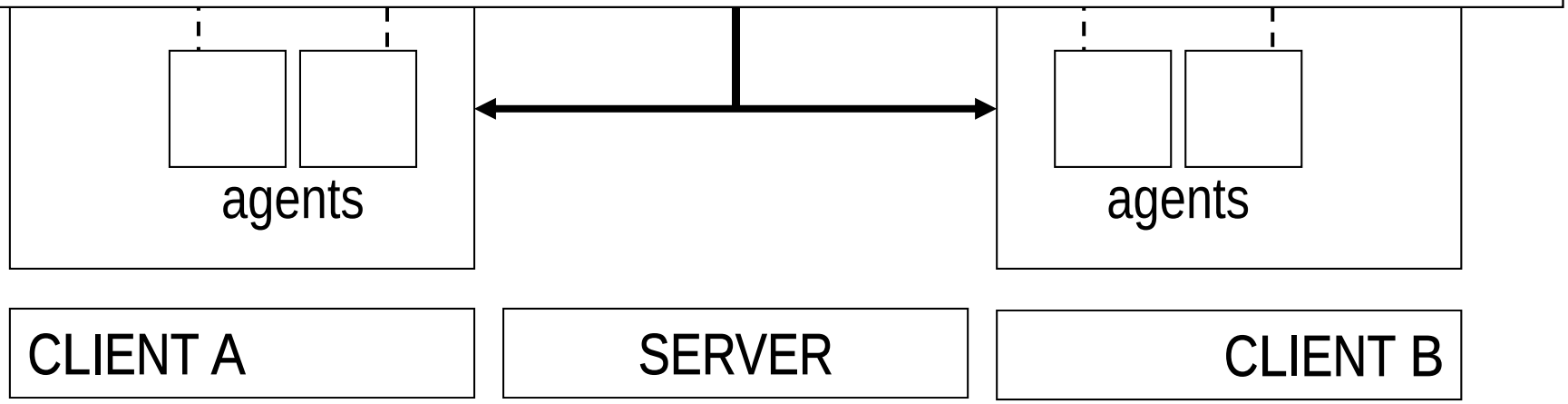
SPARK


input
analyzer
input
environment
discourse
context
environment
agents
agents
CLIENT A
SERVER
CLIENT B

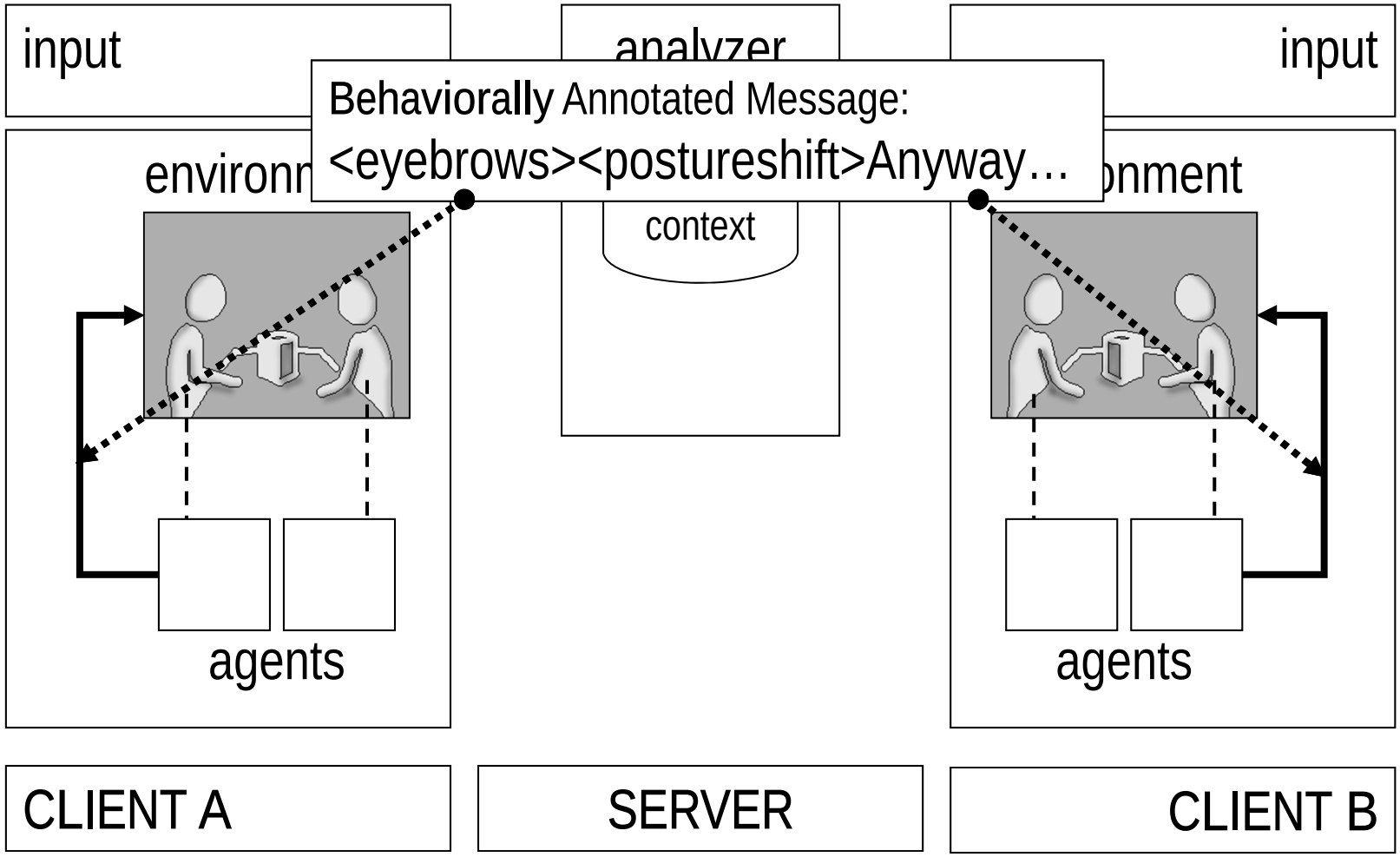
SPARK

Listener Avatar Agent – Behavior Generators

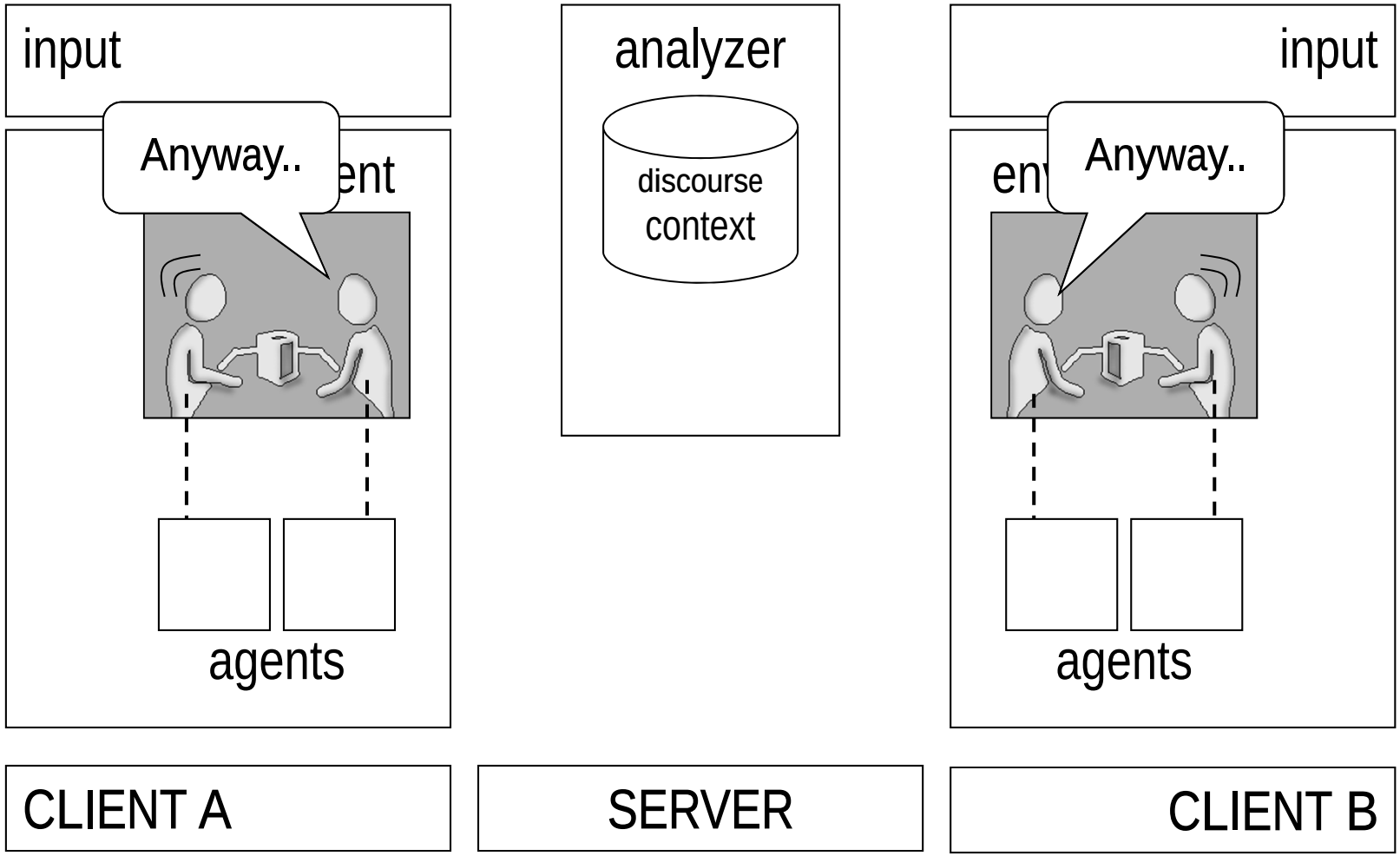
Function Markup	Behavior Markup	Research
GROUNDING[@TYPE='REQUEST']	<GAZE TYPE="GLANCE" TARGET="*SPKR*" <HEADNOD> <EYEBROWS>	(Chovil) (McClave)
REFERENCE[@TYPE='VISUAL']	<GAZE TYPE="GLANCE" TARGET="{@T}">	(Clark)
TURN[@TYPE='GIVE']	<GAZE TYPE="LOOK" TARGET="{@T}">	(Duncan)
TURN[@TYPE='TAKE']	<GAZE TYPE="LOOK" TARGET="*SPKR*">	(Duncan)
Etc.	Etc.	Etc.



SPARK


input
analyzer
input
Behaviorally Annotated Message:
<eyebrows><postureshift>Anyway…
environm
onment
context
agents
agents
CLIENT A
SERVER
CLIENT B

SPARK


input
Anyway..
agents
analyzer
discourse
context
input
Anyway..
agents
CLIENT A
SERVER
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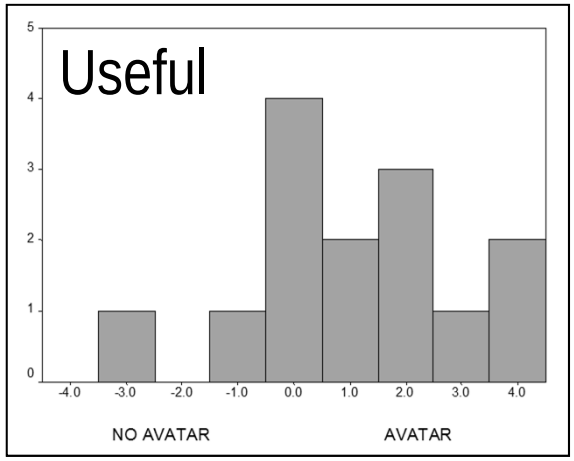
Evaluation: Avatars vs. No Avatars

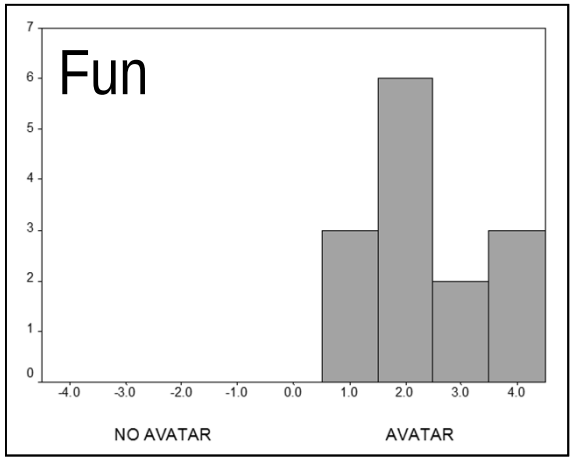
- Study (15 groups of 3 people / condition)

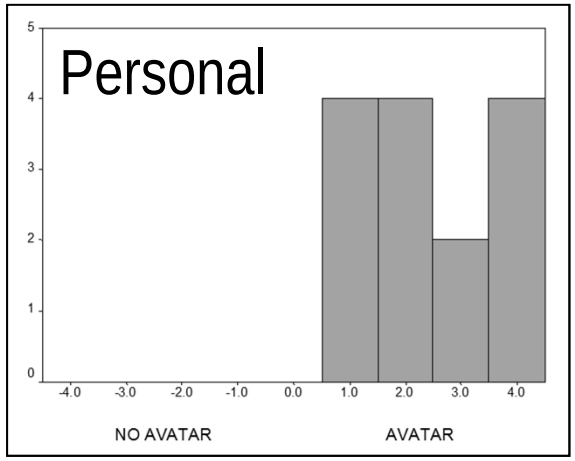
NO AVATARS visible

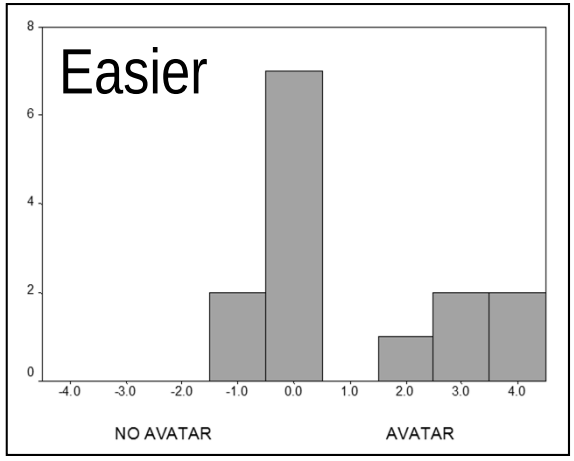
AVATARS visible

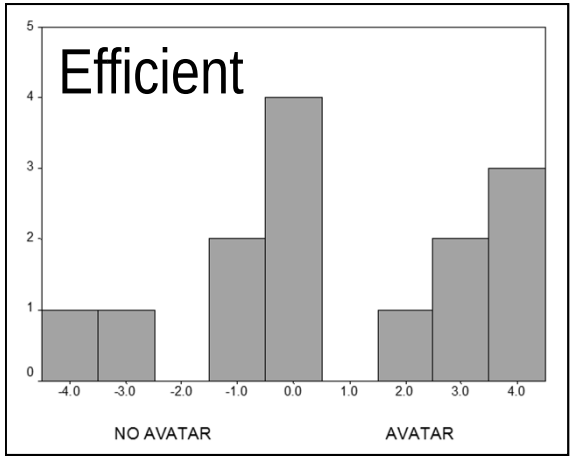
Evaluation: Preference

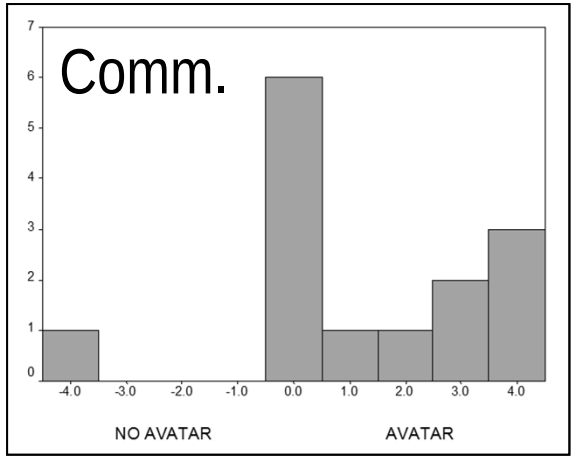








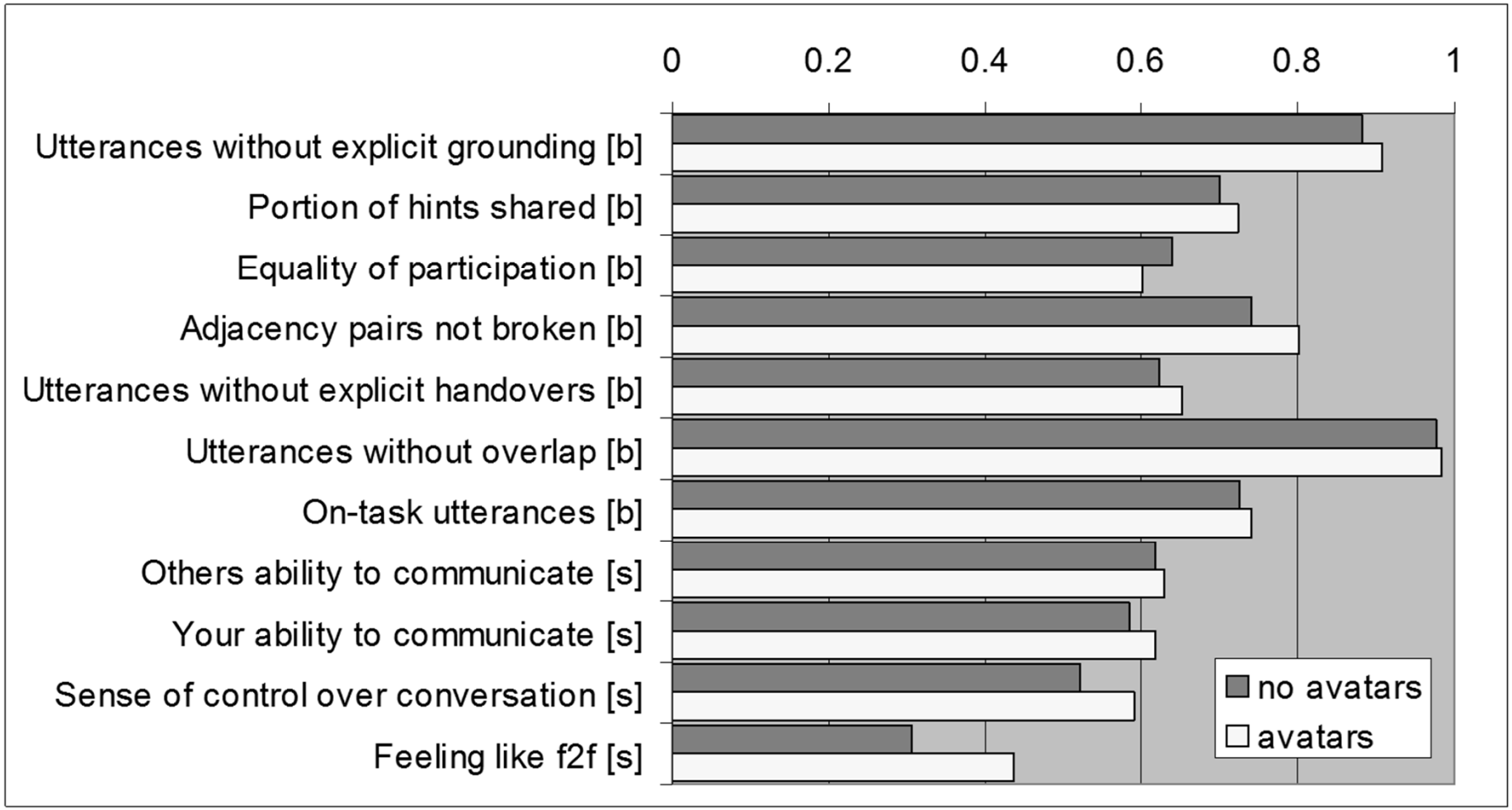




Means are significantly greater than 0 (t-test, 1-tail, $p<0.05$) in all but one!

Evaluation: Conversation

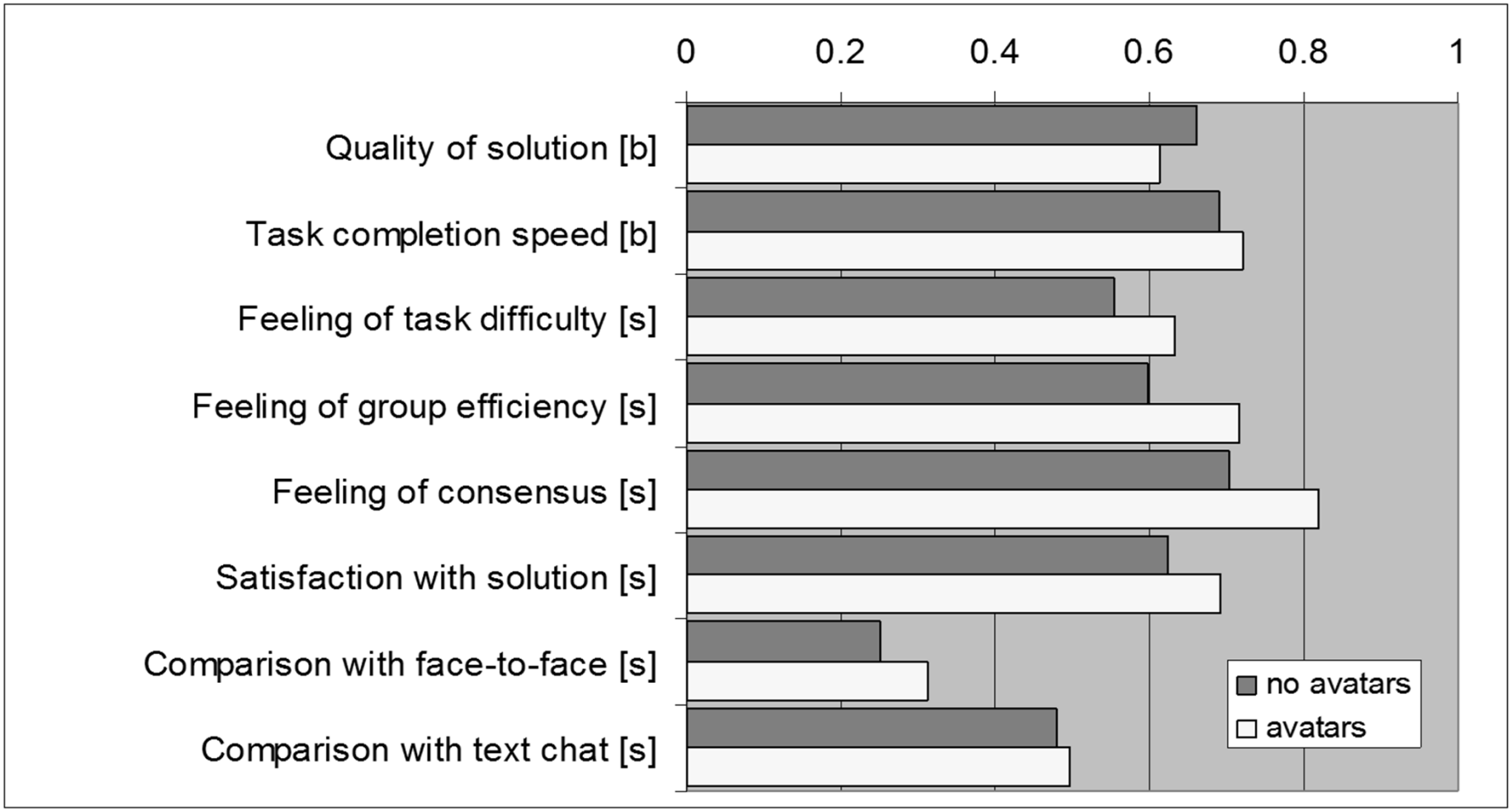
Quality of Conversation Process (11 measures):



Test mean difference > 0: t(10)=2.596, p=0.014, 1-tail, M=0.034, SD=0.043

Evaluation: Collaboration

Quality of Collaboration (8 measures):



Test mean difference > 0: t(7)=2.835, p=0.013, 1-tail, M=0.055, SD=0.055

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Conclusion: Challenges

- Hard to interpret intent
  - A rich discourse context helps
  - What is good enough?
- Moving from text to speech
  - We can extract intonation…
  - …but word recognition is hard
- There is more to being human
  - What about personality and idiosyncratic behavior?

Conclusion: In Sum

- Smart avatars contribute to presence without adding control overhead
- Spark is a flexible framework for giving avatars conversational smarts
- The spark driven avatars compelled players and may be making conversation easier