

Gossip and Small Talk: a Short Social History of Epistemics and of Virtual Humans

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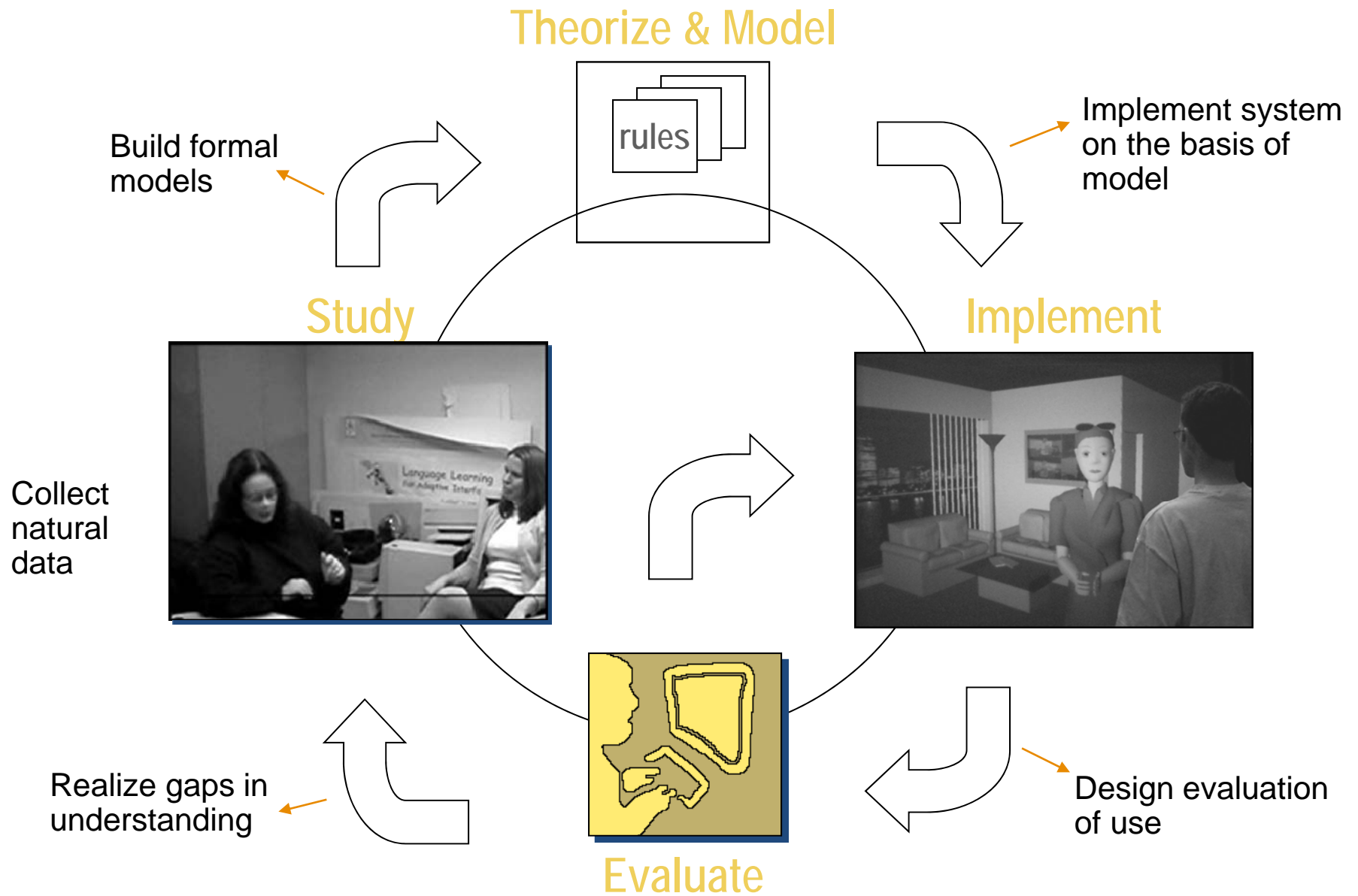
Center for Technology & Social Behavior
Northwestern University

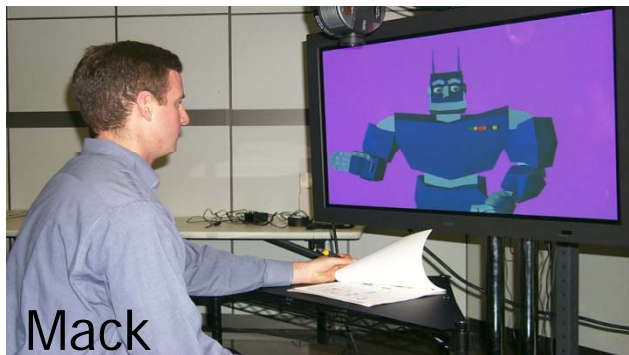
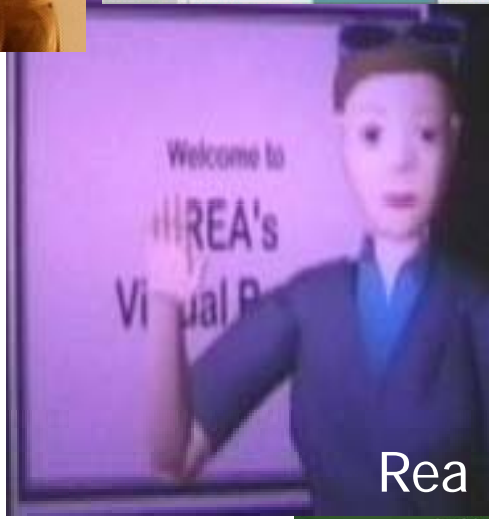
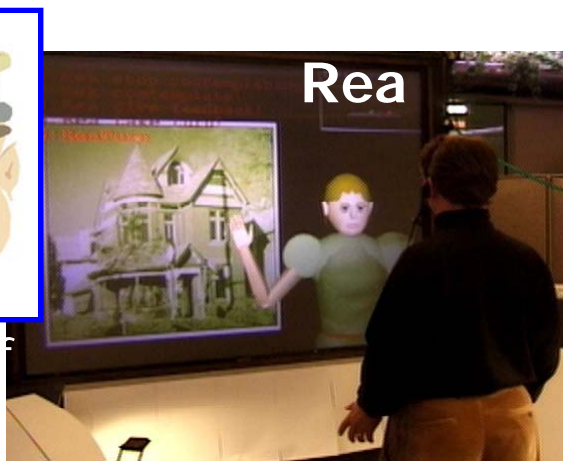


Pointing the way



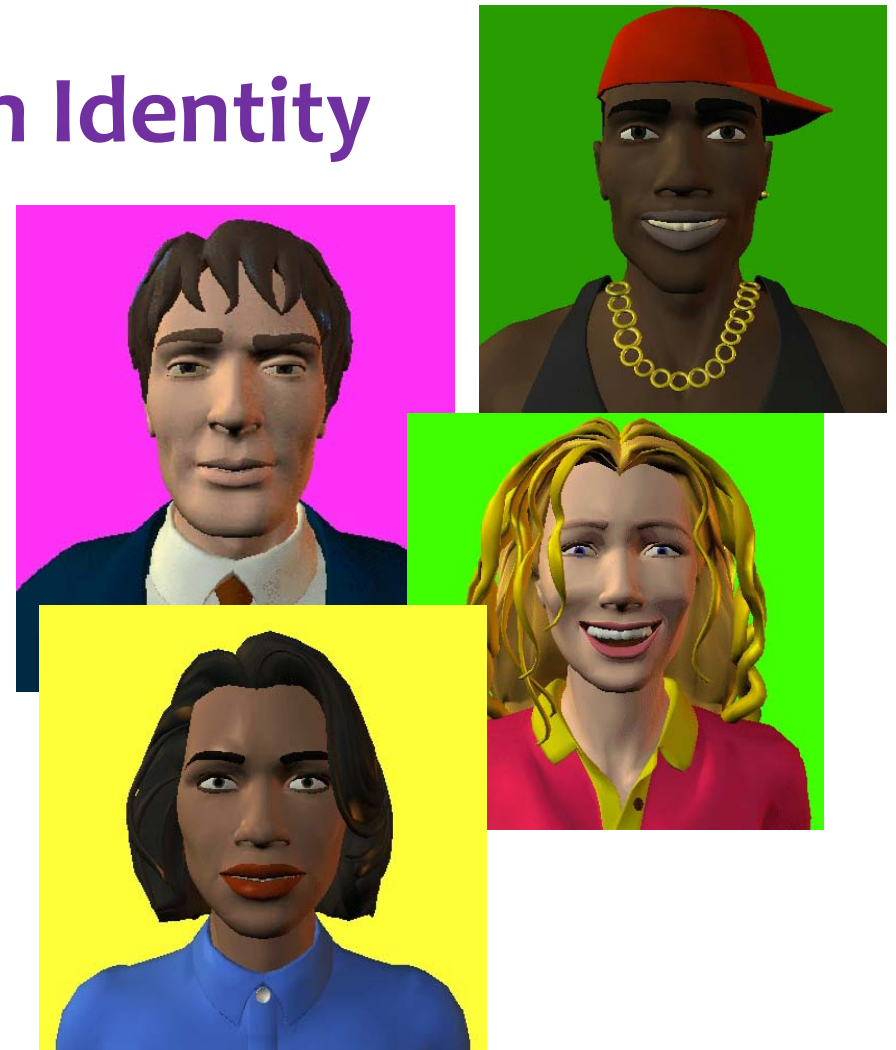
Methodology





Culturalist Research on Identity

- Cultural identity in ECAs has been difference-oriented: talk, look, act.
- “Cultural identity” in tutors has often been looks but not voice or behavior.
- “Cultural identity” in tutors has often come from the designer’s *beliefs* of what those groups are like.
- Large body of research on the topic (i.e. Nass, Hayes-Roth, Baylor, Moreno, Person) which demonstrates preferences but not outcome effects
- Example: Moreno *et al.*
 - Students *preferred* to learn from same race/ gender tutor.
 - All groups *learned the most* from white males.



Moreno, K. N., Person, N. K., Adcock, A. B., Van Eck, R. N., Jackson, G. T., & Marineau, J. C. (2002)

Alternative: Study Moment-to-Moment Behavior



- Dress
 - Jewelry
 - Hair style
 - Language use
 - Movement
- Phonological
 - Syntactic
 - Lexical
 - Delivery
 - Verbal
 - Non-verbal
 - Narrative style
 - Verbal
 - Non-verbal
- Arrows indicate that 'Language use' and 'Movement' are linked to 'Phonological', 'Syntactic', 'Lexical', and 'Delivery'. 'Movement' is also linked to 'Narrative style'.

Example of African American English



- f /θ , v /ð & t /θ
- Deletion of the copula/auxiliary
- Subject-Verb Agreement
- Habitual *be*
- Remote past *been*
- Wif/with; bave/bathe
- He __ hungry.
- They *was* lookin' for the big dog.
- He *be* gettin' some ice cream
- I *been* knowin' how to swim.

AAE Ethnography

- Not all African-Americans use AAE
- Not all African-Americans use AAE in all contexts
- Not all African-Americans use all features of AAE
- African-Americans are not the only ones to use AAE
- The majority of African Americans use some AAE to signal identity in some contexts
- How does language and nonverbal behavior in science talk differ between AAE & MAE?
- In what contexts are AAE & MAE used by children
- How do we use language and identity in the interface?

Corpus Collection

1. Two AAE speakers build a bridge with no adult in the room
2. Two AAE speakers discuss their process of bridge-building to prepare for the teacher
3. An AAE speaker and a VP build a bridge with no adult in the room
4. An AAE speaker and a VP discuss their process of bridge-building to prepare for the teacher

Annotation

1. Utterance Type

- Acknowledgement
Repetition/Rephrase
Reported Speech

2. Goal

- Suggest
Count
Singing
Show
Meta-task

3. Topic

- Pieces
Structure
Ideas/Plans
Task Criteria

1. Eye Gaze

- Toward peer
Toward toy
Elsewhere

2. Head movement

- Nod, shake, tilt

3. Kind of gesture

- Iconic, deictic, emblem

4. Science Talk

- Narrative
Explanation
Causation
Comparing
Questions

Building a Bridge Together (AAE)



Playing Teacher-Student: Talking about Bridge Together (MAE)



Results: Shift in AAE -> MAE by Task

		Bridge-building		Classroom	
	(n)	# AAE Features / total words	DDM	# AAE Features / total words	DDM
Code-switching children	14	35/360	0.10	17/508	0.03



Results: Gaze Direction

Probability of Gaze Shift by Task

Gaze target	Role	Peer	Teacher	Student
Toy		0.87	0.53	0.6
Playmate		0.07	0.32	0.27
Elsewhere		0.06	0.15	0.13



$$\chi^2 = (12, N = 4469) = 460.89, p < 0.0001$$

4469 = # of utterances from code-switching kids
12 = degrees of freedom

Summary of Results: Child-Child Interaction

<u>Task</u>	Bridge	Classroom	
<u>Role</u>	Peer	Teacher	Student
<u>Dialect</u>	+ Higher rate of AAE	- Lower rate of AAE	
<u>Nonverbal Behavior</u>	+ Hand actions + Gaze at Toy - Minimal head movements	+ Gesture + Types of gesture + Increase gaze at Peer & Elsewhere + Head movements (teacher head tilts)	

Step Two: Virtual Peer Study

- Develop race-ambiguous appearance
- Language features
 - Utterance Type
 - AAE Features
- Nonverbal features
 - Gaze Direction
 - Head movements
 - Hand movements
- Context Sensors
 - Task
 - Current Task State



Observe Child's Behavior with VP



Shift from AAE to MAE with VP by Task

	Picture ^	Building	Classroom	
Measures	<i>Child</i> ^	<i>Peer</i>	<i>Teacher</i>	<i>Student</i>
MLU	6.12*	3	7.98*	5.73*
DDM	0.171	0.164	0.042	0.084

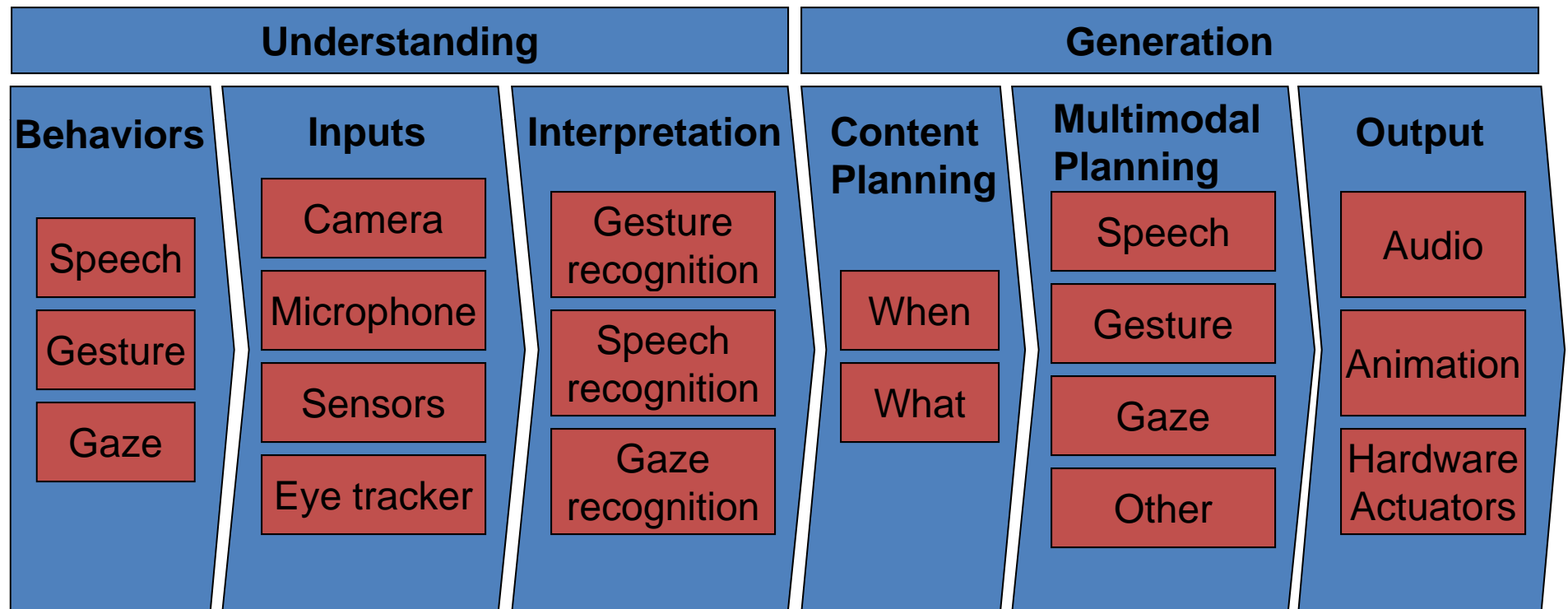


Sophistication (MLU) of child's speech is greatest in classroom task, especially when VP is student.

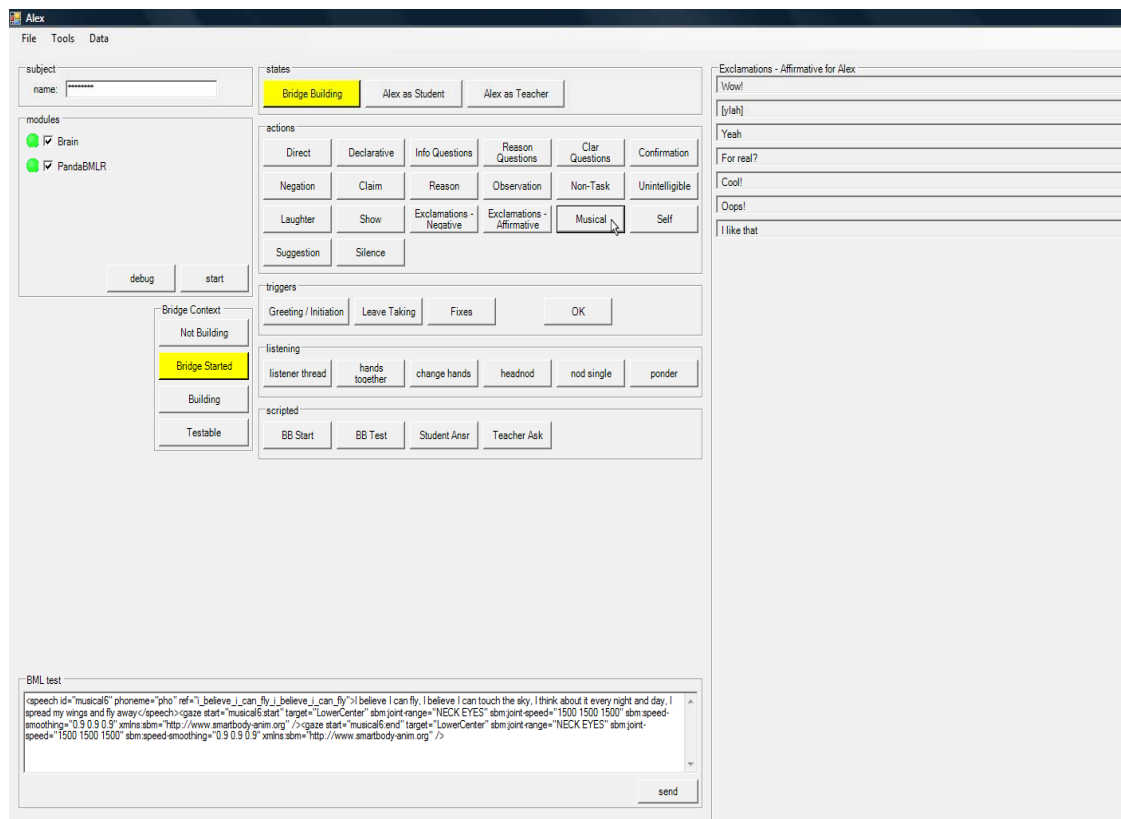
Amount of AAE is greatest with white experimenter (!) and least in classroom task – especially when VP is student.

VP has an effect on children's talk and action

Usual ECA Architecture



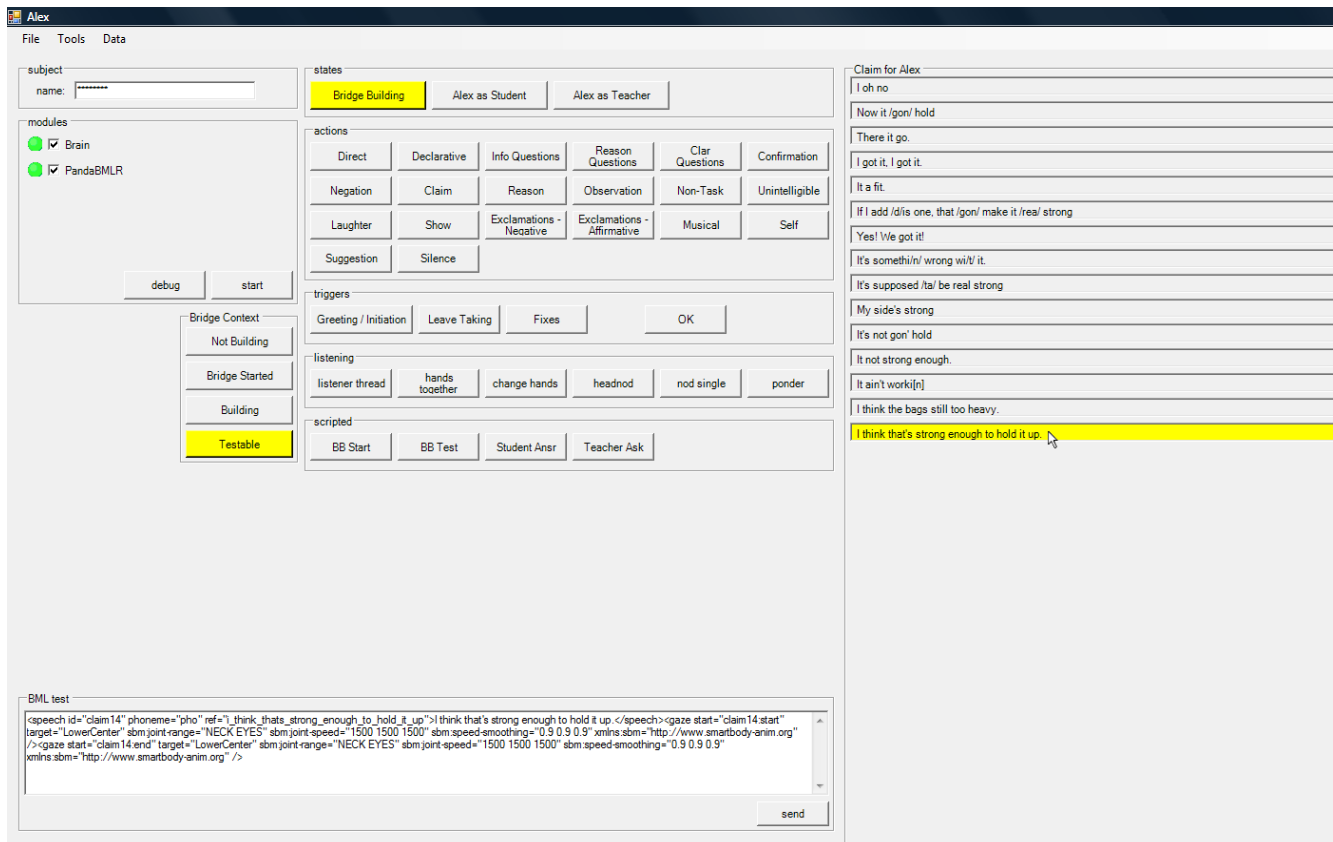
But these Experiments Usually Require WoZ (and Closet) albeit a special WoZ



Probabilistic Modeling for WoZ

- Using an annotated corpus of child-child behavior, how do we build a predictive model of behavior, that can drive an agent?
- Annotate AAE morphosyntax & phonology
- Annotate utterance act, goal act, topic act.
- Annotate gesture, eye gaze, head position, posture.
- Annotate “science talk” (causality, reasoning, explanation)
- Correlate all of these and use to create a pre-run-time

Markov Chain + Katz Back-Off Probabilistic Modeling with Good Turing Smoothing using the SRILM



Experimenter selects 'I think that's strong enough to hold it up' from 'Claim' list.

Alex
File Tools Data

subject
name: *****

modules
☒ Brain
☒ PandaBMLR

debug start

Bridge Context
 Not Building
 Bridge Started
 Building
Testable

states
Bridge Building Alex as Student Alex as Teacher

actions

Direct	Declarative	Info Questions	Reason Questions	Clar Questions	Confirmation
Negation	Claim	Reason	Observation	Non-Task	Unintelligible
Laughter	Show	Exclamations - Negative	Exclamations - Affirmative	Musical	Self
Suggestion	Silence				

triggers
 Greeting / Initiation Leave Taking Fixes OK

listening
 listener thread hands together change hands headnod nod single ponder

scripted
 BB Start BB Test Student Ansr Teacher Ask

Negation for Alex
 No
 Nuh uh (disagree)
 Nuh UH-uh
 I oh no
 Why?

BML test

```

<speech id="claim14" phoneme="pho" ref="1" think_thats_strong_enough_to_hold_it_up">I think that's strong enough to hold it up.</speech> <gaze start="claim14:start"
target="LowerCenter" sbm:joint-range="NECK EYES" sbm:joint-speed="1500 1500 1500" sbm:speed-smoothing="0.9 0.9 0.9" xmlns:sbm="http://www.smartbody-anim.org"
/> <gaze start="claim14:end" target="LowerCenter" sbm:joint-range="NECK EYES" sbm:joint-speed="1500 1500 1500" sbm:speed-smoothing="0.9 0.9 0.9"
xmlns:sbm="http://www.smartbody-anim.org" />
  
```

 send

Child says, 'You see that? It just fell'. Experimenter presses 'Declarative', and Conversational model generates 'Negation' in response.

Alex

File Tools Data

subject
name: *****

modules

- ☒ Brain
- ☒ PandaBMLR

debug start

Bridge Context

- Not Building
- Bridge Started
- Building
- Testable**

states

- Bridge Building**
- Alex as Student
- Alex as Teacher

actions

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triggers

- Greeting / Initiation
- Leave Taking
- Fixes
- OK

listening

- listener thread
- hands together
- change hands
- headnod
- nod single
- ponder

scripted

- BB Start
- BB Test
- Student Ansr
- Teacher Ask

Negation for Alex

- No
- Nuh uh (disagree)
- Nuh UH-uh**
- I oh no
- Why?

BML test

```
<speech id="negation3" phoneme="pho" ref="nuh_uhuh"></speech><gaze start="negation3.start" target="LowerCenter" sbm.joint.range="NECK EYES" sbm.joint.speed="1500 1500 1500" sbm.speed-smoothing="0.9 0.9 0.9" /><gaze start="negation3.end" target="LowerCenter" sbm.joint.range="NECK EYES" sbm.joint.speed="1500 1500 1500" sbm.speed-smoothing="0.9 0.9 0.9" /><sbm.animation name="gametable_headtilt2" MEtwarp="1.0" />
```

send

Experimenter selects 'Nuh UH-uh' from 'Negation' list.

Alex

File Tools Data

subject
name: *****

modules
☒ Brain
☒ PandaBMLR

debug start

Bridge Context
 Not Building
 Bridge Started
 Building
 Testable

states
 Bridge Building Alex as Student Alex as Teacher

actions
 Direct Declarative Info Questions Reason Questions Clar Questions Confirmation
 Negation Claim Reason Observation Non-Task Unintelligible
 Laughter Show Exclamations - Negative Exclamations - Affirmative Musical Self
 Suggestion Silence

triggers
 Greeting / Initiation Leave Taking Fixes OK

listening
 listener thread hands together change hands headnod nod single ponder

scripted
 BB Start BB Test Student Ansr Teacher Ask

Info Questions for Alex
 What are you /gon/ do?
 What are you doi/n/ next?
 What are you doi/n/?
 What are doi/n/ now?
 Do you need to add some /mo/ blocks?
 Got any ideas for me?

BML test

```
<speech id="negation3" phoneme="pho" ref="nuh_uhuh"></speech><gaze start="negation3.start" target="LowerCenter" sbm.joint.range="NECK EYES" sbm.joint.speed="1500 1500 1500" sbm.speed-smoothing="0.9 0.9 0.9" /><gaze start="negation3.end" target="LowerCenter" sbm.joint.range="NECK EYES" sbm.joint.speed="1500 1500 1500" sbm.speed-smoothing="0.9 0.9 0.9" /><sbm.animation name="gametable_headtilt2" MEtwarp="1.0" />
```

send

Child answers, 'uh-HUH', and experimenter presses 'Exclamations – Affirmative'.
 Conversational model generates 'Info Questions' as a response.

Next Steps (AKA questions):

- How do we do probabilistic modeling on hierarchical coding (utterance act, goal act, topic act)?
- How do we integrate non-verbals into probabilistic model?
- How do we integrate science talk? What role does Alex play in science talk (tutor? Peer? Model?)?
- *That is, how do we do probabilistic models on hierarchical and diverse kinds of annotated data?*

For more information

<http://www.soc.northwestern.edu/justine/>

<http://articulab.northwestern.edu>

*Thanks to
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