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# TOWARDS A MODEL OF FACE-TO-FACE GROUNDING

# Empirical Study



- Face-to-face condition (F2F)
- Shared Reference condition (SR)

# Empirical Study

	Shift to	
	within UU	pause
Acknowledgement	$gMwN/gM$ (0.495)	$gM/gM$ (0.888)
Answer	$gP/gP$ (0.436)	$gM/gM$ (0.667)
Info-req	$gP/gM$ (0.38)	$gP/gP$ (0.5)
Assertion	$gP/gM$ (0.317)	$gM/gM$ (0.418)



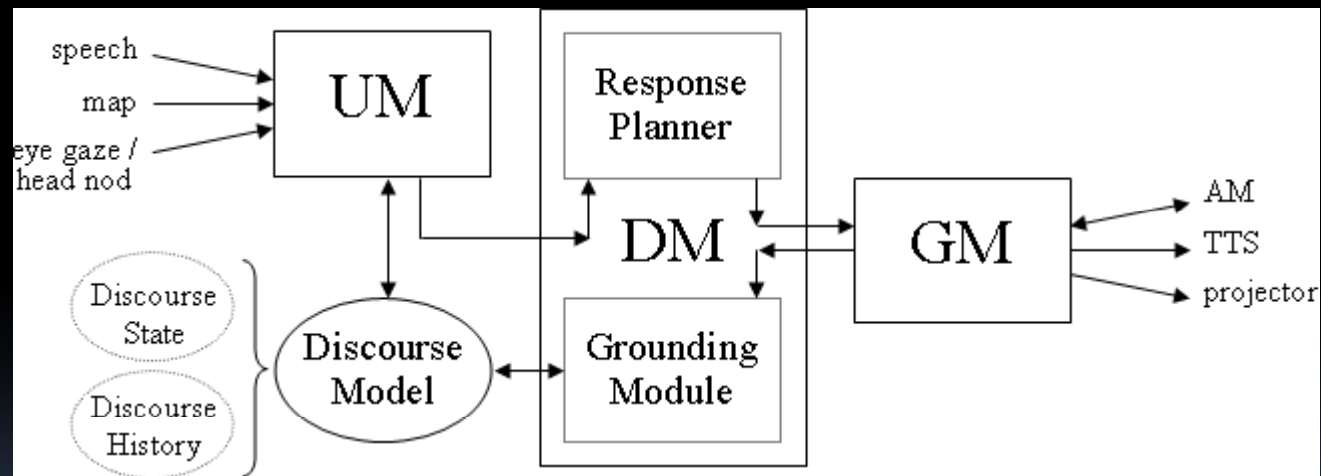
# MACK

- Interactive public information ECA kiosk
  - Can answer questions about the MIT Media lab
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# MACK I/O

- Input operates on parallel threads
  - Speech
  - Pen gesture via a paper map
  - Head nod and eye gaze via camera
- Output
  - Speech synthesis using Text-to-Speech API (TTS)
  - A graphical figure with hand and arm gestures and head and eye movements (AM)
  - LCD projector highlighting the paper map

# MACK system architecture



# MACK

- Generation module (GM)
  - Converts UU into speech, gesture and projector output
- Discourse Model (DM)
  - List of grounded UUs
  - List of ungrounded UUs
  - The current UU
- The Understanding Module
  - Converts input to dialogue moves

# Dialogue Manager (DM)

- The Response planner
  - Determines next action
  - Creates a sequence of utterance units (UU)
- Grounding Module (GrM)
  - Updates the Discourse Model
  - Passes UUs to the Generation module
  - Look up nonverbal information to judge a UU



# MACK grounding

- Verbal evidence is stronger than nonverbal

Target UU Type	Evidence Type	NV Pattern	Judgment of ground	Suggested next action
Assertion	positive	within: map pause: map /nod	grounded	go-ahead: 0.7 elabor.: 0.30
Assertion	negative	within: gaze pause: gaze	ungrounded	go-ahead: 0.27 elabor.: 0.73
Answer	positive	within: gaze pause: map	grounded	go-ahead: 0.83 elabor.: 0.17
Answer	negative	pause: gaze	Ungrounded	go-ahead: 0.22 elabor.: 0.78

# MACK example

[1] U: How do I get to Room 309?

[2] M: To get to Room 309, go to that door and make a right.  
●-----●  
look at map

[3] M: Walk down the hall and make a left at the door  
●-----●-----●-----●  
look at map gaze at MACK

[4] M: It's the glass door with red couches right outside.  
●-----●-----●-----●-----●  
look at map nod

[5] M: And that's Room 309.  
●-----●  
look at map

**The End**