Human-Computer Interaction
IS4300

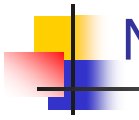
T5 – Paper Prototyping

- Recruit 3-5 users who are as close as possible to your target demographic.
- Be sure to record demographic information (age, gender, education, occupation, etc.) for your report.
- **Testing Users** When you run your prototype on a user, you should do the following things:
  - Obtain verbal consent for participation.
  - Brief the user.
  - Present one task.
  - Watch the user do the task. Take notes of your observations.
  - Repeat with the other tasks.
  - Interview users, take any measures you think are important.

2

Quiz

- Characterize the following 15 seconds of dialog
  - Diane (on left) is a real estate agent, Beth & Ned Flood are new clients.
  - Video will be played 10 times
  - You will then have 5 minutes to analyze & write up your results
- *Hint: think about each communicative modality separately, starting with speech*



Notation

- Each utterance on a new line, preceded by speaker initial (Diane,Beth,Ned).

B: [1 So what are you looking for]?

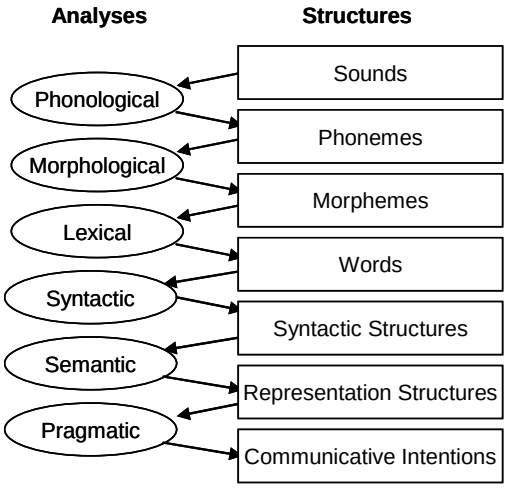
1: right hand point at B

N: Oh, um, I think three bedrooms.

Human Dialogue

Why should HCI designers/researchers study it?

Hierarchical Structure of Language

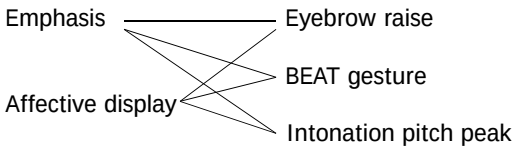


Discourse, Dialogue & NVB are all pragmatic concerns

- Intimately depend on context
- Discourse is concerned with
  - The combinatorial meaning of utterances (internal context)
  - Other contextual phenomena (external context)
    - Deixis
    - Social deixis
    - Grounding & referring
    - Etc.

Conversational behavior vs. function

- Eyebrow raise is a *conversational behavior*
- Emphasis is a *conversational function*
- There is a many-to-many mapping between behaviors and functions

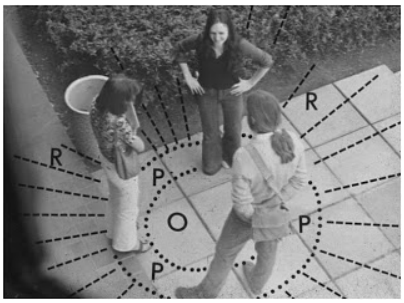


Types of Conversational Function

- Propositional
- Interactional
- Affective
- Attitudinal
- Relational
- ...

Proxemics
functions?

- Engagement & disengagement
- Social distance
- Immediacy behavior



Eye gaze
functions?

- Attention
- Deictic
- Turn-taking

Eyebrows

- Emphasis
- Affective displays

Headnods
functions?

- Emphasis
- Greetings
- Backchannels
- Acknowledgements

Hand gesture *functions?*

- *Form… (from David McNeil)*
  - Beat
  - Deictic
  - Iconic
  - Metaphoric
  - Emblematic
- Function
  - Emphasis
  - Propositional/Semantic
  - Turn-taking / interruption

Turn-taking

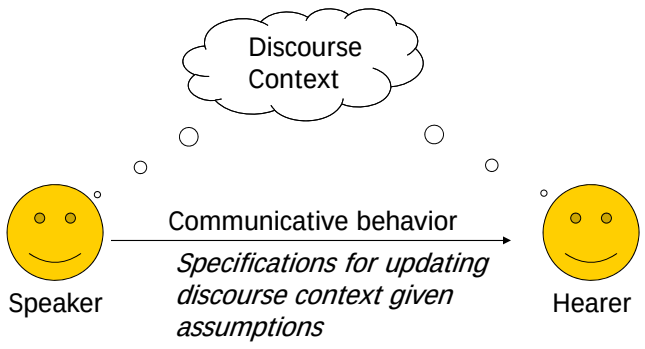
- Interlocutors cannot talk at once
- Cues for 'giving turn'
  - Gaze at next speaker
  - Pause
  - Rising end intonation
- Cues for taking 'taking turn'
  - Speaking
  - Gesturing

Grounding

- Process by which interlocutors come to a shared understanding of what is said
- A collaborative process
- Mechanisms
  - Requests for acknowledgement
  - Acknowledgements
    - Can be contingent move
  - Request for repair
  - Repair

Discourse understanding

How does hearer understand?



Assumptions
- Physical context
- Language abilities
- "Commonsense"
- Cultural context
- Gricean maxims (quantity, quality, relevance, etc)
- etc

Speech act theory

- Our utterance are actions
  - Bless, Vow, Curse
  - Assert, Promise, Request, Reply, etc.
- Locutionary act (uttering the words)
- Illocutionary act (speech act)
- Perlocutionary act (ultimate effect)

- *e.g. "It's cold in here."*
- *But, very problematic!*

Other phenomena

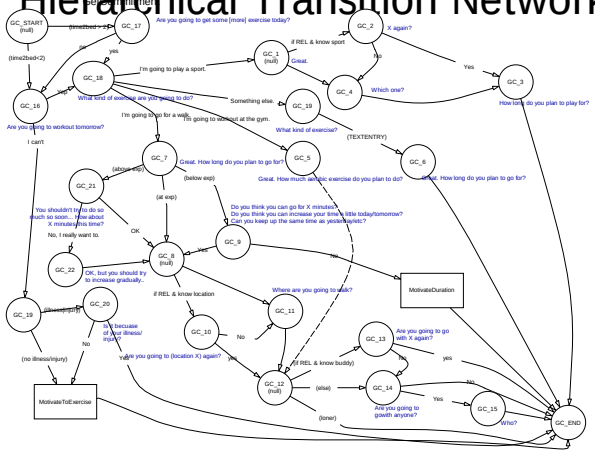
- Anaphora / Cataphora
  - *John ate an apple. He liked **it**.*
  - *If you need **one**, there's a towel in the top drawer.*
- Ellipsis
  - *Anything wrong?*

Representations of Dialog as used in dialog systems

- State transition networks
  - Hierarchical
  - ATNs
- Rule-based
  - Chunks of dialog are represented by a partially-ordered sequence of states
    - e.g. adjacency pairs
  - Chunks are negotiated and deployed dynamically at runtime

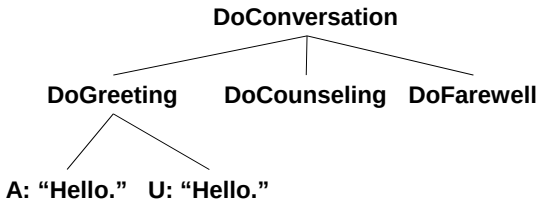
Dialogue Representation

- Hierarchical Transition Networks



Dialogue Representation

- Hierarchical Task Decomposition Planner
  - Based on ANSI/CEA 2018



Embodied Conversational Agents

- recognize and respond to verbal and non-verbal input
- generate verbal and non-verbal output.
- use conversational functions such as turn taking, feedback, and repair mechanisms.
- can negotiate conversational process, as well as contribute new propositions to the discourse.

Motivation

- Intuitive
- Multi-modal
- Social

Example: REA

- Acknowledgment of user's presence
  - Proxemics, facial display
- Feedback function
  - Headnod, paraverbal (e.g. "mmhmm"), eyebrows
- Turntaking function
  - User speech, gesture
  - Rea gaze
- Greeting, Farewell
- Emphasis
- Multimodal propositional output

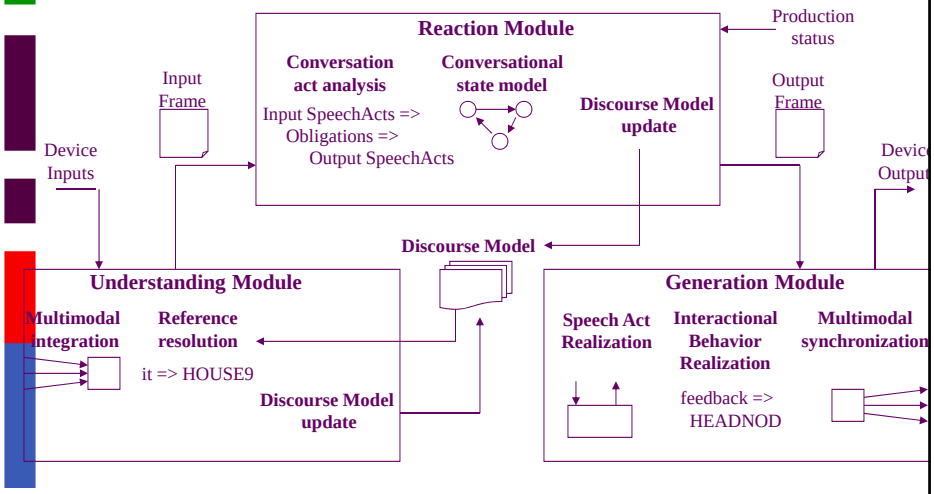
Rea Turn-Taking Model

State	User Input	Input Function
Rea speaking	Gesture	Wanting turn
	Speech	Taking turn
User speaking	Pause of <500 msec.	Wanting feedback
	Imperative phrase	Giving turn
	Interrogative phrase	Giving turn
	Declarative phrase & pause >500 msec. & no gesture	Giving turn
	Declarative phrase & long gesture or pause	Holding turn

Rea Conversational Behaviors

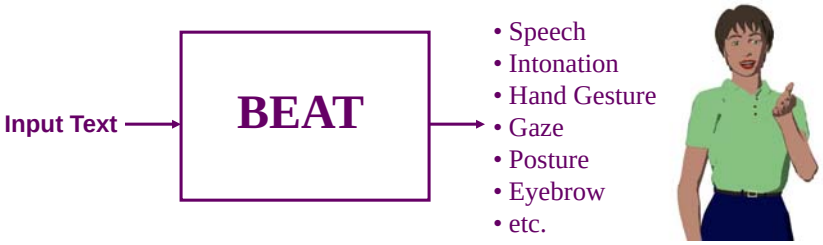
State	Output Function	Behaviors
User Present	Open interaction	Look at user. Smile. Headtoss.
	Attend	Face user.
	End of interaction	Turn away.
	Greet	Wave, “hello”
Rea Speaking	Give turn	Relax hands. Look at user. Raise eyebrows
	Signoff	Wave. “bye”
User Speaking	Give feedback	Nod head Paraverbal
	Want turn.	Look at user. Raise hands. Paraverbal(“umm”).
	Take turn.	Look at user. Raise hands to begin gesturing. Speak.

REA Architecture

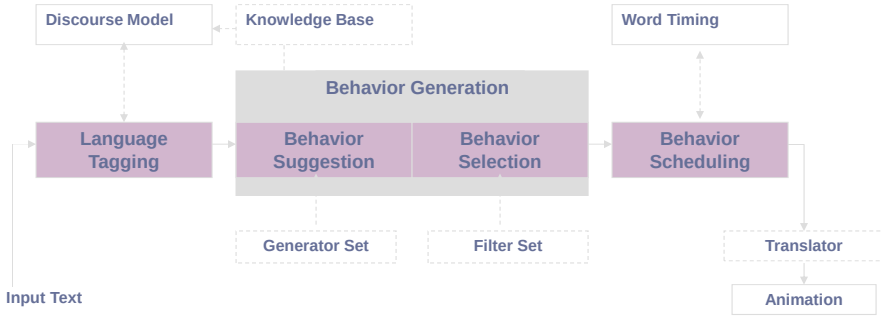


BEAT: An Extensible Toolkit for Generating Coverbal Behavior

- A toolkit to make building new ECAs easier
- Encapsulates all linguistic knowledge required to add nonverbal behavior to a script

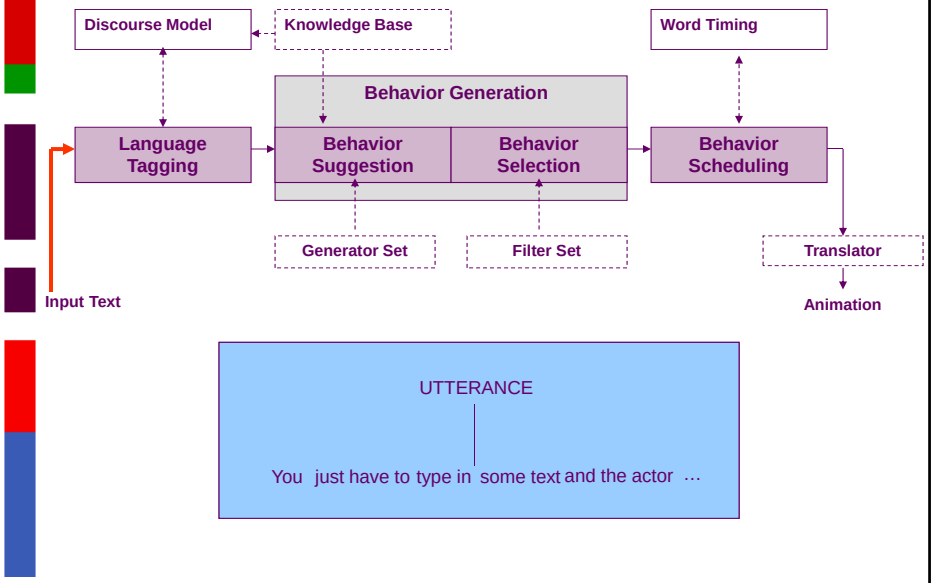


BEAT Architecture



"You just type in some text, and the actor talks and gestures by itself!"

XML Trees Passed Among Modules



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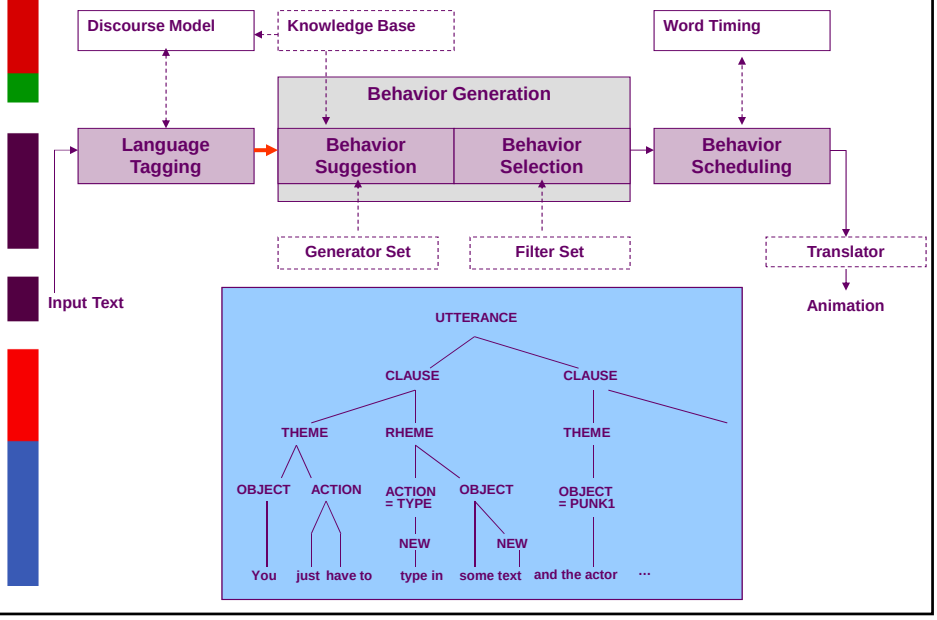

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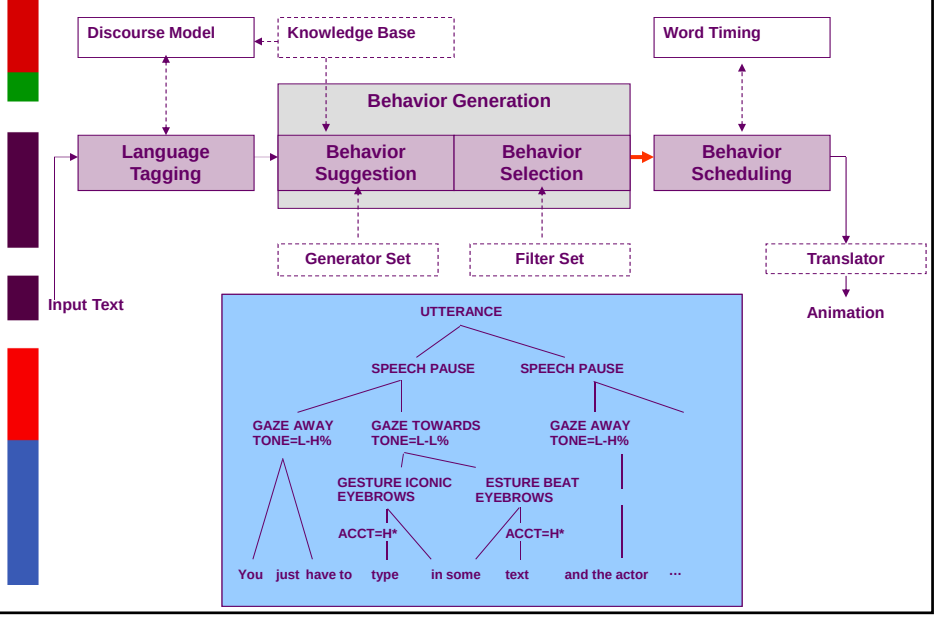

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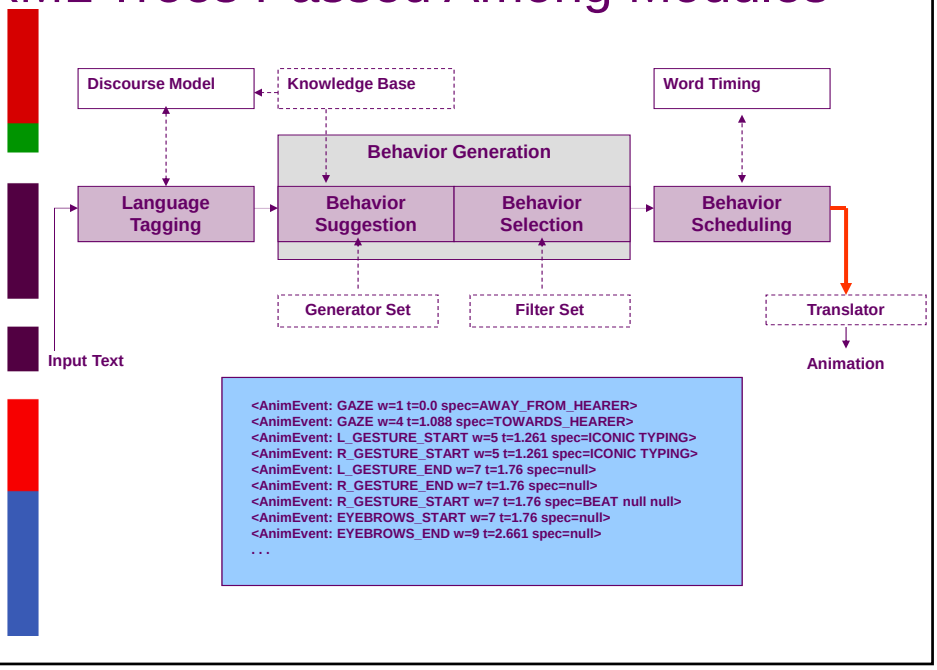
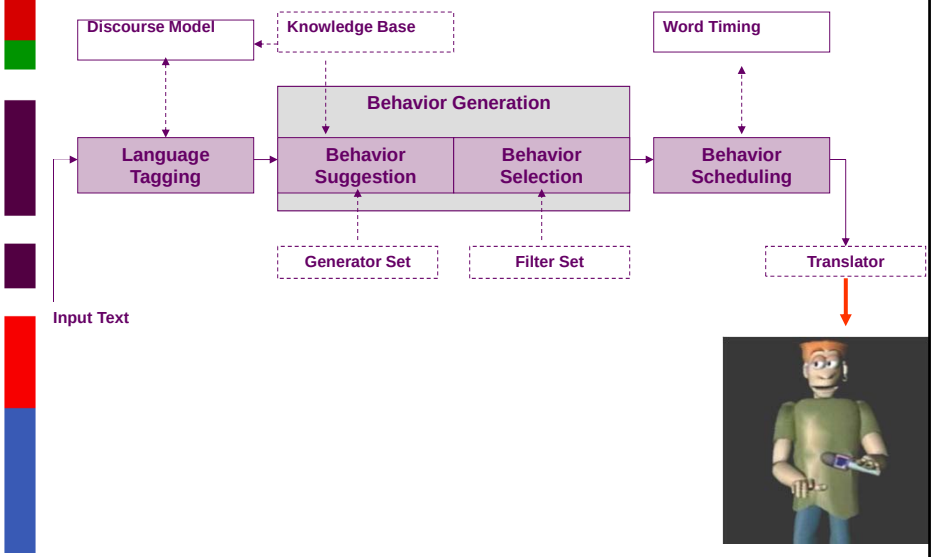


BEAT Architecture



Empirical Studies: Posture Shifts

Cassell, Nakano, Bickmore, Sidner &Rich. "Non-Verbal Cues for Discourse Structure." ACL '01

Posture shifts with respect to discourse segment

	Monologues (0.06/s)			Dialogues (0.07/s)		
	ps/s	ps/int	energy	ps/s	ps/int	energy
Inter-dseg	0.340	0.837	0.832	0.332	0.533	0.844
intra-dseg	0.039		0.701	0.053		0.723

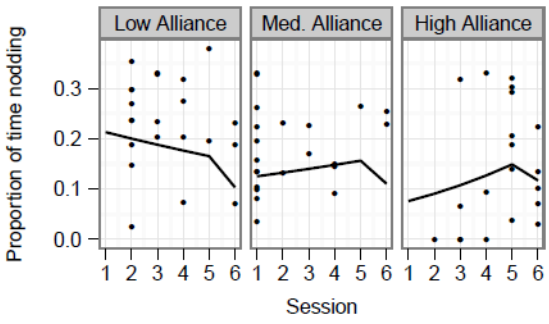
Resulting Models

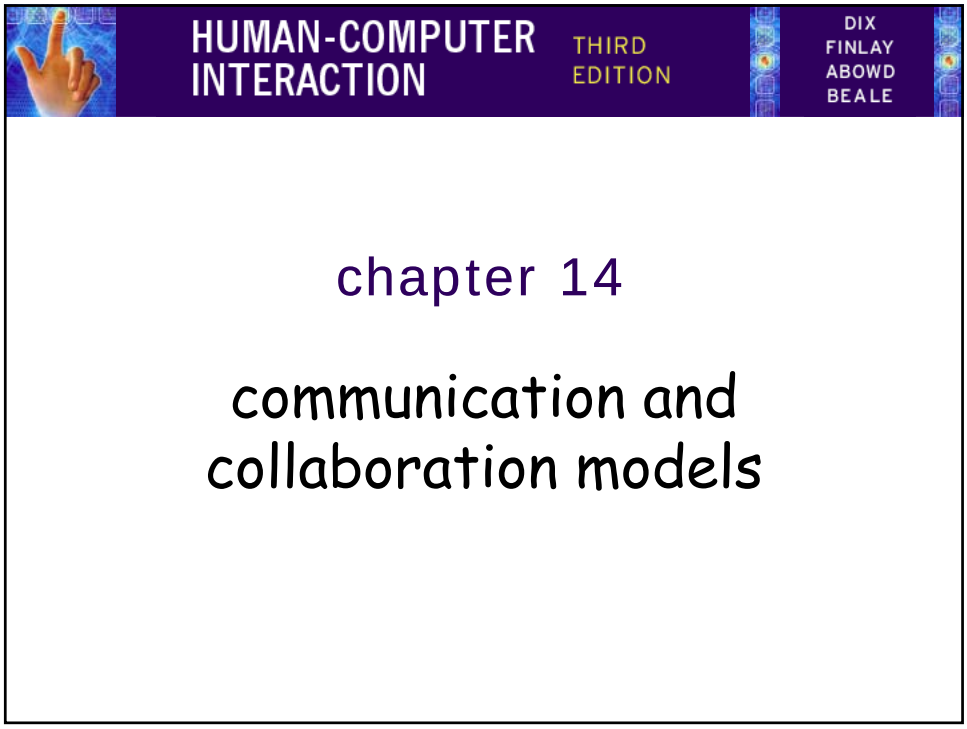
New Topic Level	Gesture		
	NONE	POINT	REGION
No Change	80.8%	13.1%	6.1%
PAGE	63.6%	13.6%	22.7%
SECTION	48.3%	32.8%	19.0%
ITEM	31.2%	65.9%	2.9%

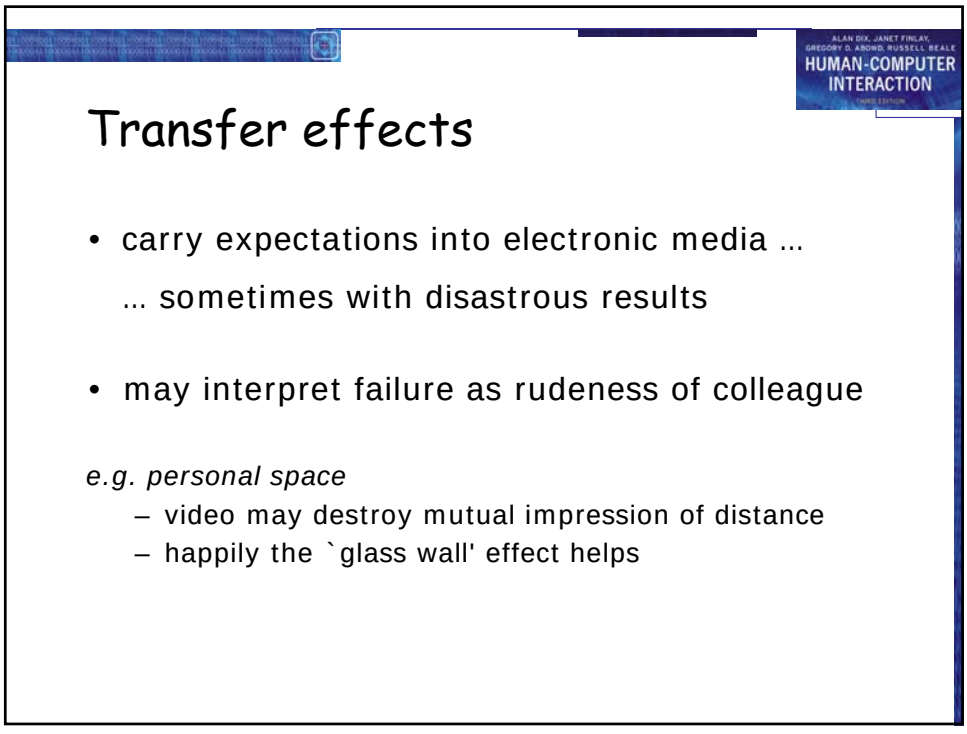
Nurse Gaze

Speaking, not gesturing: **gaze at document 65%**
Speaking and gesturing: **gaze at document 83%**

Change in behavior over time and by relationship quality




HUMAN-COMPUTER
INTERACTION
THIRD
EDITION
DIX
FINLAY
ABOWD
BEALE
chapter 14
communication and
collaboration models


HUMAN-COMPUTER
INTERACTION
Transfer effects
• carry expectations into electronic media …
… sometimes with disastrous results
• may interpret failure as rudeness of colleague
e.g. personal space
– video may destroy mutual impression of distance
– happily the `glass wall' effect helps

Back channels -media effects

Restricting media restricts back channels

video	–	loss of body language
audio	–	loss of facial expression
half duplex	–	lose most voice back-channel responses
text based	–	nothing left!

Text-based communication

Most common media for asynchronous groupware
exceptions: voice mail, answer-phones

Familiar medium, similar to paper letters
but, electronic text may act as speech substitute!

Types of electronic text:

- discrete directed messages, no structure
- linear messages added (in temporal order)
- non-linear hypertext linkages
- spatial two dimensional arrangement

In addition, linkages may exist to other artefacts

Problems with text

No facial expression or body language

⇒ weak *back channels*

So, difficult to convey:

affective state – happy, sad, …

illocutionary force – urgent, important, …

Participants compensate:

'flaming' and smilies

;-) :-(:-)

Maintaining context

Recall *context* was essential for disambiguation

Text loses external context, hence deixis
(but, linking to shared objects can help)

1. **Alison:** Brian's got some lovely roses
2. **Brian:** I'm afraid they're covered in greenfly
3. **Clarise:** I've seen them, they're beautiful

Both (2) and (3) respond to (1)
… but *transcript* suggests greenfly are beautiful!

Coping strategies

People are very clever!

they create *coping strategies* when things are difficult

Coping strategies for slow communication

attempt to increase granularity:

eagerness – looking ahead in the conversation game

- **Brian:** Like a cup of tea? Milk or lemon?

multiplexing – several topics in one utterance

- **Alison:** No thanks. I love your roses.

To do

- Read
  - CSCW (Dix Ch 19)
- Project
  - P6 – First software prototype
  - Must be running and distributable by 11/7