# Lecture 14 – Agents and Natural Language

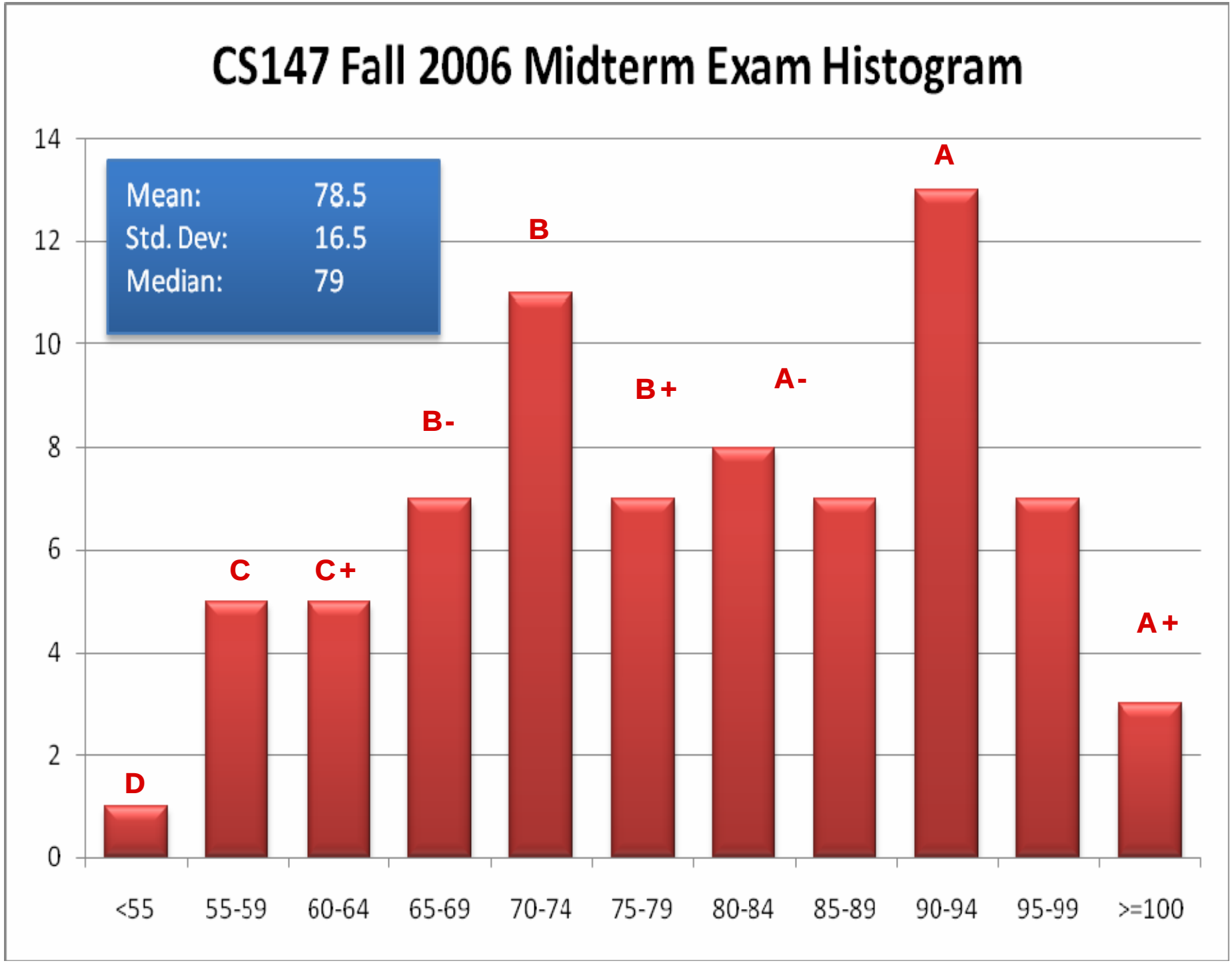
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CS147 - Introduction to Human-Computer Interaction Design

Computer Science Department

Stanford University

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CS147 Fall 2006 Midterm Exam Histogram
Mean: 78.5
Std. Dev: 16.5
Median: 79
14
12
10
8
6
4
2
0
D
C
C+
B-
B
B+
A-
A
A+
<55
55-59
60-64
65-69
70-74
75-79
80-84
85-89
90-94
95-99
>=100

# Learning Goals

- What is the agent vision?
- Why is it hard?
- What are the promises and dangers?

# Vision: Knowledge Navigator - 1987



# Interface Agents - Negroponte

- The “well trained English butler”
  - Direct manipulation vs. delegation
  - Metaphor of  “agents” such as real estate agent, travel agent,..
- Shared context/experience
  - The issue is not I.Q. . It is shared knowledge and the practice of using it in your best interests.
  - Machine learning to develop context
  - …filter and extract relevant information from a body of information that is orders of magnitude larger than anything I can digest.
- The power of multiple independent agents

# Natural Language

- Ad Hoc response (Eliza, 1966)
- Symbolic understanding (SHRDLU, 1970)
- Statistical recognition (current systems)

# Eliza (Weizenbaum, 1966) – The Doctor is In

TELL ME YOUR PROBLEM
Men are all alike.
IN WHAT WAY?
They're always bugging us about something or other.
CAN YOU THINK OF A SPECIFIC EXAMPLE?
Well, my boyfriend made me come here.
YOUR BOYFRIEND MADE YOU COME HERE
He says I'm depressed much of the time.
I AM SORRY TO HEAR YOU ARE DEPRESSED
It's true. I am unhappy
DO YOU THINK COMING HERE WILL HELP YOU NOT TO BE UNHAPPY
I need some help, that much seems certain.
WHAT WOULD IT MEAN TO YOU IF YOU GOT SOME HELP
Perhaps I could learn to get along with my mother.
TELL ME MORE ABOUT YOUR FAMILY
My mother takes care of me.

# Eliza continued

WHO ELSE IN YOUR FAMILY TAKES CARE OF YOU

My father.

YOUR FATHER

You are like my father in some ways.

WHAT RESEMBLANCE DO YOU SEE

You are not very aggressive but I think you don't want me to notice that.

WHAT MAKES YOU THINK I AM NOT VERY AGGRESSIVE

You don't argue with me.

WHY DO YOU THINK I DON'T ARGUE WITH YOU

You are afraid of me.

DOES IT PLEASE YOU TO BELIEVE I AM AFRAID OF YOU

My father is afraid of everybody.

WHAT ELSE COMES TO YOUR MIND WHEN YOU THINK OF YOUR FATHER

Bullies.

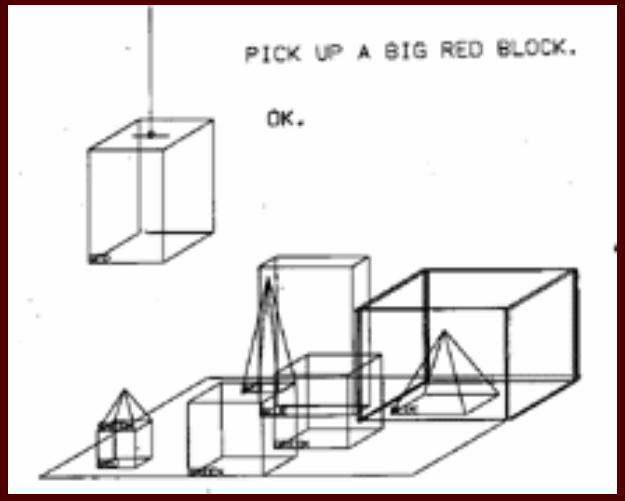
DOES THAT HAVE ANYTHING TO DO WITH THE FACT THAT YOUR BOYFRIEND MADE YOU COME HERE

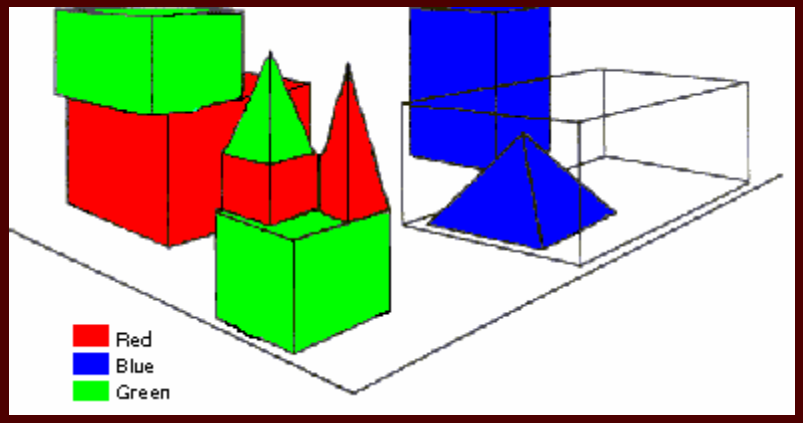
# ELIZA script

```
key: if 3
   decomp: * if *
      reasmb: Do you think its likely that (2) ?
      reasmb: Do you wish that (2) ?
      reasmb: What do you know about (2) ?
      reasmb: Really, if (2) ?
key: dreamed 4
   decomp: * i dreamed *
      reasmb: Really, (2) ?
      reasmb: Have you ever fantasized (2) while
         you were awake ?
      reasmb: Have you ever dreamed (2) before ?
```

# Natural Language Understanding

- SHRDLU (Winograd, 1970)



# SHRDLU Dialog

- pick up a big red block.
  OK. (does it)
  grasp the pyramid.
  I DON'T UNDERSTAND WHICH PYRAMID YOU MEAN.
  find a block which is taller than the one you are holding and put it into the box.
  BY "IT", I ASSUME YOU MEAN THE BLOCK WHICH IS TALLER THAN THE ONE I AM HOLDING.
  OK. (does it)
  what does the box contain?
  THE BLUE PYRAMID AND THE BLUE BLOCK.
  what is the pyramid supported by?
  THE BOX.
  how many blocks are not in the box?
  FOUR OF THEM.
  is at least one of them narrower than the one which i told you to pick up?
  YES, THE RED CUBE.

# SHRDLU continued

- will you please stack up both of the red blocks and either a green cube or a pyramid?
  OK. (does it)
  which cube is sitting on the table?
  THE LARGE GREEN ONE WHICH SUPPORTS THE RED PYRAMID.
  is there a large block behind a pyramid?
  YES, THREE OF THEM: A LARGE RED ONE, A LARGE GREEN CUBE, AND THE BLUE ONE.
  is there anything which is bigger than every pyramid but is not as wide as the thing that supports it?
  YES, THE BLUE BLOCK.
  does a steeple
  SORRY, I DON'T KNOW THE WORD "STEEPLE".
  a "steeple" is a stack which contains two green cubes and a pyramid.
  I UNDERSTAND.
  are there any steeples now?
  NO.
  build one.

# Difficulties in Computer Language Understanding

- Multiplicity of mappings from level to level
  - Ambiguity (multiple senses), polysemy, homonymy, etc.
- Context dependence (e.g., pronouns)
- Subtle complexities of rules
- Ill-formedness of “natural” natural language
  - False starts, ungrammaticality, wrong words
- Difficulty of formalizing imprecise meanings
  - Metaphor, vagueness, indirect speech acts
- Pervasive use of world knowledge in cooperative communication
  - The common sense problem

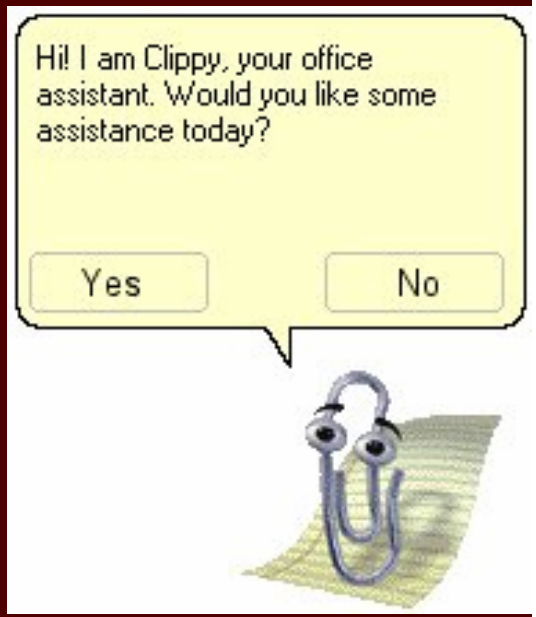
# Voice/Phone systems

- Limited domain
- Statistical recognition
- Shaping the response
- Social behavior



# Agents in the User Interface

- Believable agents – Metaphors with character
  - Virtual Characters (Apple Guides)
  - Microsoft Bob, Microsoft Agents
  - Conversational agents
  - Non-player game characters






# Microsoft Bob

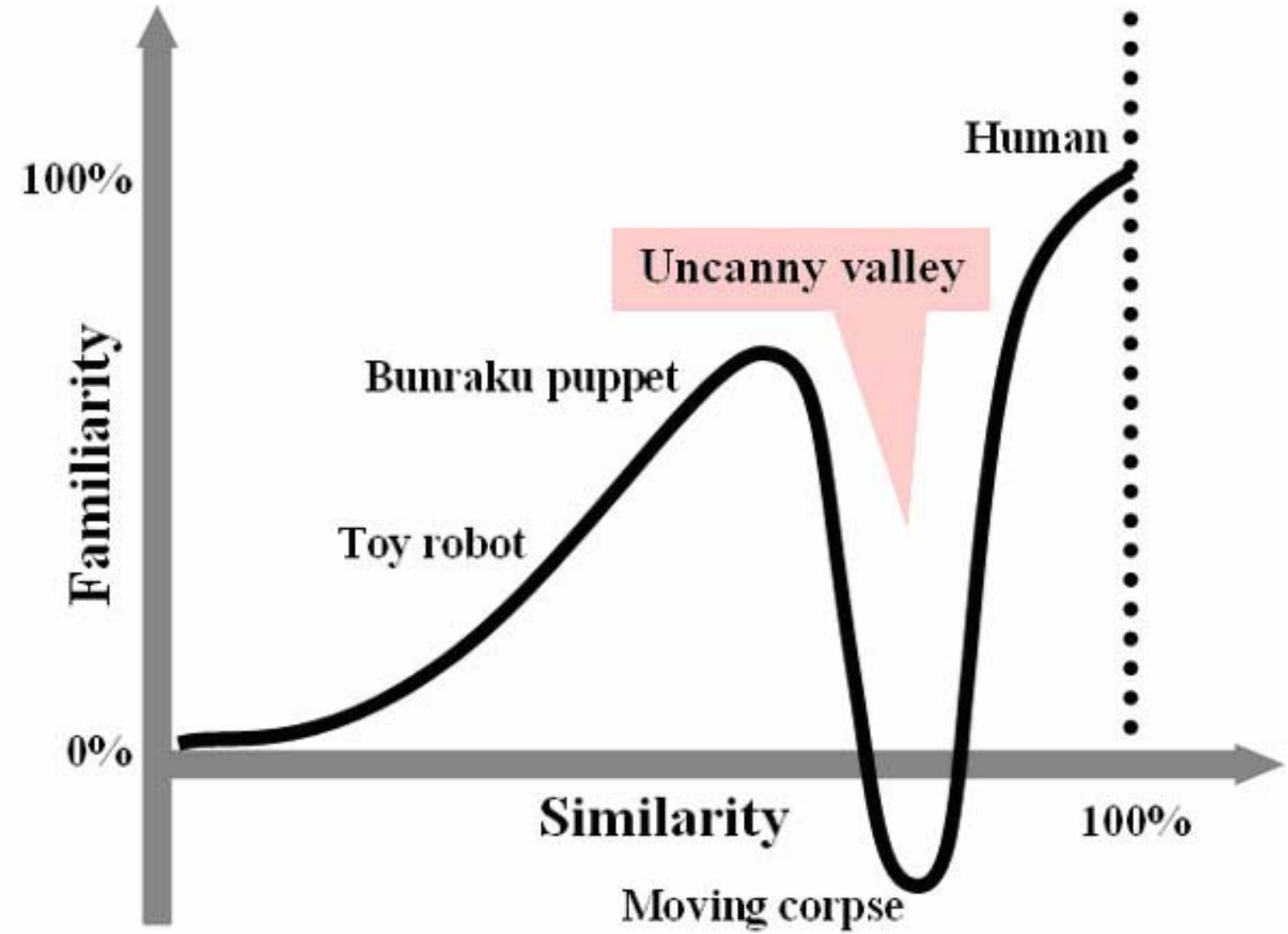


# Anthropomorphism and The Media Equation

Byron Reeves and Clifford Nass, *The Media Equation: How People Treat Computers, Television, and New Media Like Real People and Places*, CSLI, 1996.

- What triggers human-like responses?
  - Looks
  - Language
- How does it affect the user?
  - Inappropriate attributions (e.g. Eliza)
  - False expectations (assumed intelligence)
  - Affective responses (e.g., politeness, flattery)
  - Uncomfortableness (the “uncanny valley”)

# The Uncanny Valley



# Issues for Agent Design [Norman]

- Ensuring that people feel in control
- Hiding complexity while revealing underlying operations
- Promoting accurate expectations and minimizing false hopes
- Providing built-in safeguards
- Addressing privacy concerns
- Developing appropriate forms of human-agent interaction