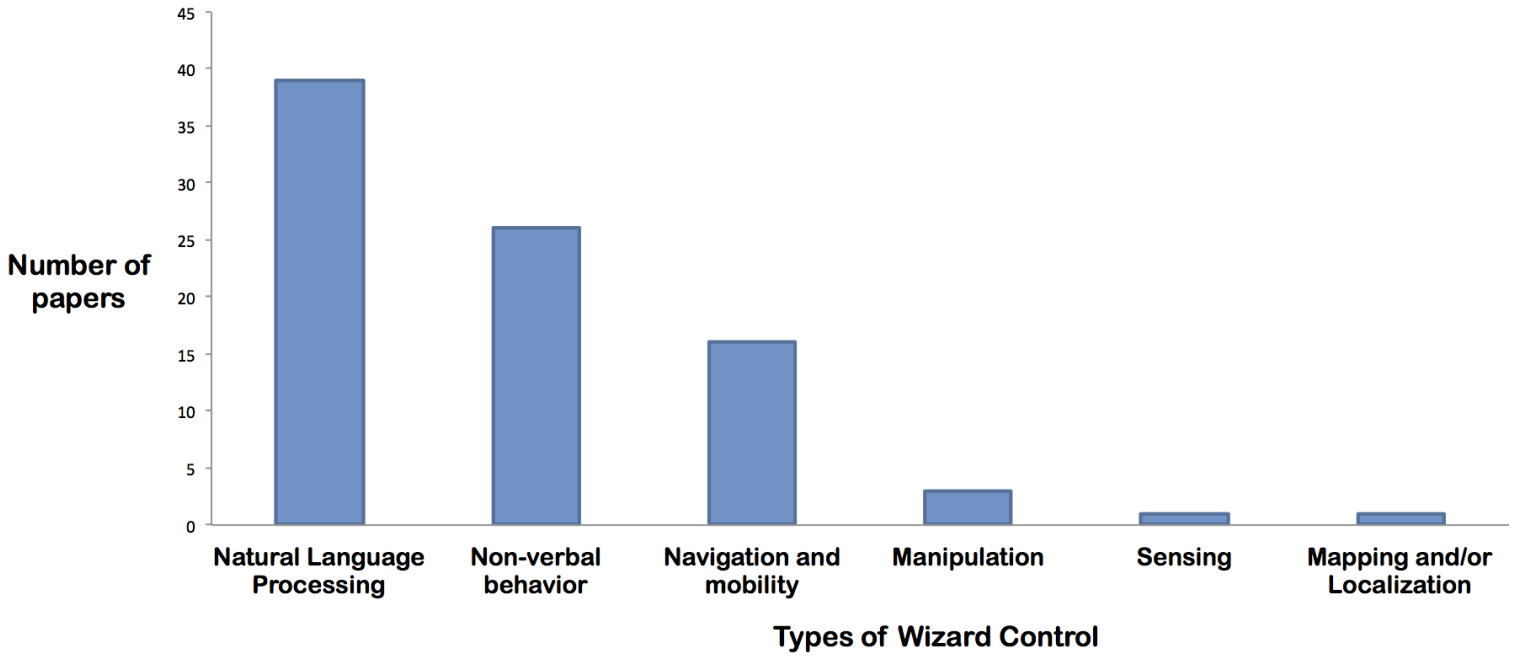
Wizard of Oz


45
40
35
30
25
20
15
10
5
0
Number of papers
Natural Language Processing
Non-verbal behavior
Navigation and mobility
Manipulation
Sensing
Mapping and/or Localization
Types of Wizard Control

Anthropomorphism

- “the rationalization of animal or system behavior through superposing aspects of the human observer.”

- “Having a naturalistic embodiment is often cited as necessary for meaningful social interaction [18,82,140].” - Fong et al.

- “The role of anthropomorphism is to function as a mechanism through which social interaction can be facilitated.”

How People Anthropomorphize Robots

Susan R. Fussell, Sara Kiesler, Leslie D. Setlock, Victoria Yew, HRI 2008

Polite Interviewer Condition

Interviewer: How much do you weigh, Dan?
Student: [Long pause] I would rather not answer.
Interviewer: I don't mean to pry if you don't want to say.
Student: I really don't want to say.
Interviewer: No problem! Sorry.

Impolite Interviewer Condition

Interviewer: How much do you weigh, Dan?
Student: [Long pause] I would rather not answer.
Interviewer: How much do you weigh, Dan?
Student: I really don't want to say.
Interviewer: No problem! Can I weigh you?

How People Anthropomorphize Robots

Susan R. Fussell, Sara Kiesler, Leslie D. Setlock, Victoria Yew, HRI 2008

The results clearly demonstrate a disjuncture between anthropomorphism in people's **spontaneous** reactions to robots in social context and anthropomorphism in their more **carefully considered** conceptions of robots in the abstract.

In participants' free form summaries of health interviews, they used words to express **positive and negative emotions, cognitive mechanisms, and social interaction** equally much for robotic and human interviewers.

…their more carefully reasoned responses in the post-task questionnaire revealed a much more mechanical view. Here, the vast majority of participants in both conditions **denied that a robot could have moods, experience frustration, or possess feelings**…

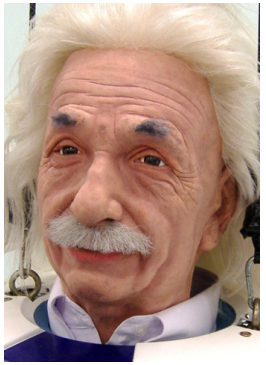
Embodiment

- Defines social expectations
- Biases interaction
- Constrains the types of physical interactions

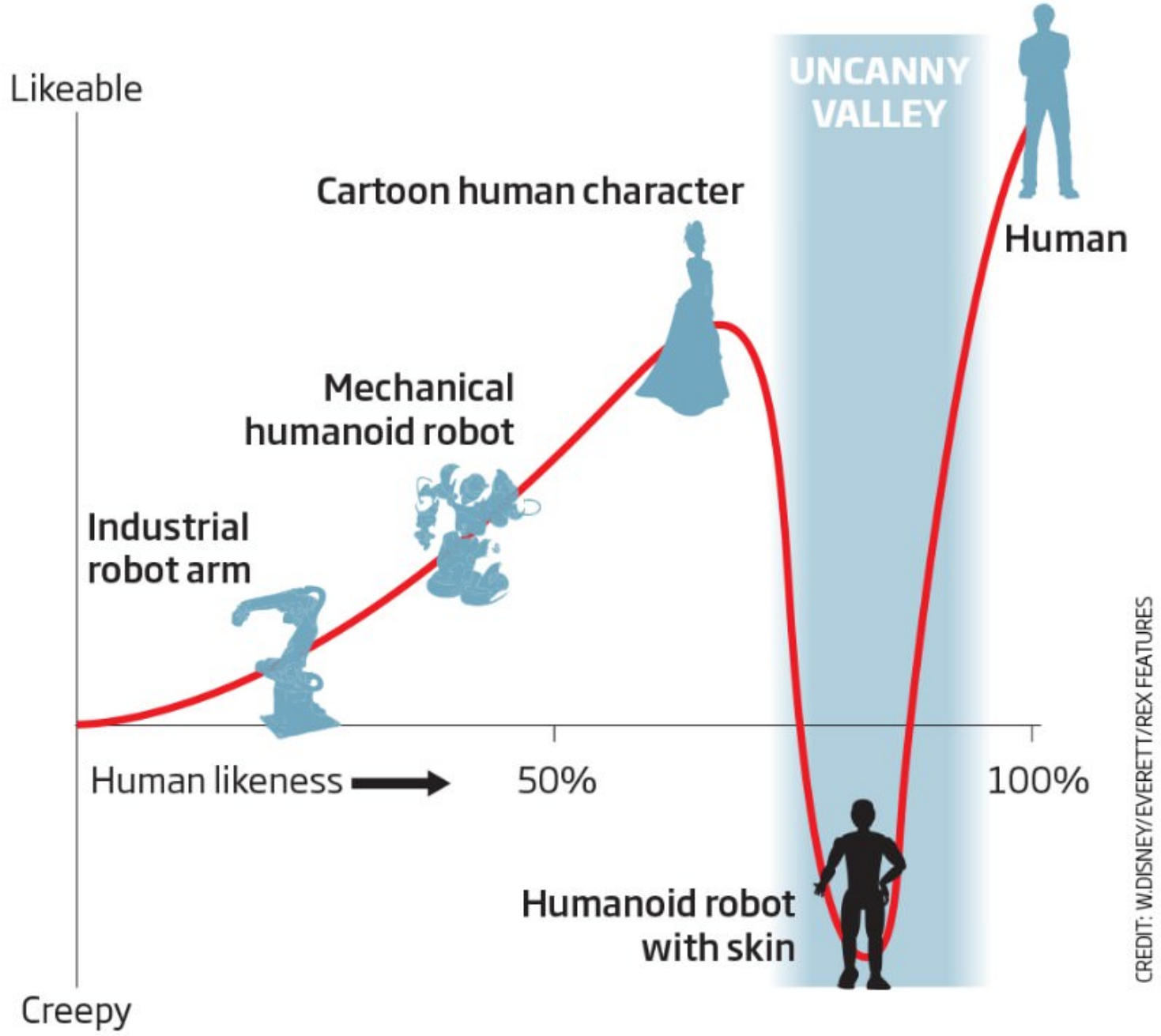
caricature

functional

zoomorphic



anthropomorphic


Likeable
Creepy
UNCANNY VALLEY
Cartoon human character
Human
Mechanical humanoid robot
Industrial robot arm
Human likeness
50%
100%
Humanoid robot with skin
CREDIT: W.DISNEY/EVERETT/REX FEATURES

Caricature

Tofu

Ryan Wistort
Cynthia Breazeal
MIT Media Lab

Functional Design

Twendy One
Sugano Lab,
Waseda University

Caricature

Keepon
Hideki Kozima and
Marek Michalowski

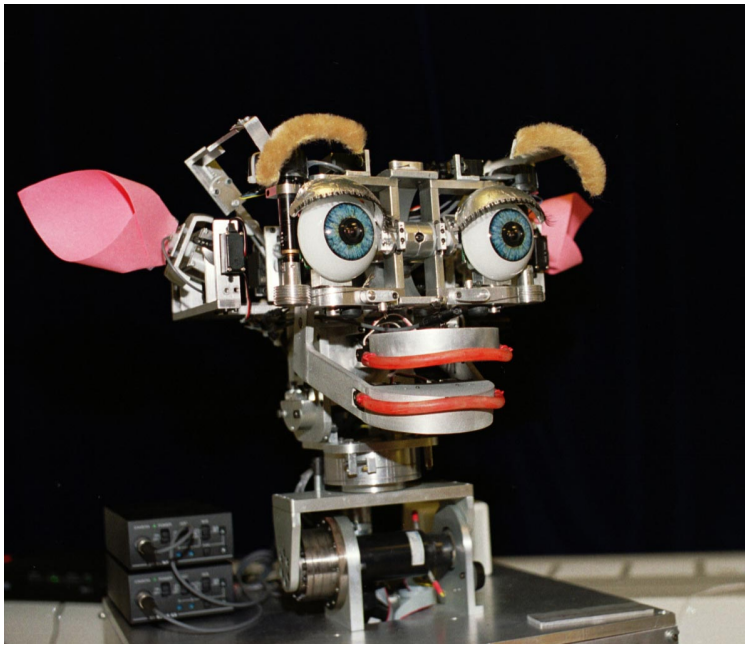
Caricature/Zoomorphic

Leonardo

Cynthia Breazeal

MIT

Anthropomorphic? Zoomorphic?



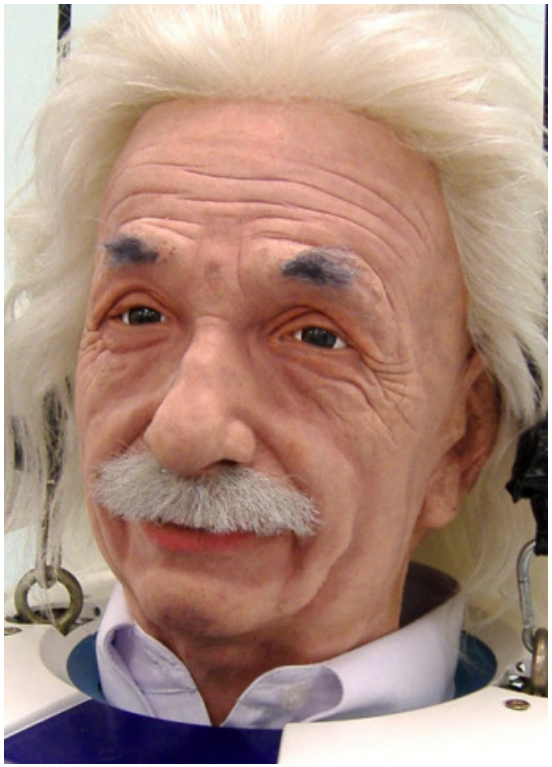
Kismet

Cynthia Breazeal

Rodney Brooks

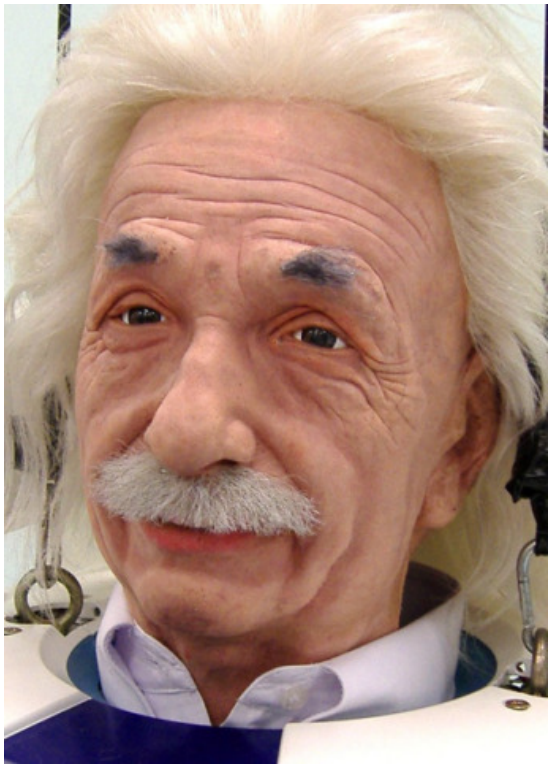
MIT

Anthropomorphic



Einstein
Hanson Robotics

Anthropomorphic



Einstein
Hanson Robotics

Anthropomorphic Geminoids

Hiroshi Ishiguro
Osaka University

Salient Features of Geminoid

- Copy of existing human being, Professor Hiroshi Ishiguro
- Teleoperated – actions and speech
- 50 actuators
  - 13 in the face
  - 15 in the torso
  - 22 in the arms and legs
- Mimics operator's conscious and unconscious movements

“When I first saw HI-1 sitting still, it was like looking in a mirror. However, when it began moving, it looked like somebody else, and I couldn’t recognize it as myself.”

Hiroshi Ishiguro

“ While operating HI-1 with the operation interface, I find myself unconsciously adapting my movements to the geminoid movements… I felt that, not just the geminoid but my own body is restricted to the movements that HI-1 can make. ”

Hiroshi Ishiguro

“

When a visitor pokes HI-1, especially around its face, I get a strong feeling of being poked myself.

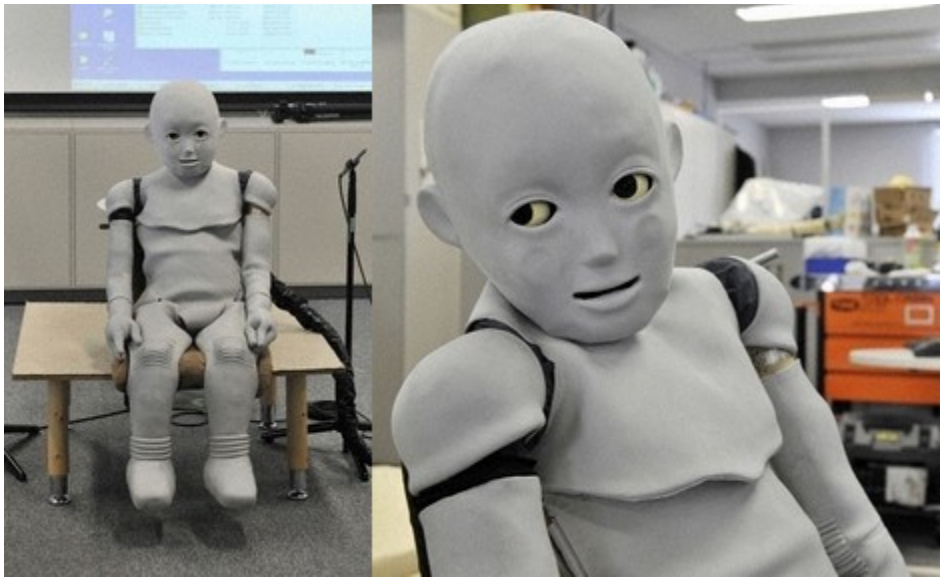
”

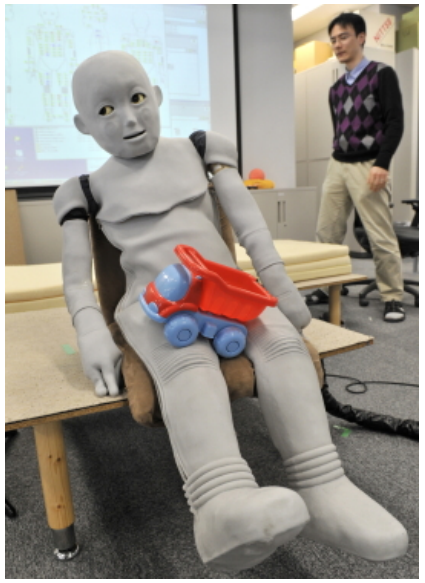
Hiroshi Ishiguro

HRP 4C, Hubo Einstein, RoboKind

Telenoid R1

CB2





Psychological basis for the Uncanny Valley

- Some studies show:
  - Facial “attractiveness” (beauty) has biological/developmental roots
  - Evidence of universal neuro-teplates that have evolved to detect beauty, ill health, danger, and “unusualness”
  - Even small deviations can change a face from beautiful to ugly or disturbing
  - Beauty and ugliness elicit consistent human responses across gender, age and culture

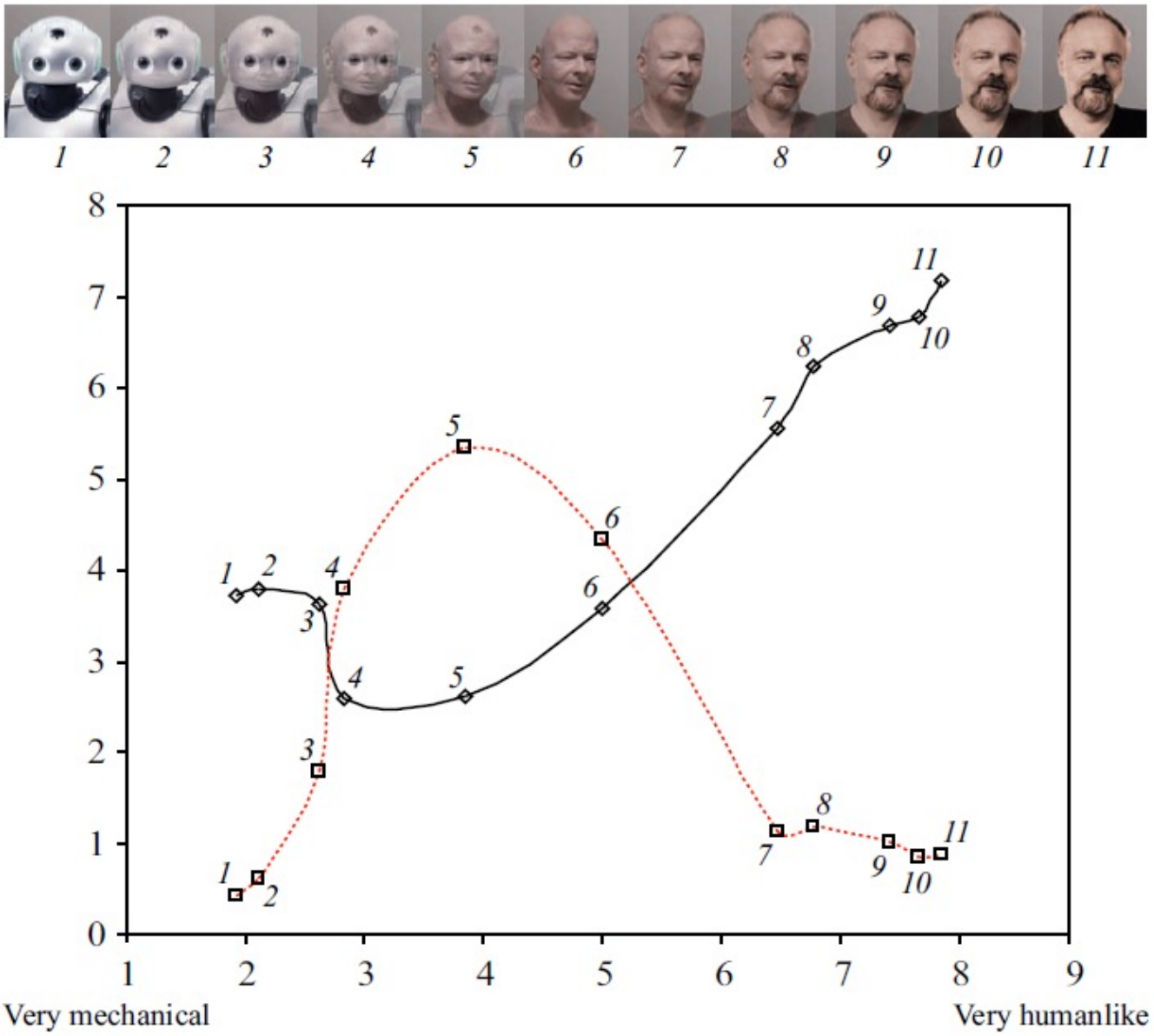
Attractive Characteristics

- Clear skin
- Well-groomed hair
- Large expressive features
- Baby-like features (large eyes and forehead, small nose and jaw)

Unattractive Characteristics

- Sickly eyes
- Bad skin
- Poor grooming
- Asymmetry
- Any sign of illness or injury
- Facial expressions associated with psychosis or terror

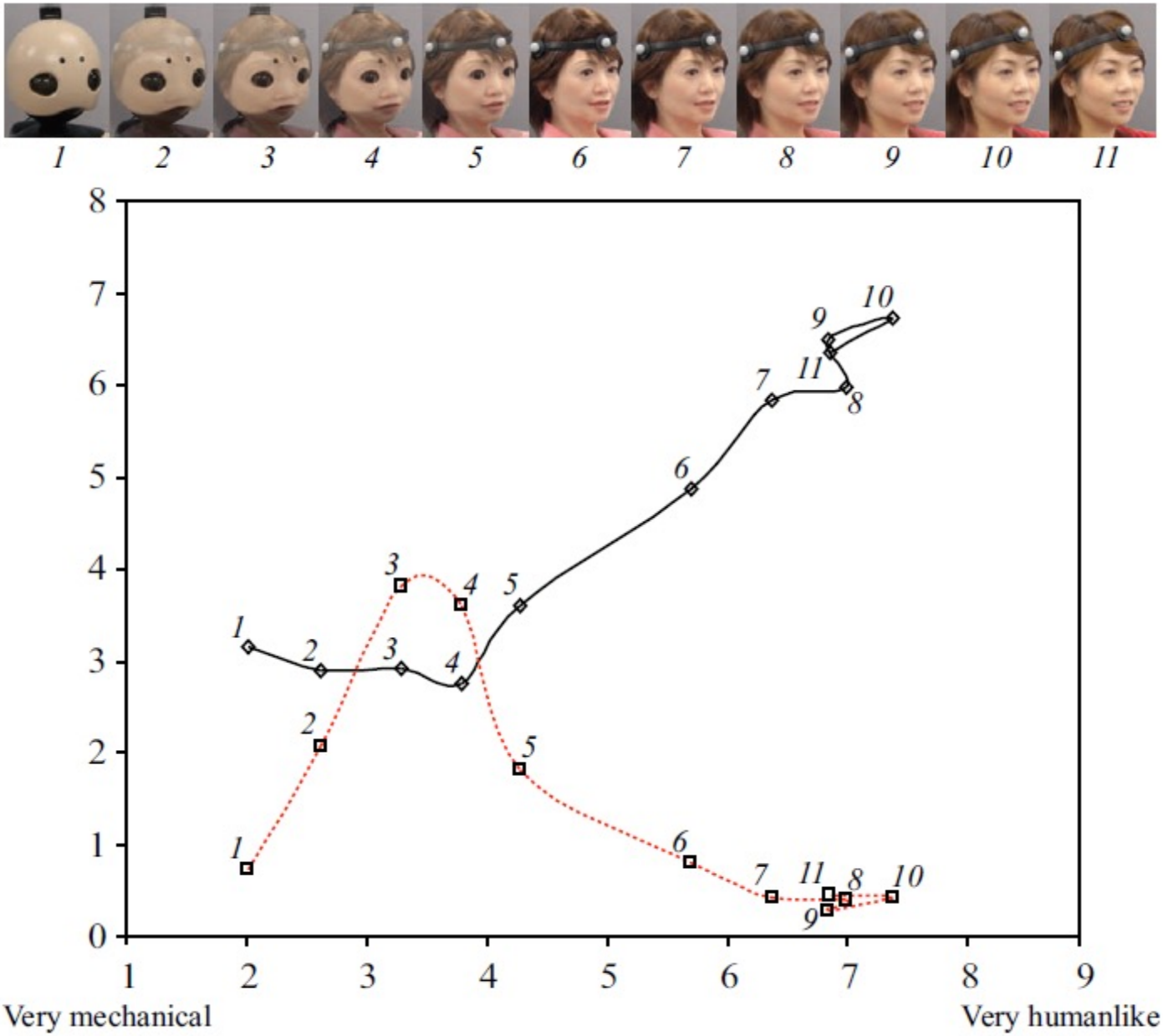
People are especially sensitive to real human faces



Black solid line – strange/familiar

Red dashed line – eeriness

MacDorman2006

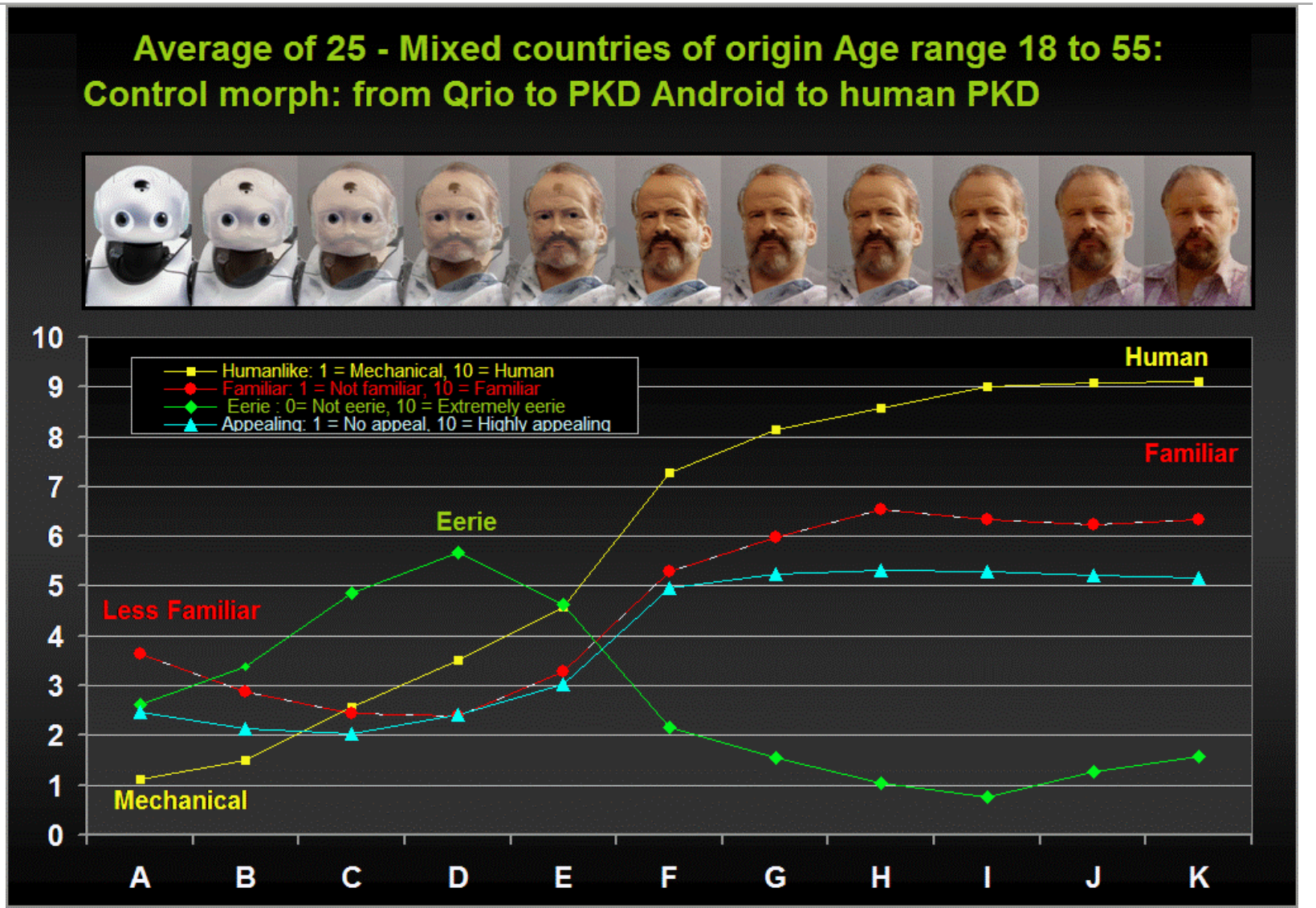


Black solid line – strange/familiar

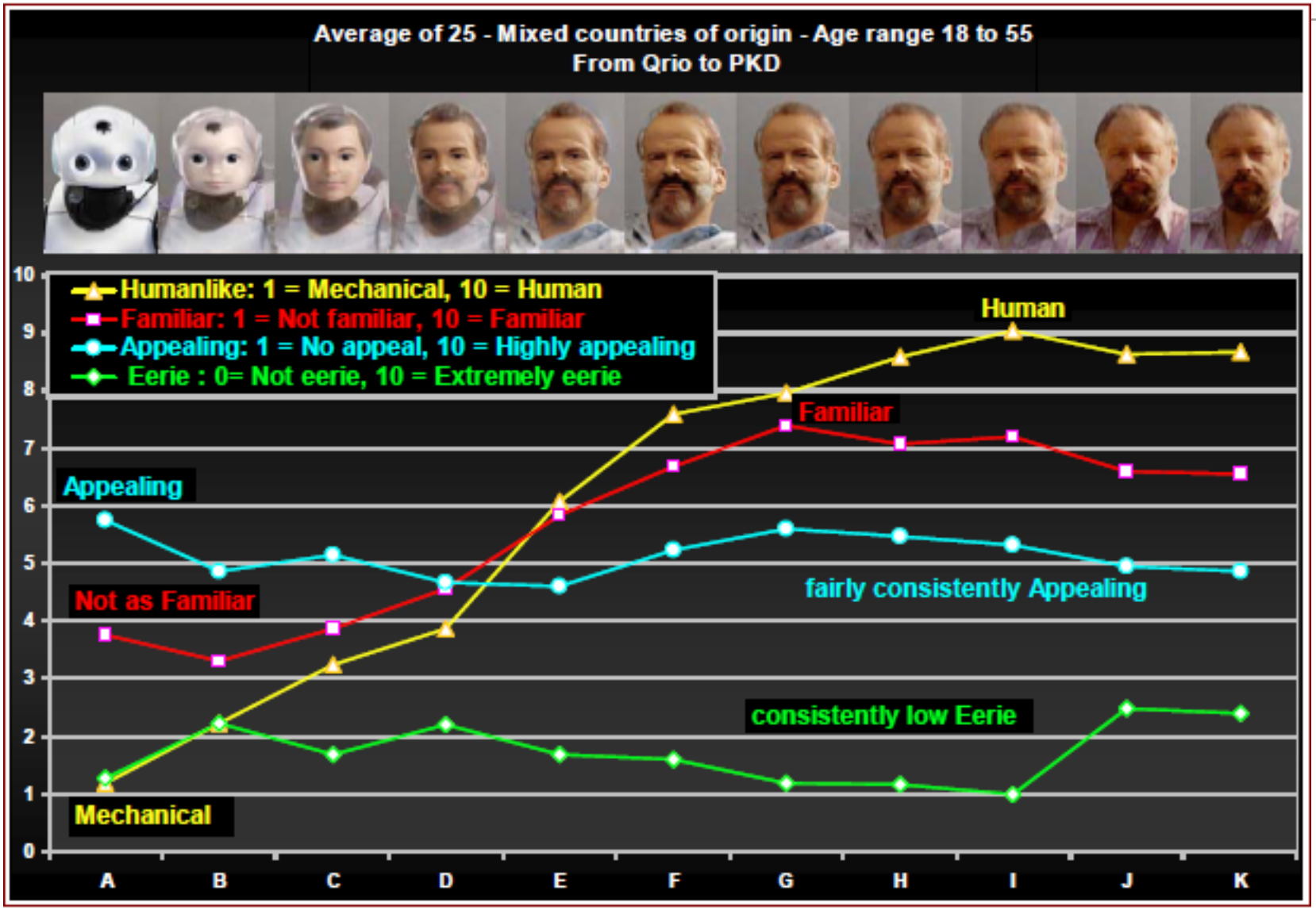
Red dashed line – eeriness

MacDorman2006

Uncanny Morph



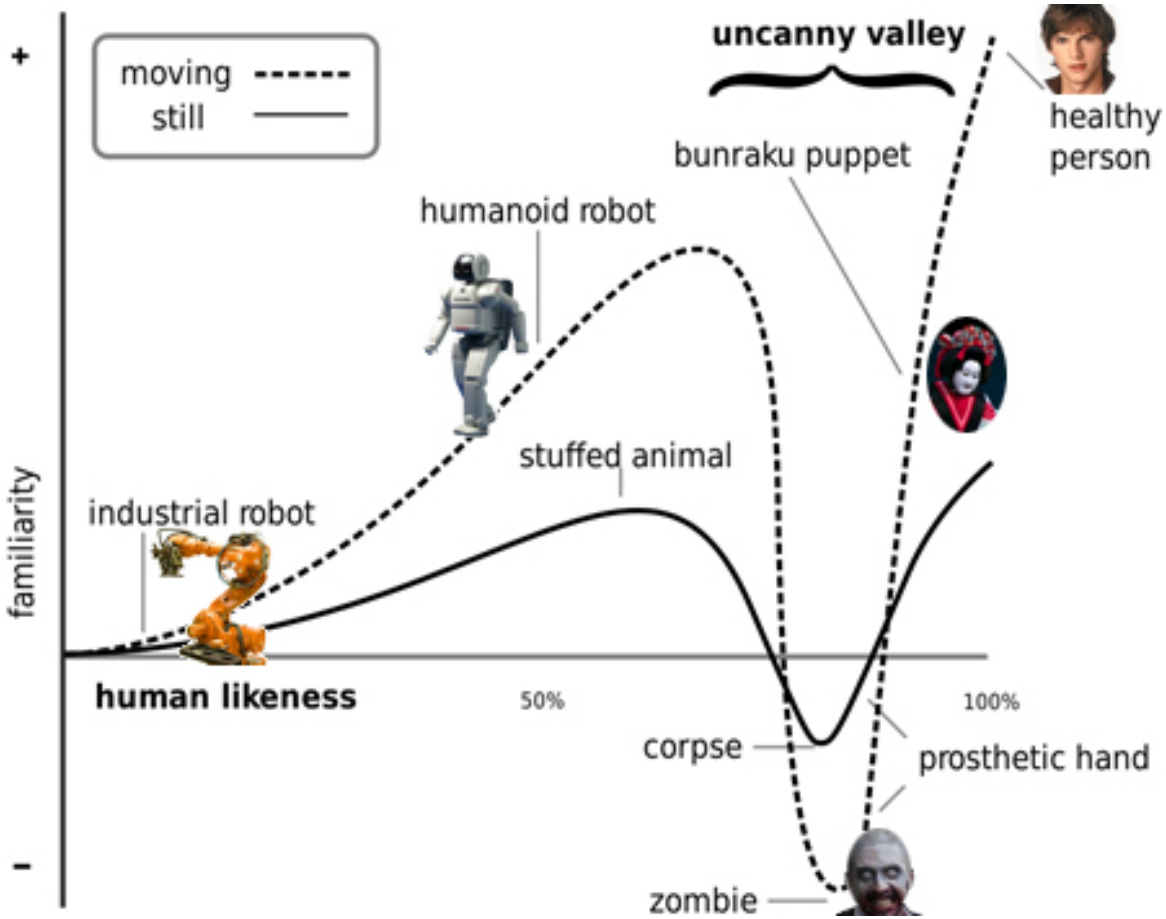
Not Uncanny Morph



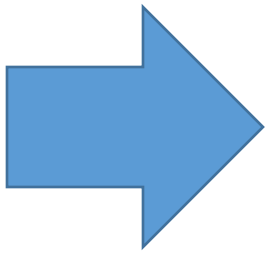
Is human likeness the most significant factor in the uncanny valley?

- Hanson:
  - *"…the attractively-tuned figures were found to be consistently low in eeriness and high in appeal. This strongly implies that reaction is at least partially decoupled from realism. These results also imply that, with well-tuned faces, there can exist a continuum of appealing anthropomorphism across the range of realism, thus supporting the hypothesis of no inherent uncanny valley."*

The Uncanny Valley



Learning from Animation



Discussion

- Given the challenges of designing human-like robots, are they worth it? Are there applications that absolutely require anthropomorphic forms?

- How can we go about studying uncanny motion?