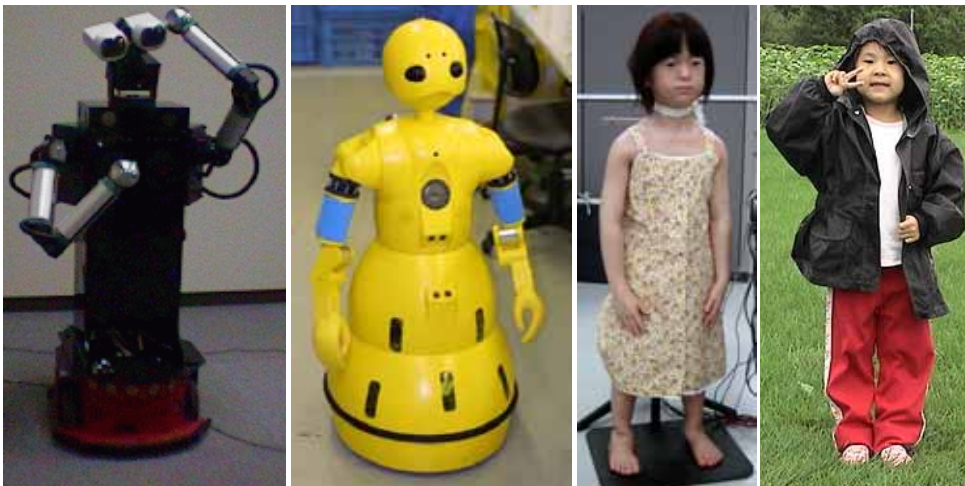


Discussion 2

Android science

Appearance or behavior



Two evaluation methods

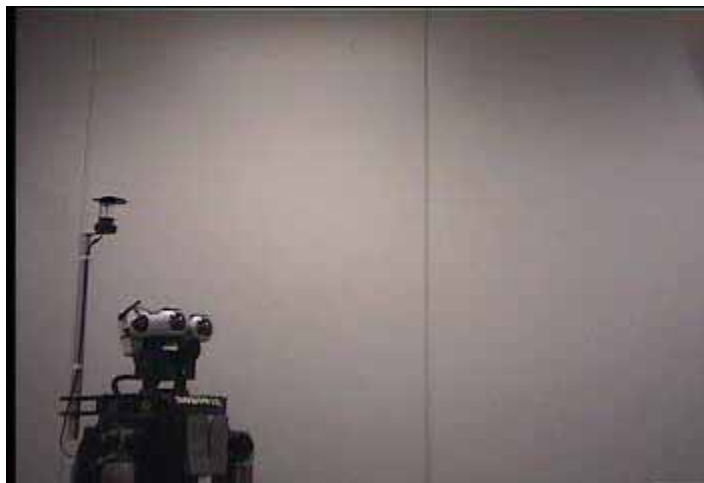
Bottom up

Incrementally add elemental behaviors and check the effect in each step

Top down

Develop an android robot which looks like a human. Delete elemental behaviors one by one.

An example of the elemental behavior Eye contact



Top down approach to “appearance and behavior problem”

Basic questions

- Dose appearance influences the interaction?
- Which is more impressive for a human?
- Can we have phased definition of difference between a robot and a human?

Development of an android robot

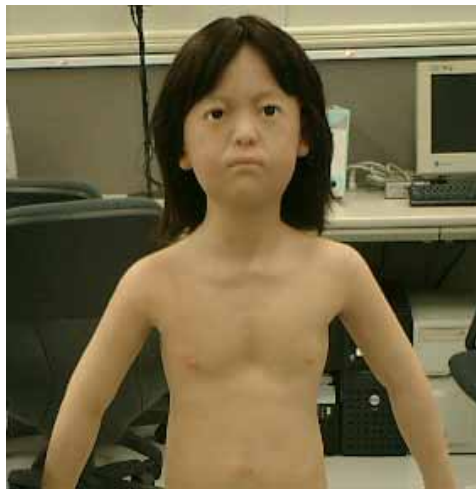
- 120cm, 5years old
to compare with other robot
- Copy from a child (plaster cast)
- Silicon skin
- Sensitive
Piezo sensor
- DOF
 - Eys:5
 - Mouth: 1
 - Neck: 3



How to make



Android robot

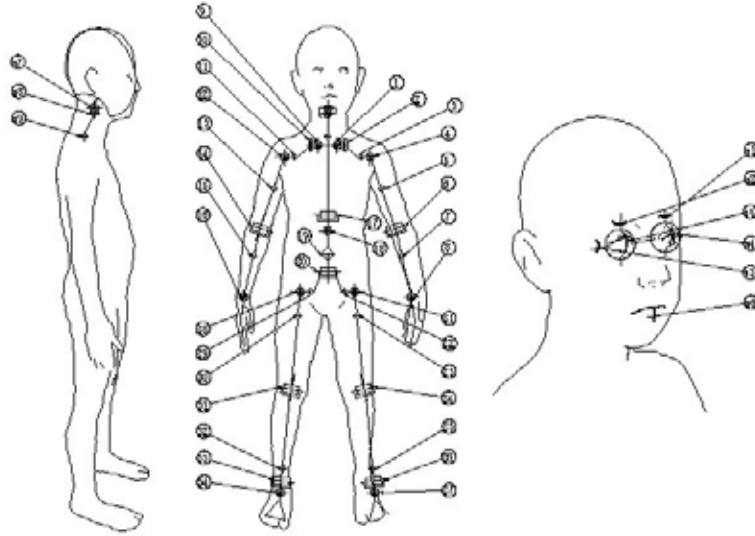




Inside mech.



The skeleton



Behaviors 1



Behaviors 2



First contact



Tow primary experiments

- 1. Difference between an android robot and a humanoid robot**
- 2. Impression of an android robot**

Difference between an android robot and a humanoid robot

Eye motion explains the impression



Recorded eye motions



Gazing points



Human

Active android

Static android

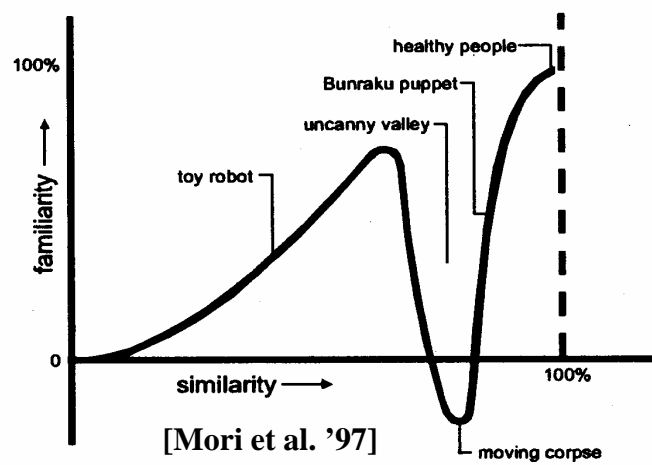
How dose a human recognize the android robot

- Subjects from different ages (2 weeks to 5 years)
- Record subjects' behaviors and eye motions

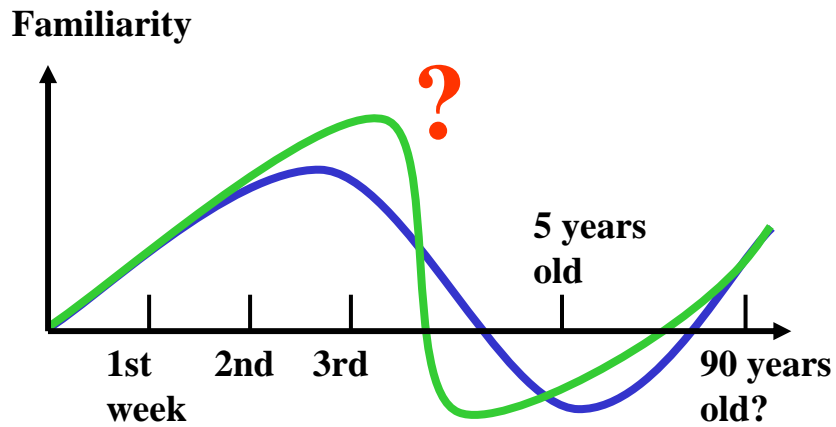
Appearance is more important for an infant?
How dose the balance change as she/he grows up?



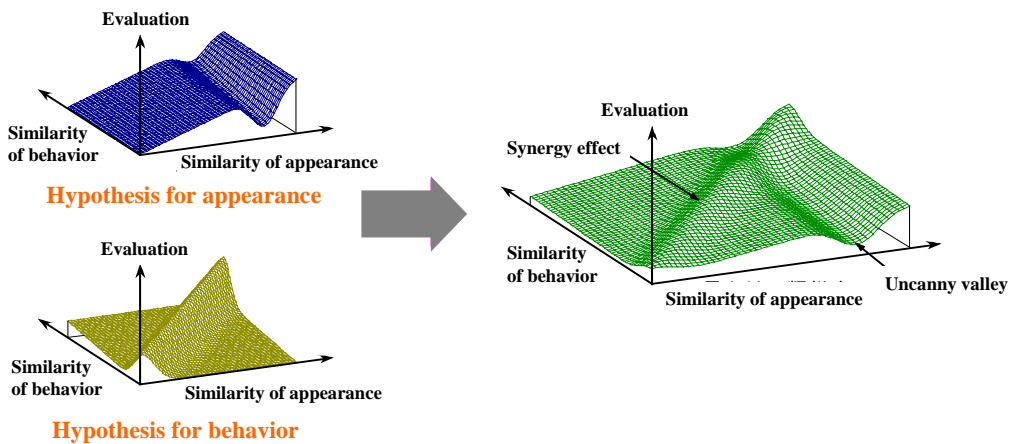
Similarity and familiarity

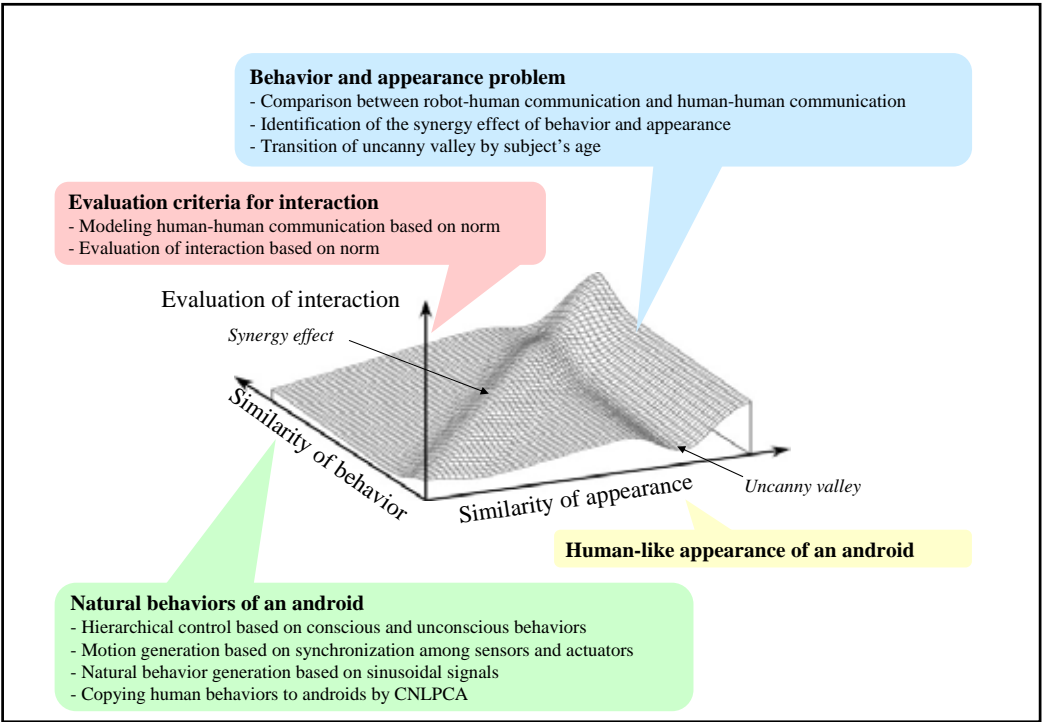


Impression of the android robot



Hypotheses for appearance and behaviors





New android robot

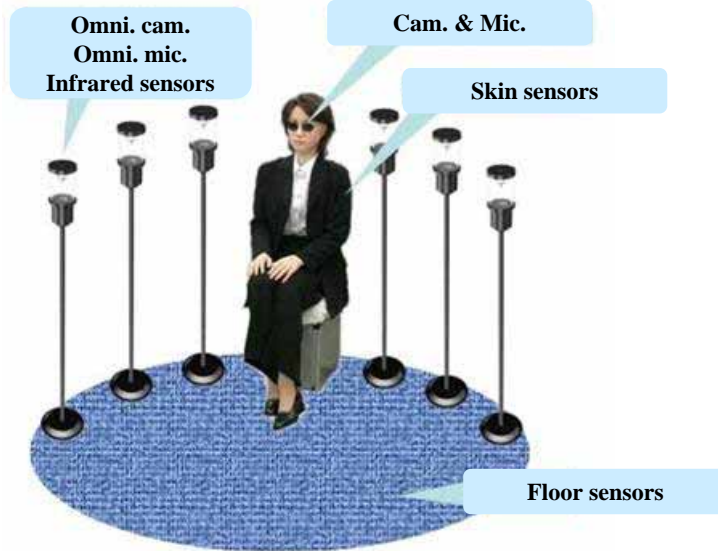
Another experiment with an adult android

- 1. How do subjects react to questions by the android?**
- 2. How do subjects awake to the android?**

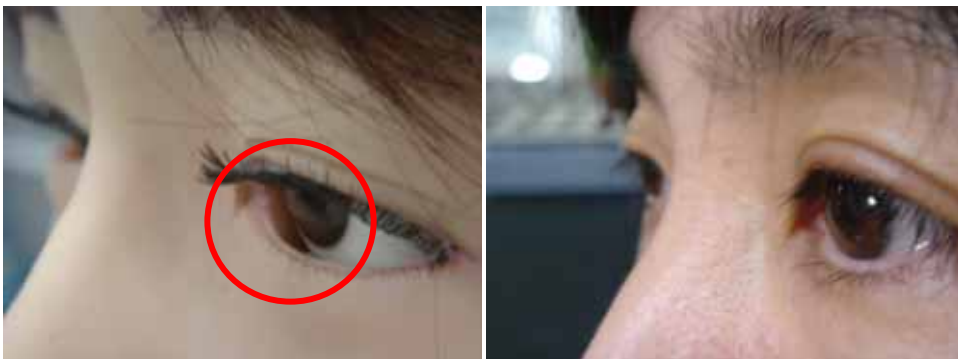
Videos

- 1. How do subjects react to questions by the android?**
- 2. How do subjects awake to the android?**

Android that has functions for perception and representation



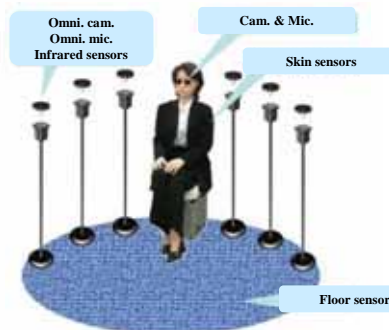
Very similar appearance to human



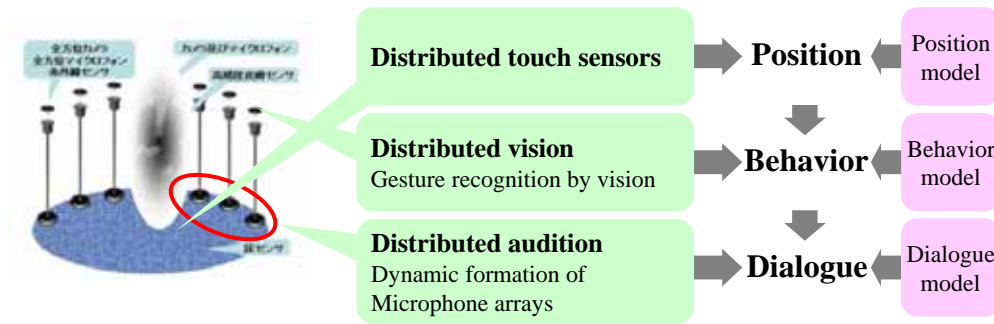
Development of better androids



Perception: Integration with sensor networks



Human behavior recognition by the sensor network



Very similar behavior - Unconscious behavior -

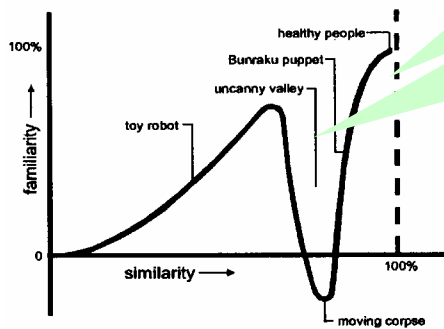


Very similar reaction - Natural reactions -



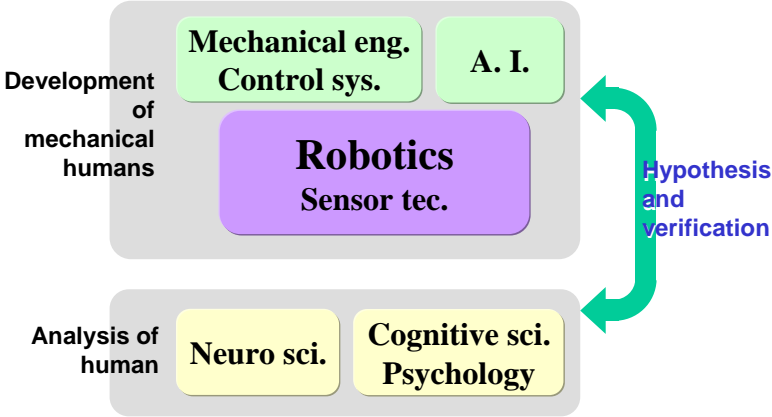
Evaluation of interaction by brain science

- Total Turing Test
- How to compensate the uncanny valley
- Conscious and unconscious human reaction



Opt-topography

Android science



Integration of science and engineering