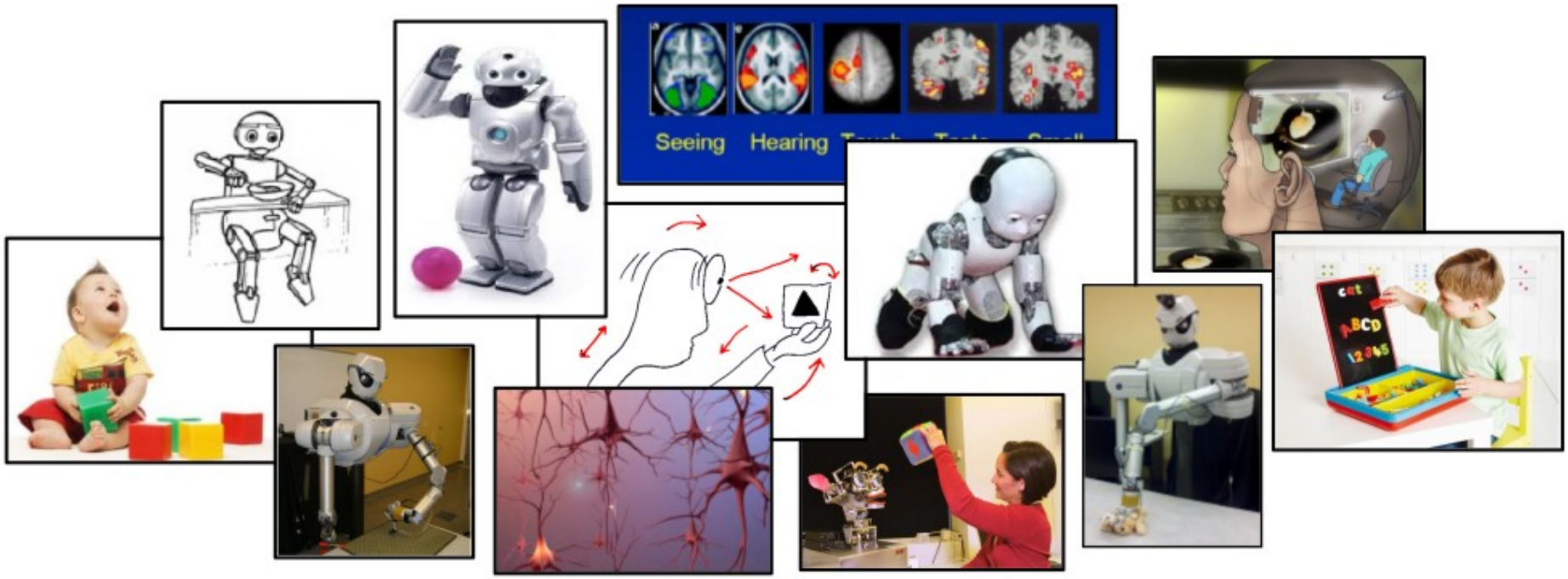


COMP 150: Developmental Robotics

Instructor: Jivko Sinapov
www.cs.tufts.edu/~jsinapov

Today

- Syllabus – overview and Q & A
- Projects Q & A
- Overview of Robotics

Announcements

North-East Robotics Colloquium

- Held at Northeastern University on Saturday October 21st
- https://nerc2017.ccis.northeastern.edu/
- Deadline for registration: October 15
- $50 dollars for graduate students, $10 for undergrads
- Extra credit if you attend – let me know if you will

Class Goals

At the end of this class you will have an understanding of the current state of the art in cognitive and developmental robotics and will be able to contribute to original research in this field.

Organization*

This class will be taught as a seminar. The students will be expected to read the assigned papers for each lecture in advance and to actively participate in class discussions.

* The instructor reserves the right to change any and all aspects of this class for whatever reason or no reason at all (a.k.a., academic freedom).

** You agree that I have the unconditional right to exercise this discretion in a way that is most favorable or convenient to me.

Prerequisites

Prerequisites

STAR WARS

(all episodes)

Prerequisites

STAR WARS (all episodes)

THE MATRIX (all episodes)

Prerequisites

(all episodes)

(all episodes)

(most episodes)

Prerequisites

A strong interest in the question, ``What is intelligence and how can it be implemented in a physical robot?''

In most cases, at least one person on a project team should have some programming experience.

The most important prerequisite of all, however, is your interest in the course, motivation, and commitment to learning.

Prerequisites

For best results take two lectures weekly.

Common side effects may include sleepless nights, broken robots, nervousness, and banging head on keyboard.

Frequent visits to the instructor and the TA have been shown to alleviate some of those symptoms. Talk to your instructor if this class is right for you.

How Difficult is this Class?

Attendance

You are expected to attend every class and actively participate in the discussions. If you miss a class, it is your responsibility to find out what we talked about, including any announcements.

Homework Assignments

- Homework assignments will consist of short written essays on questions related to the readings
- Homeworks will be announced in class
- Your submission will consist of a post on a forum
- Next homework is going out on Tuesday

Projects

The final project must be a research or design project that is related to the topics covered in class. You may choose to work individually or in small groups (2-3 members each). Working in groups, however, is highly recommended.

You are encouraged to select a topic for your final project as soon as possible. A written project proposal will be due on 10/26. The final project report will be due on the Sunday of the last week of classes.

Each team will be required to present the results of their final project during the last week of the semester.

Project Components

- Preliminary Proposal “Presentation”
- Project Proposal
- Progress Report
- Final Report + Presentation

Questions about projects....

- Are we required to use specific programming languages?
- How do we team up and form study groups?
- What are the “types” of projects we could do?
- How do we decide the topic?

Questions about projects....

- Is there a robotics lab where we can work at?
- Are we expected to use real robots and if so, which robots?
- If using real or simulated robots, to what extent do we have to program all the implementation running on the robot, e.g., low level controllers?
- Are we allowed to use github to store our project materials?
- Are you going to grade us on the quality of code?

Questions about programming...

- Help! I am not a programmer!

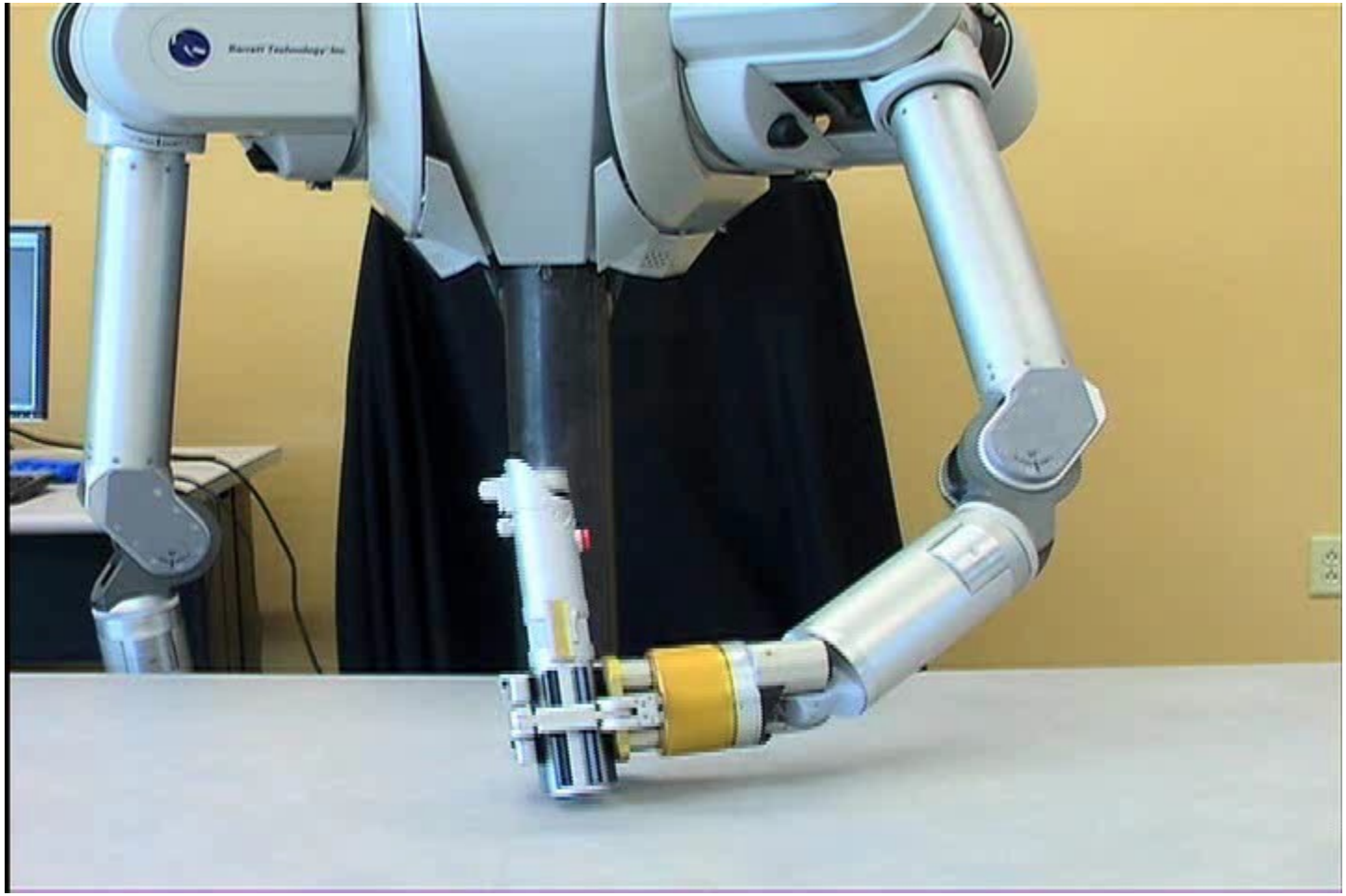
Questions about my research...

Small-Group Activity

- Question: What is an object? To a human? To a robot?
- Talk to your neighbors in a small group and try to come up with some definitions
- We'll share the results in 5-10 min

Behavior-Based Object Exploration

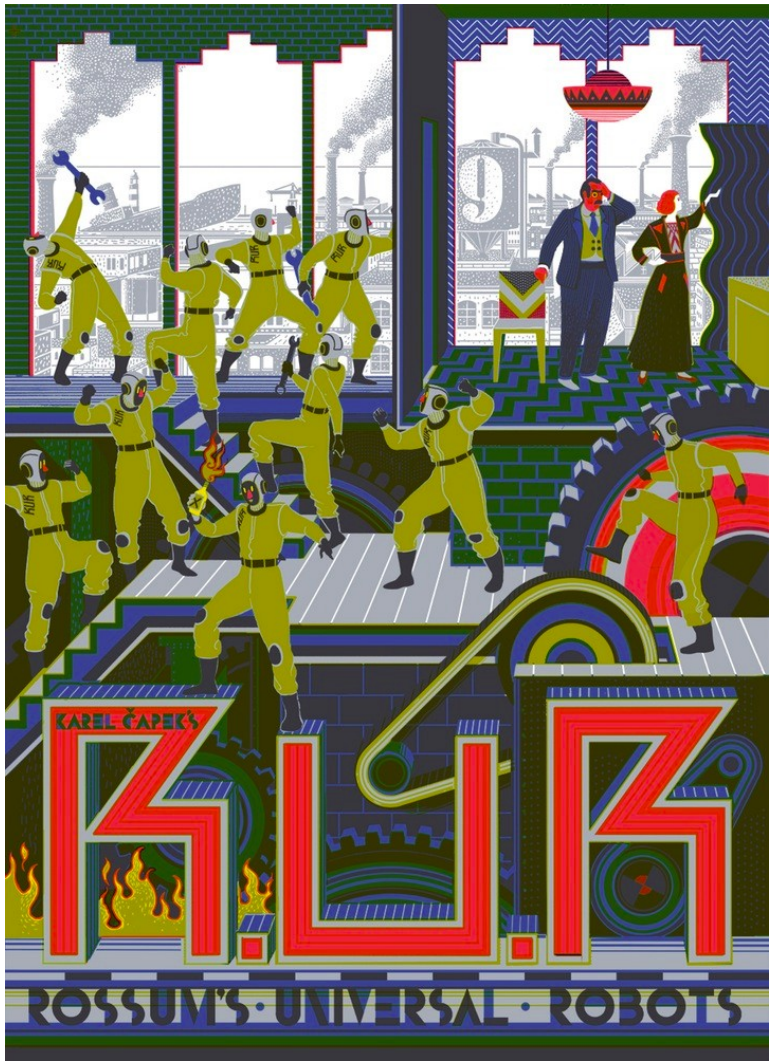
Behavior-Based Object Exploration



Other questions?

A Brief History of Robotics

A Brief History of Robotics



First introduced in the play *R.U.R. (Rossum's Universal Robots)* which opened in Prague in January 1921.

The word ‘robot’ is derived from the Czech word for forced labor or serf.

Early Depiction of Robots in Movies

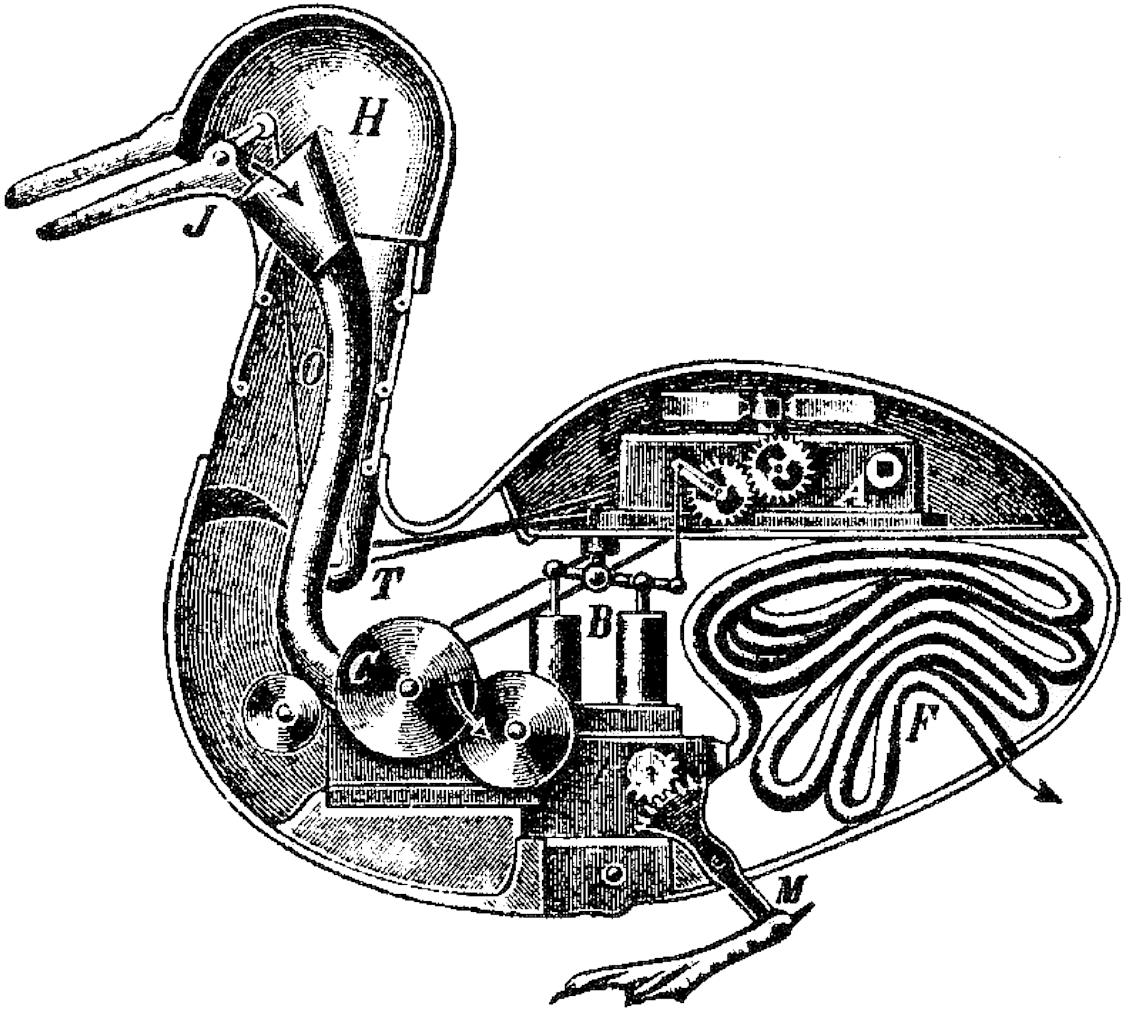
Definition

"re-programmable, multi-functional, manipulator designed to move material, parts, tools, or specialized devices through variable programmed motions for the performance of a variety of tasks"

– Robotics Industry Association (RIA)

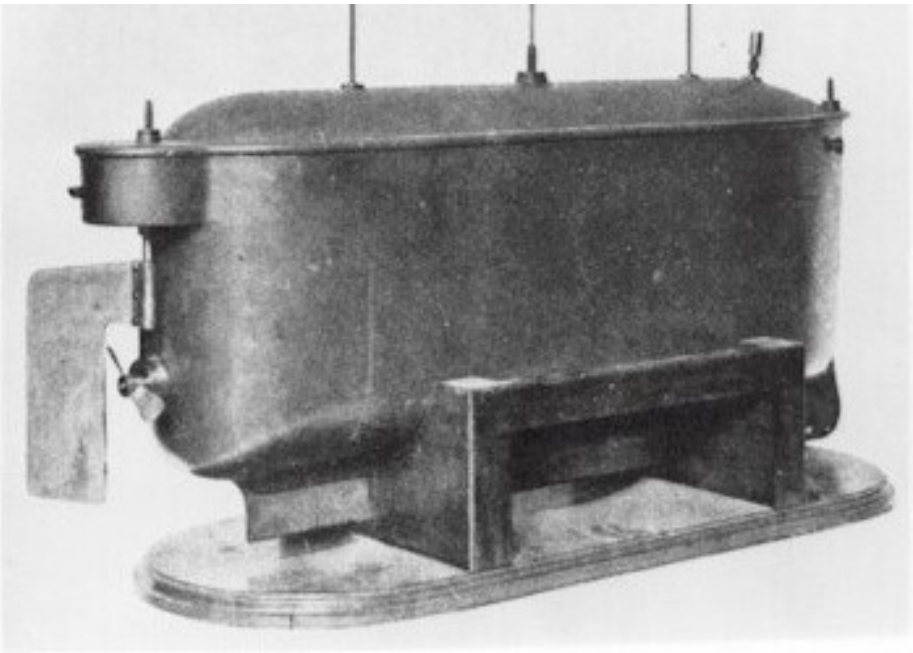
A Brief Timeline

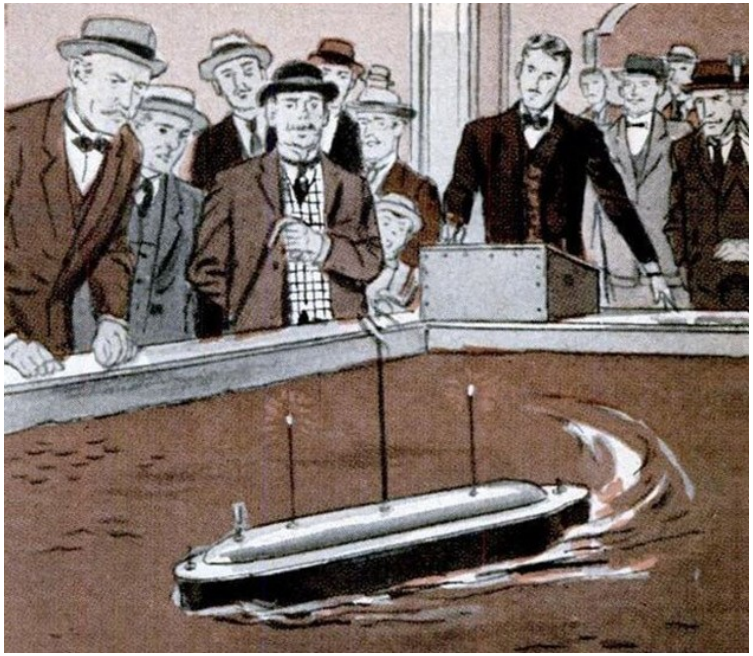
Mechanical Duck



[Jacques de Vaucanson (1709-1782)]

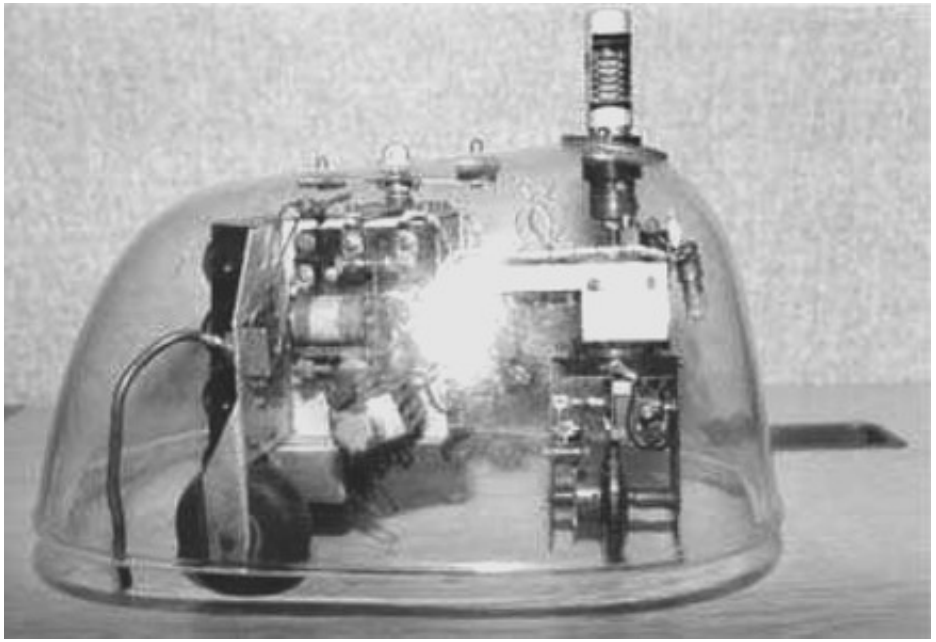
Radio-Controlled Submarine





[Nikola Tesla, 1898 (patent #613809)]

Walter's Turtle

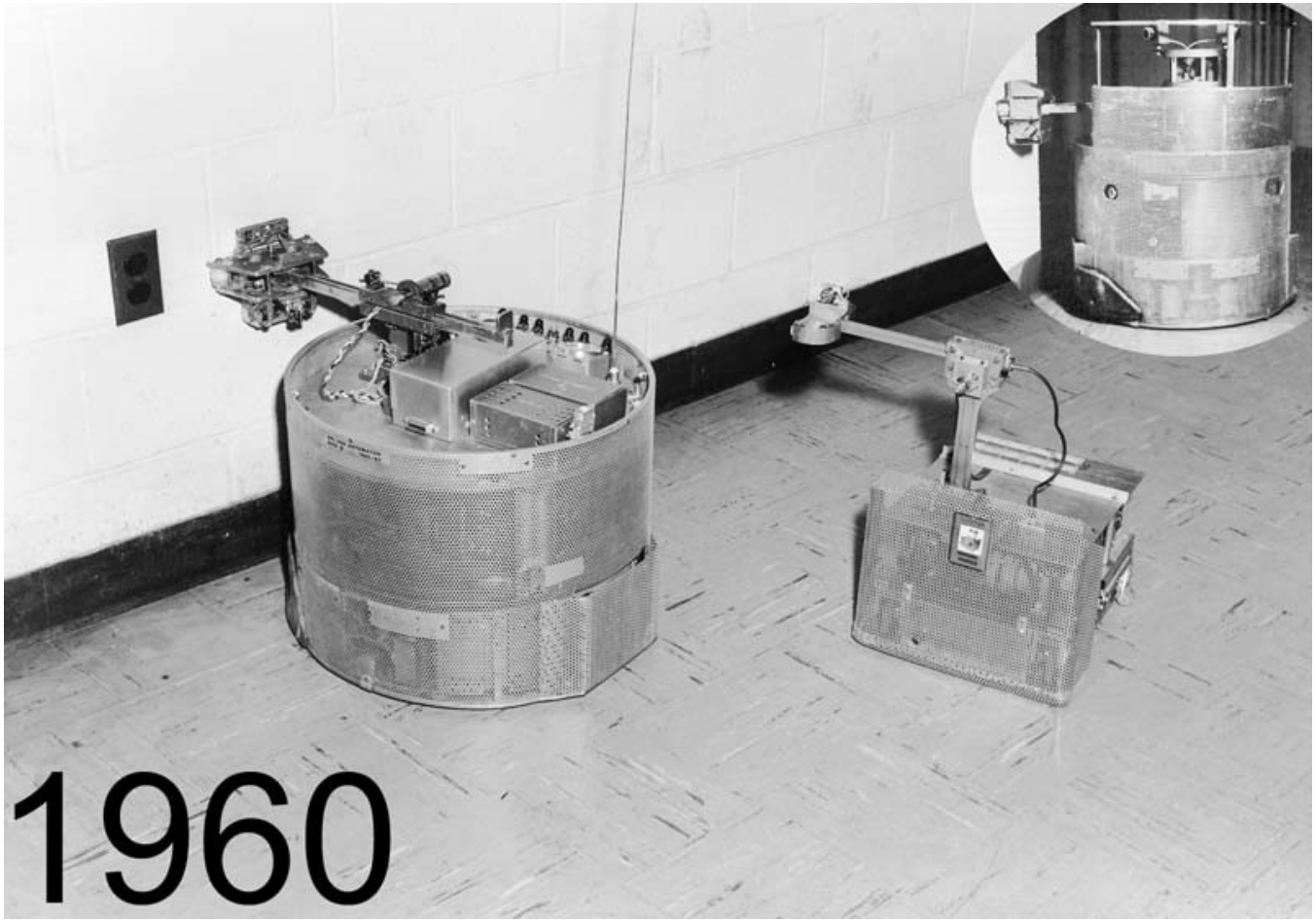


[Grey Walter, 1948-49]

Walter's Turtle

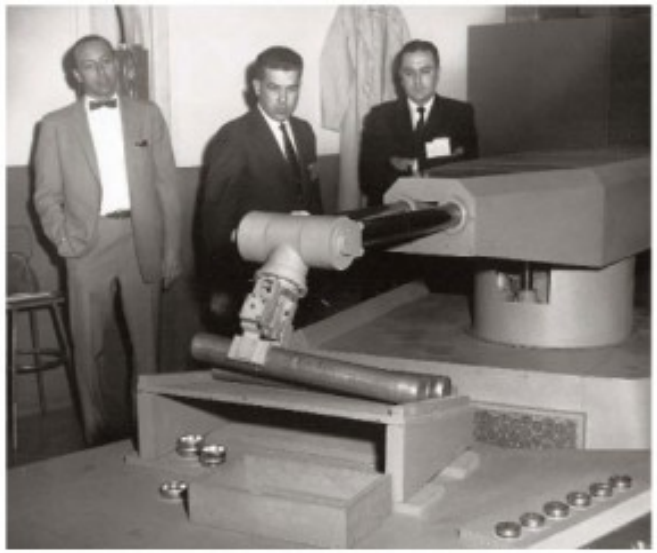
[BBC Report ~1949]

The “Beast”



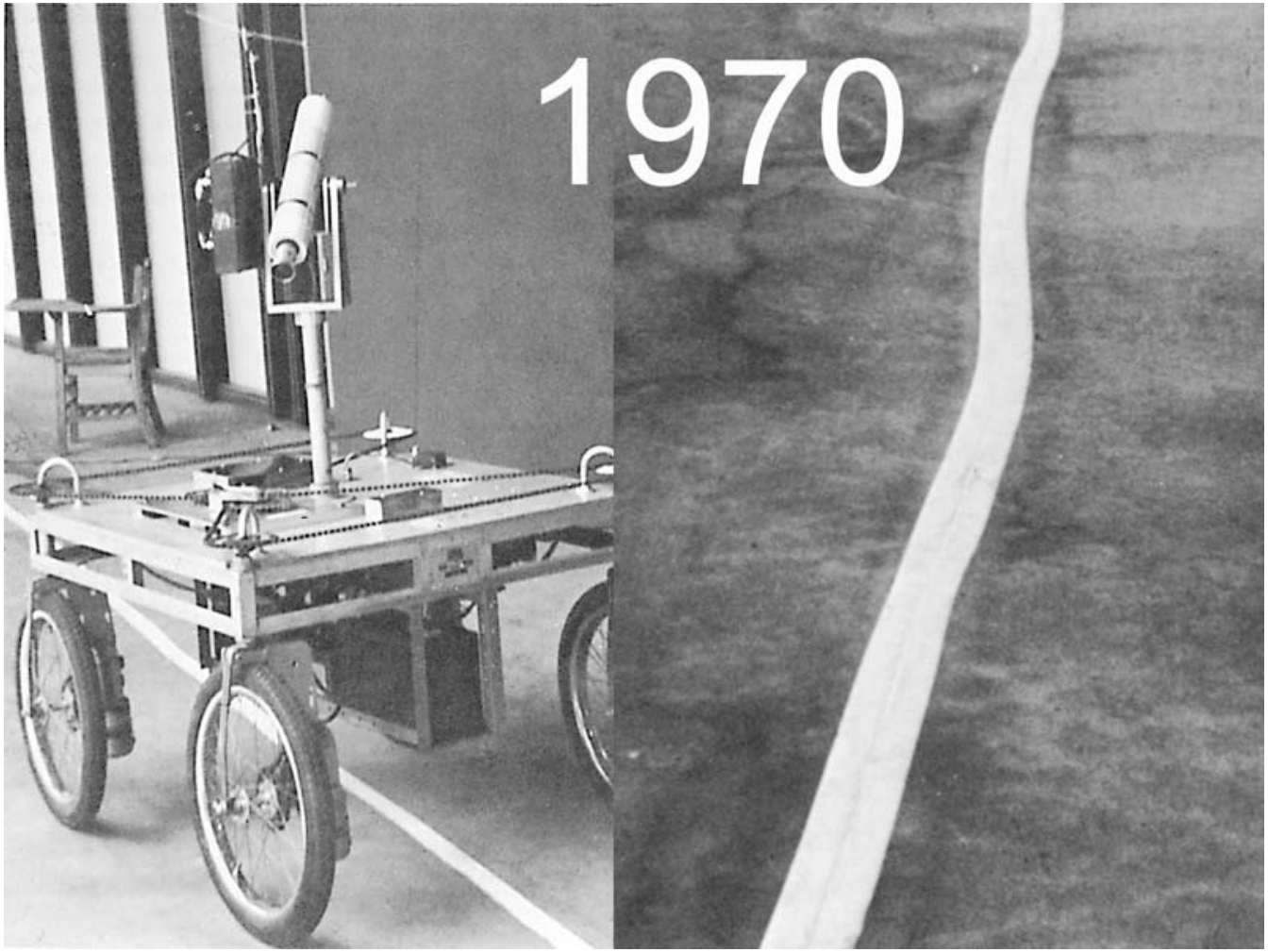
[John Hopkins University Applied Physics Lab]

First Industrial Robot



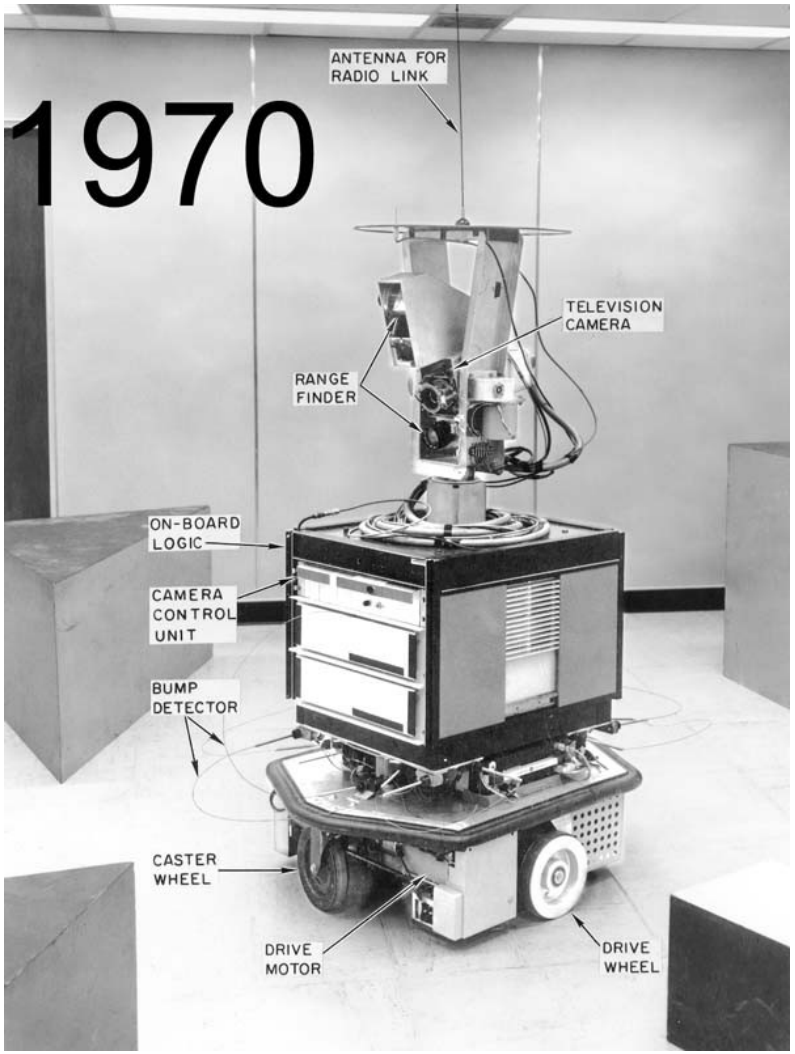
First Industrial Robot (~60s)

The Stanford Cart



[Stanford University, 1970]

Shakey



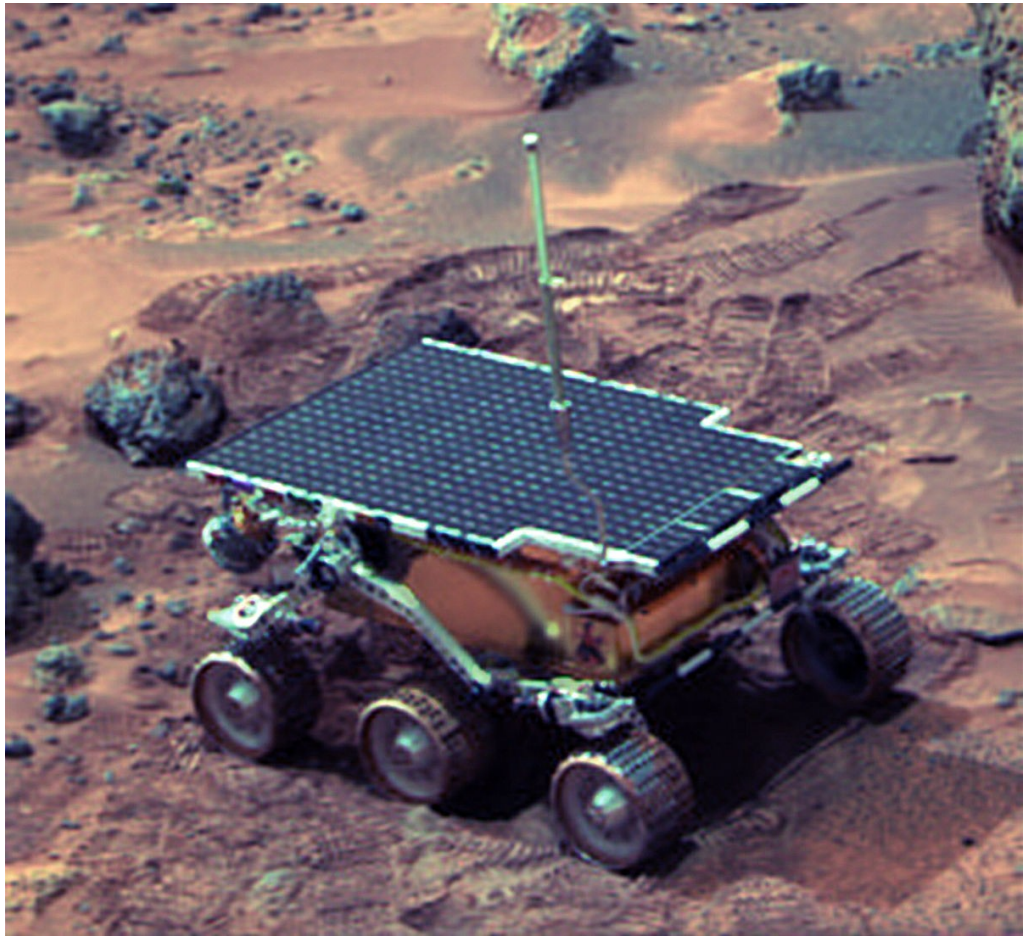
[Stanford Research Institute, 1970]

Video

Genghis

[Rodney Brooks, MIT, 1989]

Sojourner



[NASA, 1997]

Honda's Humanoids

1986 ⟶ 2011

[Honda, 1986-2011]

Honda's Humanoids

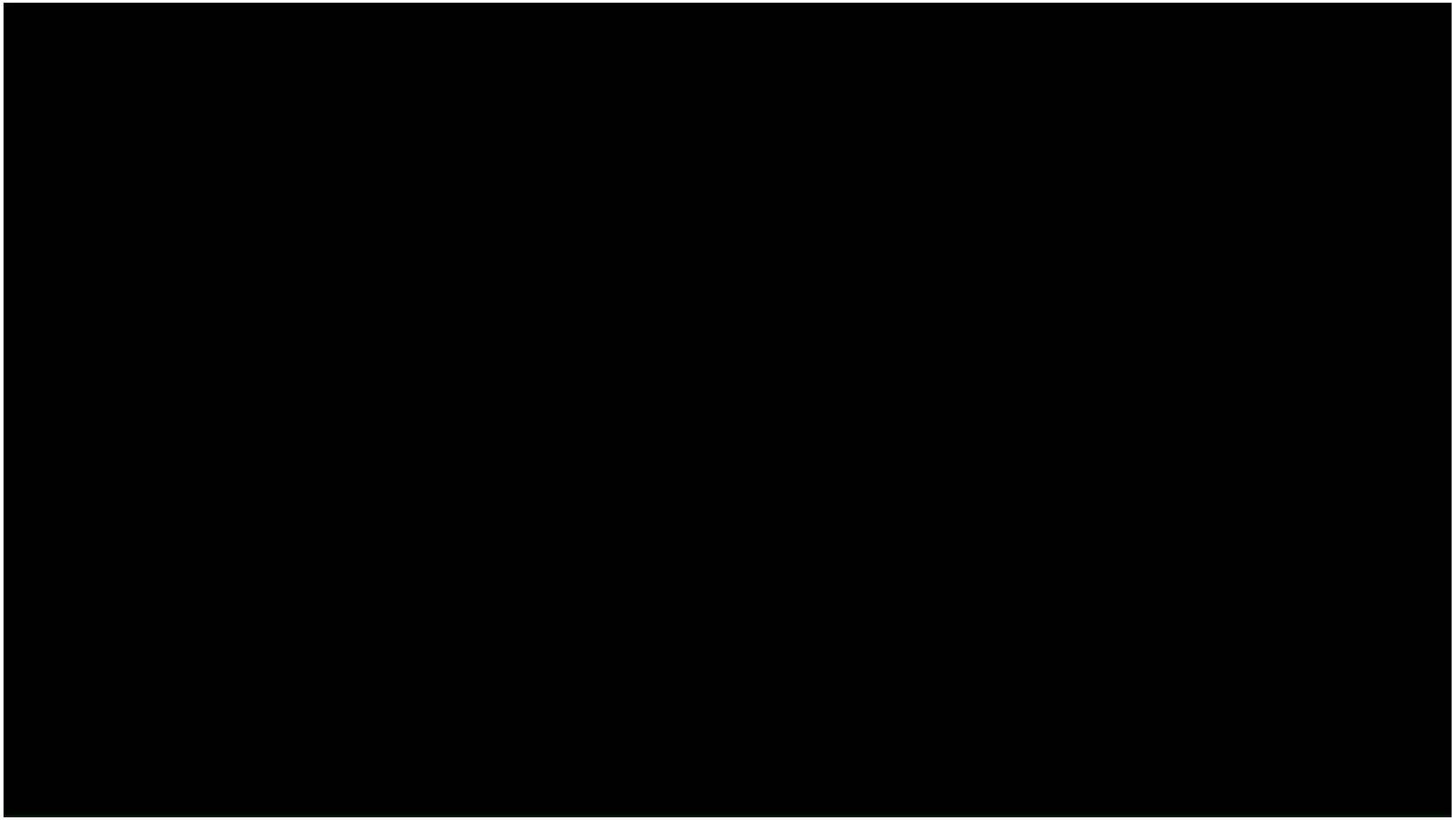
Sony's Robot Dog

Androids

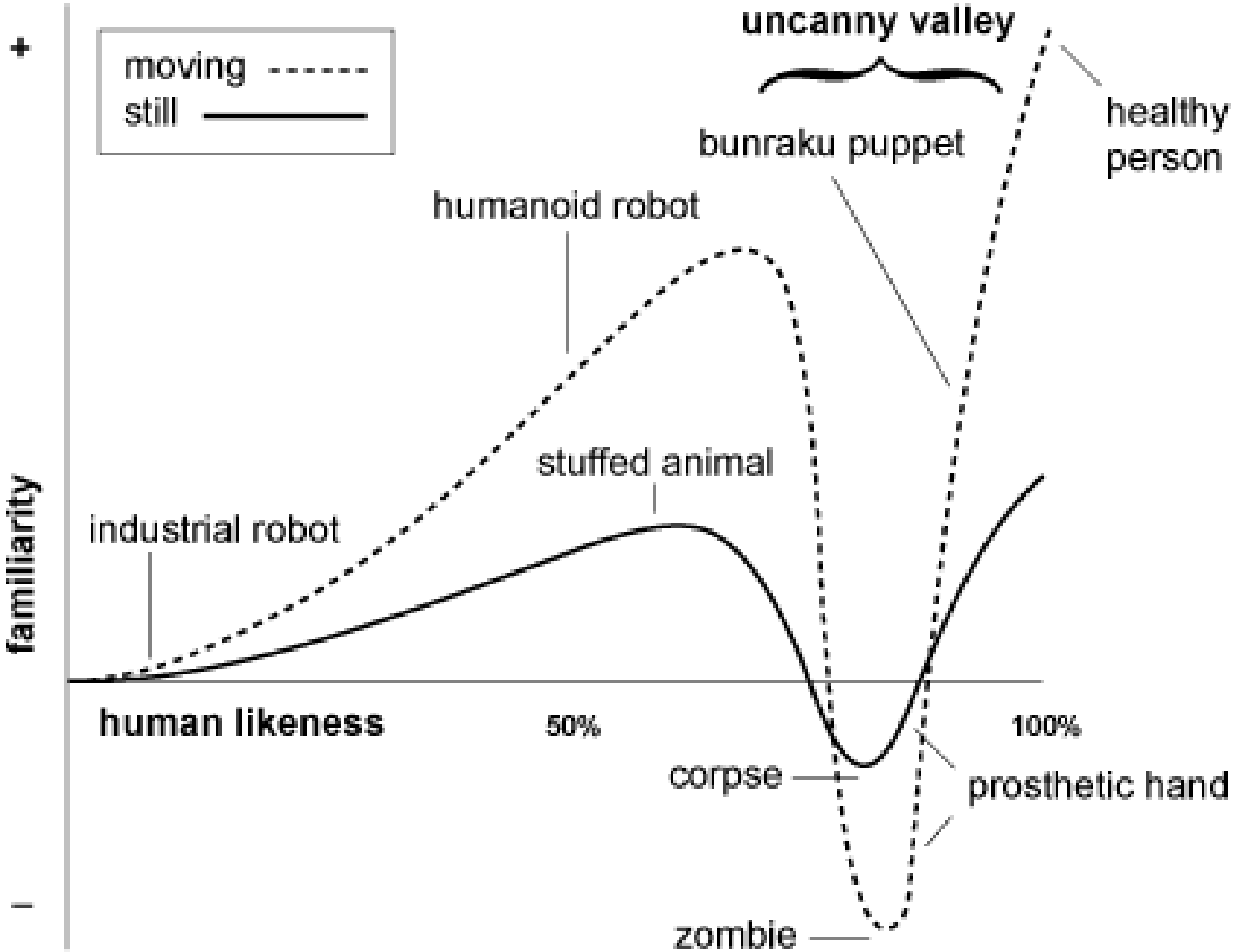
[Honda, 1986-2011]

MADE IN JAPAN

Geminoid Summit



The Uncanny Valley



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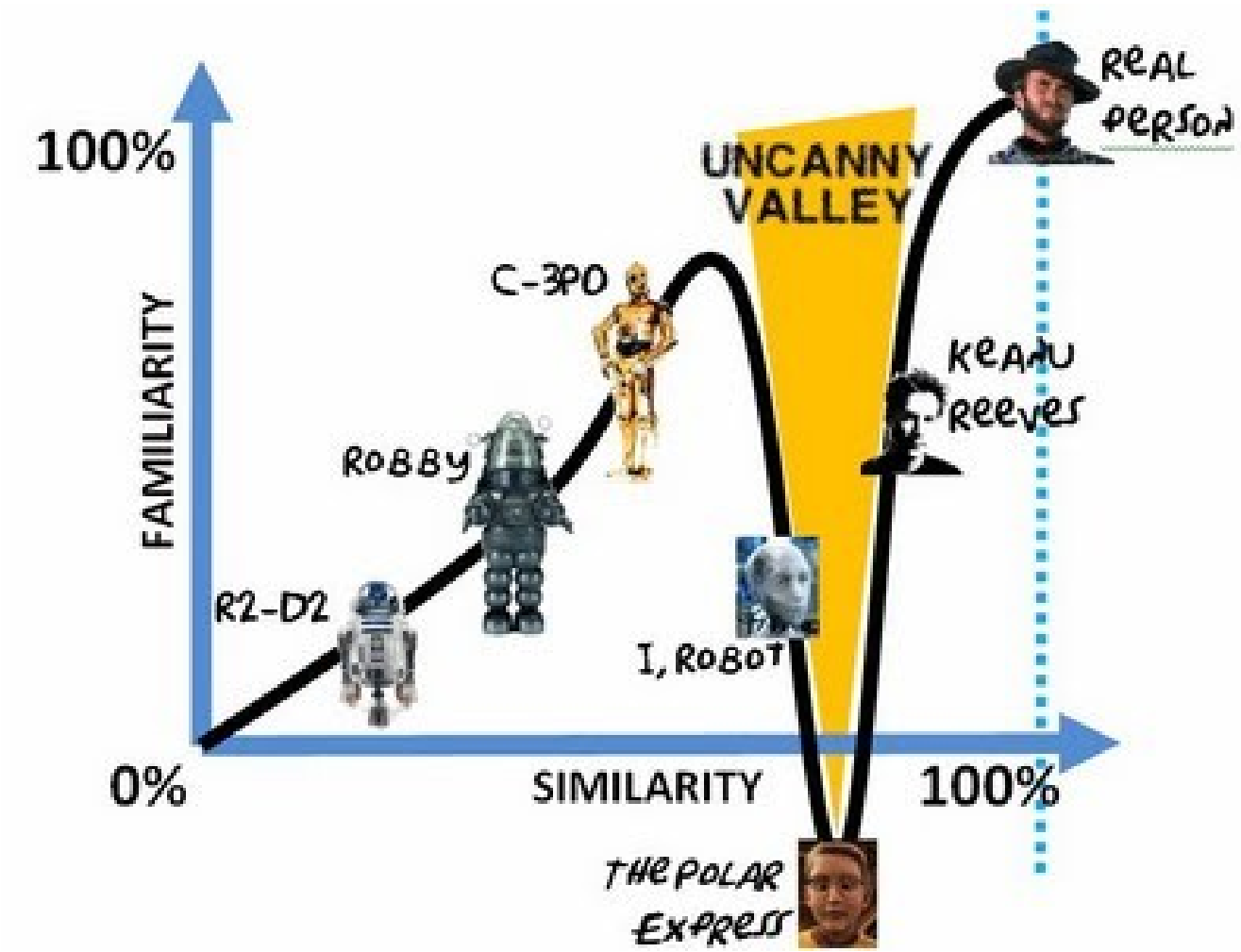

DIGITAL
CONTENT
EXPO

DIGITAL
CONTENT
EXPO

ROBO SAPIENS

Evolution of a New Species

Peter Menzel and Faith D'Aluisio
CREATORS OF *MATERIAL WORLD*

Next time...

- What are the major practical and research questions in robotics?
- Mapping and Localization
- Movement and Control
- Perception and Cognition
- ...