

What Makes Humanoids Different?

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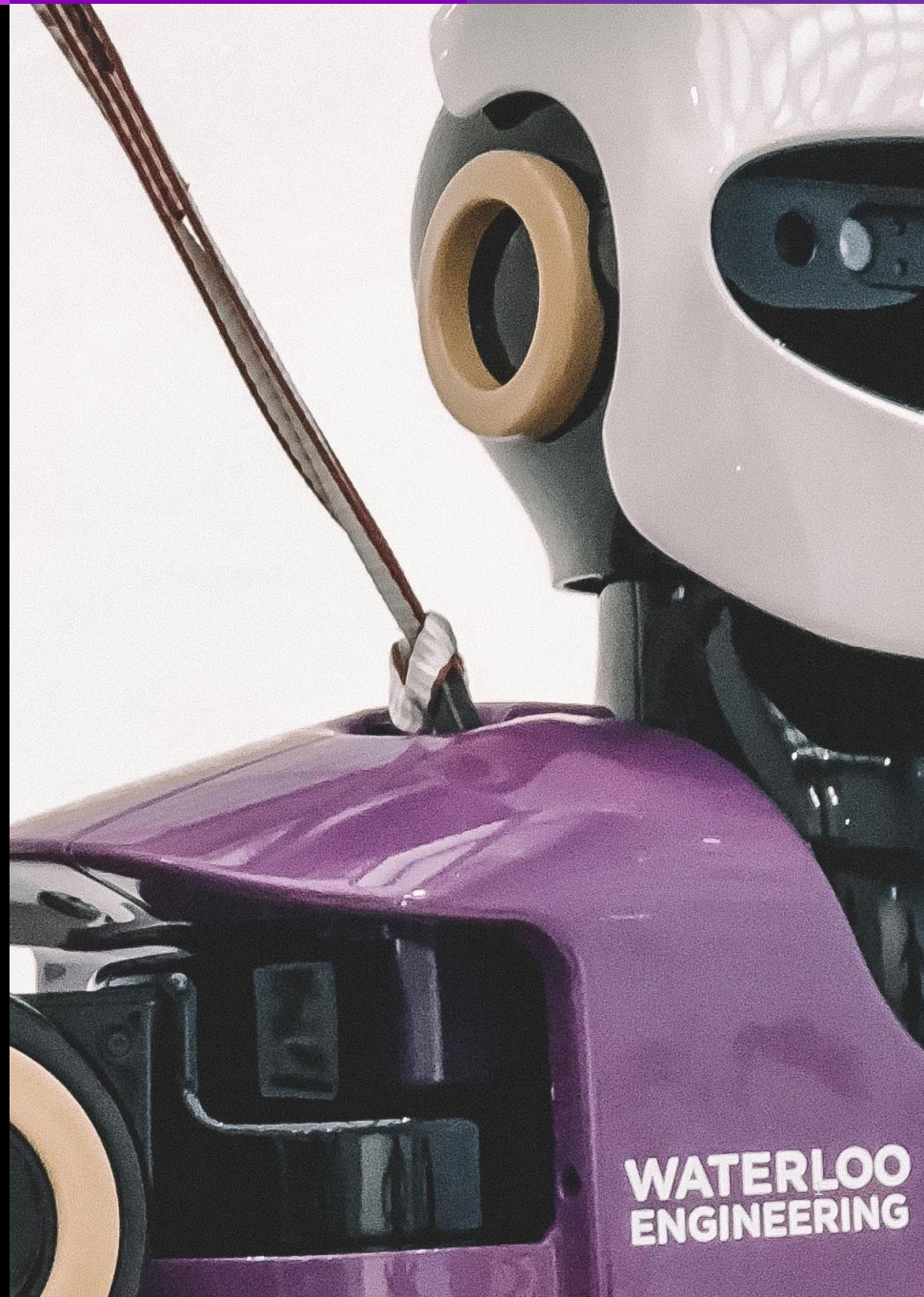
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Background & Motivation

- Decades of experience and deep connections in the robotics space in Canada
 - Triple alumnus of the University of Waterloo (Mechatronics BAsC, ECE MASc & PhD)
 - PhD thesis focused on dynamic balance and gait metrics for robotics bipeds (2013-2019)
 - Founding (& ongoing) Manager of the Waterloo RoboHub: <https://robohub.uwaterloo.ca>
 - Colleague, instructor, and/or mentor for the majority of robot startup founders in Canada
- A Pathway Study for Future Humanoid Standards: [10.13140/RG.2.2.27892.21122](https://doi.org/10.13140/RG.2.2.27892.21122)
 - Co-chair of the chapter on HRI with Marie Charbonneau (University of Calgary)
 - Co-author on the chapters about Classification of Humanoids and the Role of Stability
 - Planted the initial physical classification seeds, which quickly grew into the proposed approach
 - Planning to continue working with the IEEE Humanoid Study Group on the next steps

WHAT IS A HUMANOID ROBOT?

RODNEY BROOKS' RECENT COMMENTS ON THE FUTURE OF HUMANOID ROBOTS:

“What it means to be a *humanoid robot* will change over time.

... wheels for feet, at first two, and later maybe more ...

... one, two, and three arms ... parallel jaw grippers ... suction cups ...

... sensors that are not passive cameras ... eyes in their hands ...

... many robots with different forms for different specialized jobs ...

But they will all still be called *humanoid robots*.”

Rodney Brooks, Founder of iRobot, Rethink Robotics, and Robust.AI

ON HEARING ABOUT DEVOL'S PATENT, THEN LATER WHEN ASKED TO DEFINE "A ROBOT":

“Sounds like a robot to me!”

“I can't define a robot, but I know one
when I see one.”

Joseph Engelberger, the “Father of Robotics”

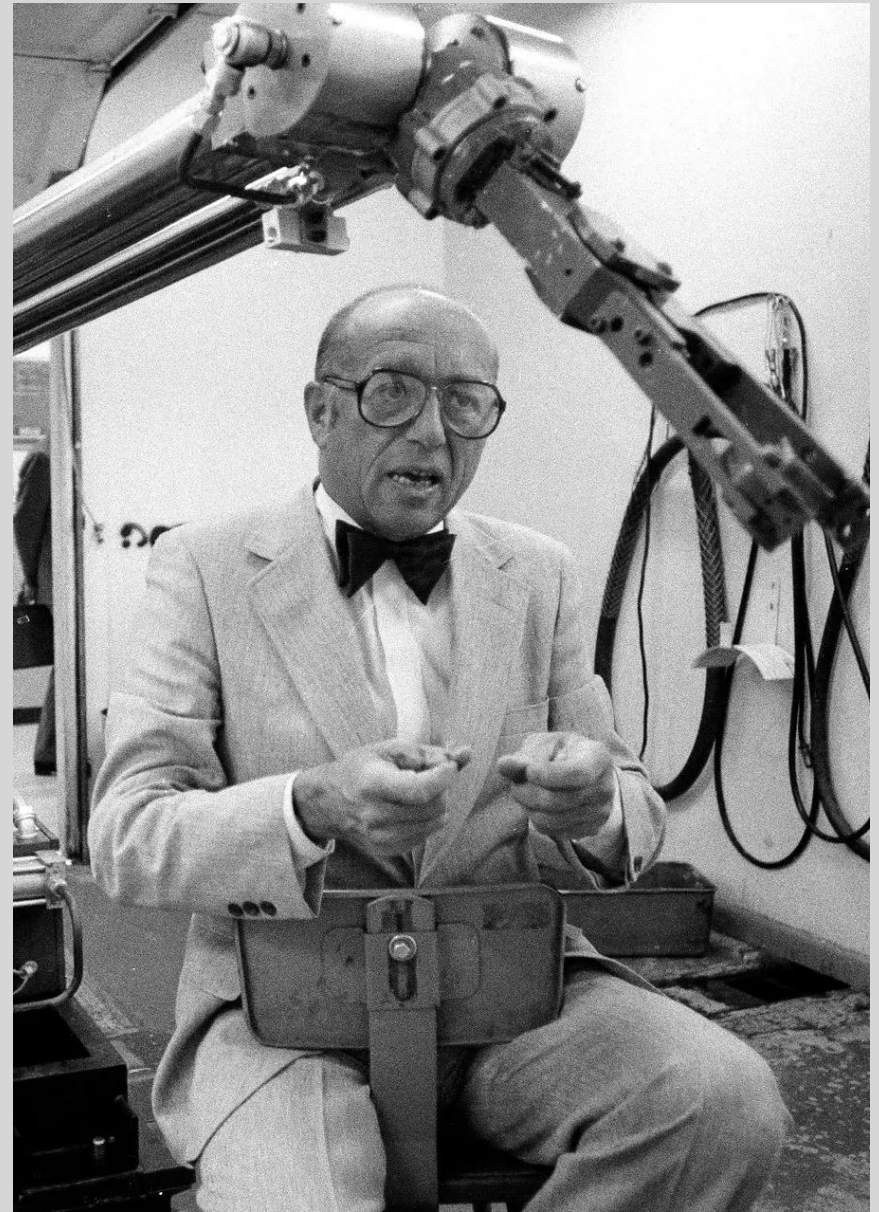


Image credit: The New York Times

THE 2003 ENCYCLOPEDIA OF SCIENCE & TECHNOLOGY:

“Humanoid robotics encompasses a rich diversity of projects where perception, processing, and action are embodied in a *recognizably anthropomorphic form* to emulate selected physical, cognitive, and social dimensions of the *human body and experience.*”

David J. Bruemmer and Mark S. Swinson

What is Anthropomorphism?

Predictors/Precursors

Observations about the robot's actions:

- Morphology
- Movements
- Behaviours
- Communication

Anthropomorphism

Internal attribution of human mental capacities to robots:

- Thinking
- Feeling
- Perceiving
- Wanting
- Choosing

Consequences

Internal assignment of social roles and norms to robots:

- Personality
- Moral values
- Responsibility

Adapted from "Anthropomorphism in human-robot interactions: a multidimensional conceptualization" by Rinaldo Kühne and Jochen Peter in *Communication Theory*, Volume 33, Issue 1, February 2023, Pages 42-52, <https://doi.org/10.1093/ct/qtac020>

CHAPTER 1 OF THE 2019 “HUMANOID ROBOTS” TEXTBOOK:

“There is no commonly accepted definition of the term humanoid robot ... Nevertheless, the generic characteristics of a humanoid robot can be derived based on the following assumptions. Humanoid robots are designed:

- to operate autonomously in various environments such as [examples];
- to perform a broad spectrum of physical tasks;
- to communicate with humans;
- to come in physical contact with humans without endangering them;
- to operate tools and manipulate objects designed for humans.

From the design viewpoint, these assumptions imply a human-like physical appearance ... ”

Dragomir N. Nenchev, Atsushi Konno, and Teppei Tsujita

IS THE APPLICATION “HUMANOID”?

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