
Artificial Intelligence - What does it really mean?

Thomas Christaller
Autonomous intelligent Systems

The first Robots and Their Engineers

Hephaistos

- Scene in the Ilias
- Pandora

Homunculus, Paracelsus

Golem, Rabbi Loew

Frankenstein, Mary Shelley

Science Fiction,

z.B. Lem, Asimov, Gibson



Der Terminator (1984)



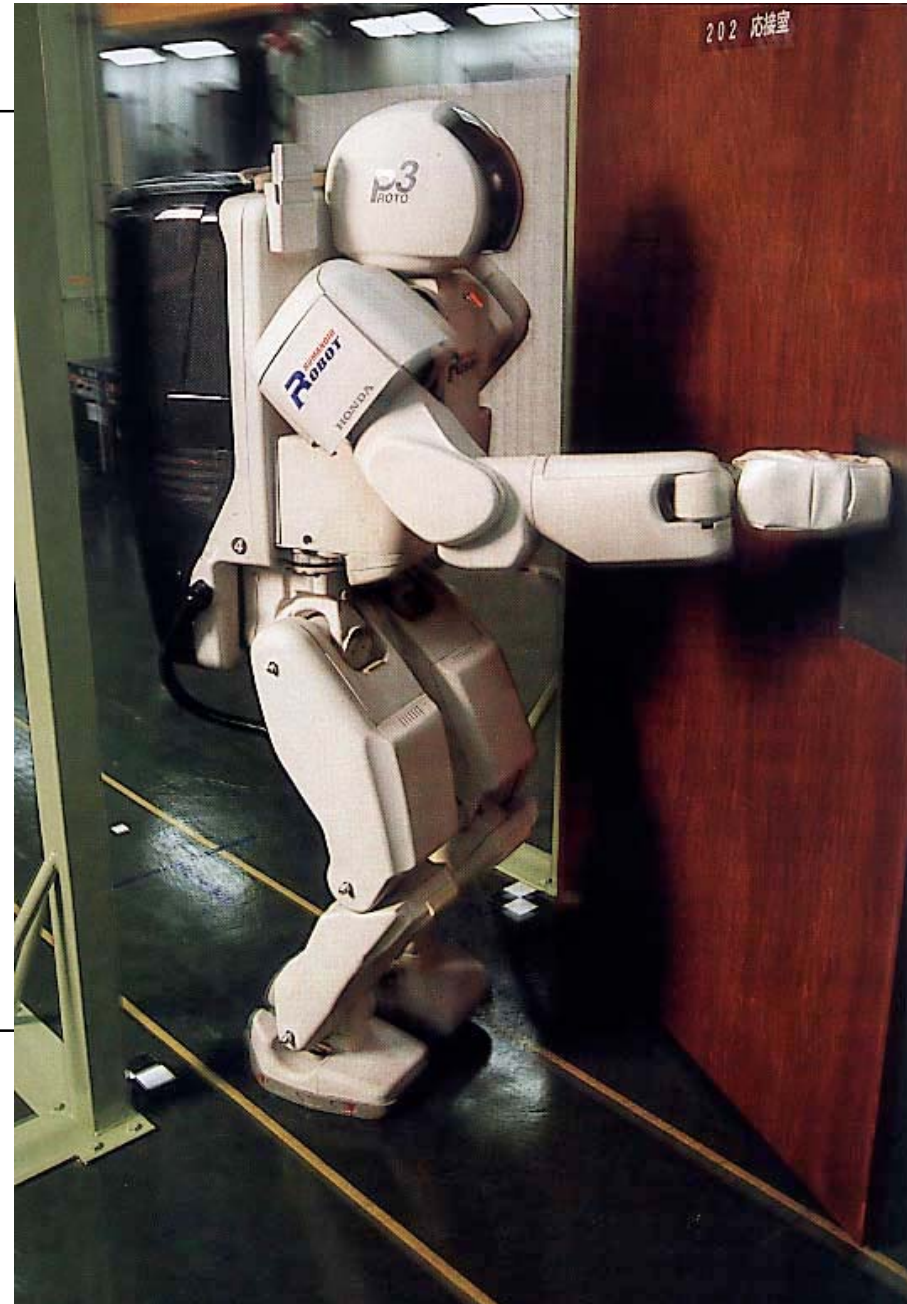
Der Golem, wie er in die Welt kam (1920)

telligente

Frankensteins Monster
(Boris Karloff) in
Frankenstein (1931)



P3 from Honda



Archivierungsangaben

Taken from:
Peter Menzel et al.
Robos@piens.
MIT Press, 2000

Definitions of Artificial Intelligence

AI is the study of ideas which enable computers to do things that make people seem intelligent. The central goals of AI are to make computers more useful and to understand the principles which make intelligence possible. Patrick Winston: Artificial Intelligence. 1977, p. 1

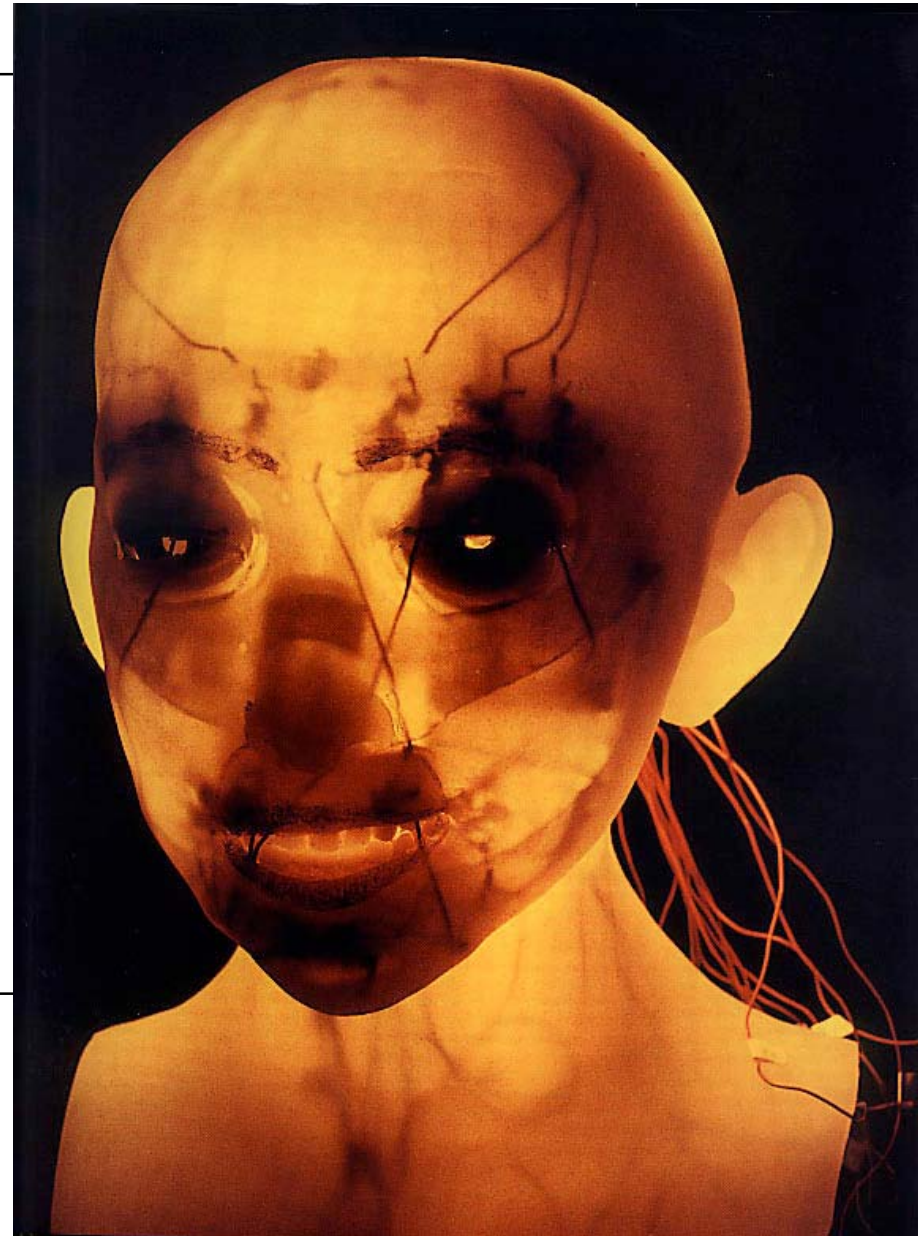
AI research is considering problems to be solved with computers which at the time being are unsolved. Marvin Minsky

Face Robot

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Definitions of Artificial Intelligence (ctd.)

"KI" bezeichnet das Forschungs- und Wissensgebiet, das den Computer als Modell für die Charakterisierung kognitiver Prozesse und als Medium für deren Synthetisierung einsetzt. ...

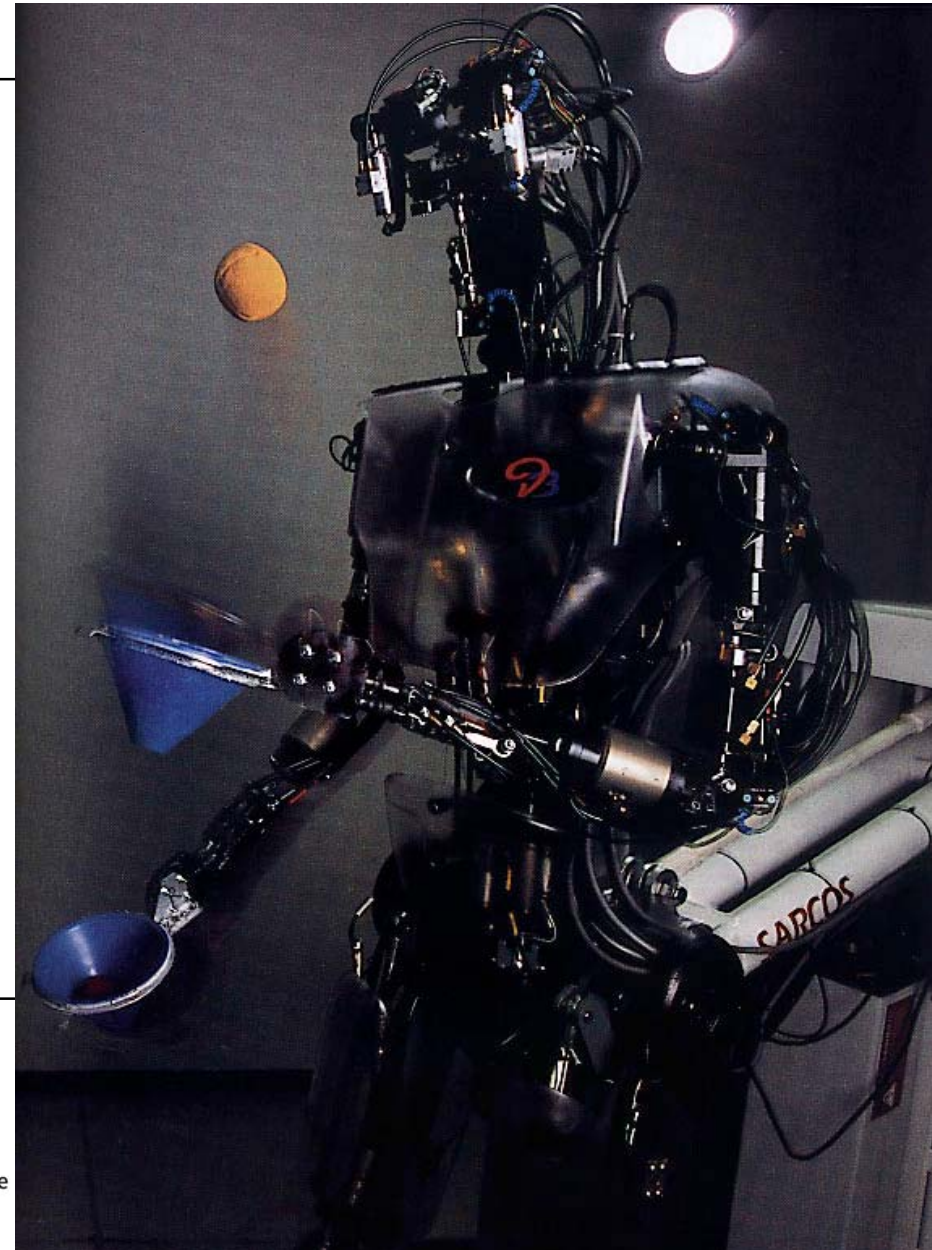
spezifische (menschliche) kognitive Fähigkeiten und ihre Voraussetzungen besser verstehen und nachbilden zu können ...

Kawato's Humanoid

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Definitions of Artificial Intelligence (ctd.)

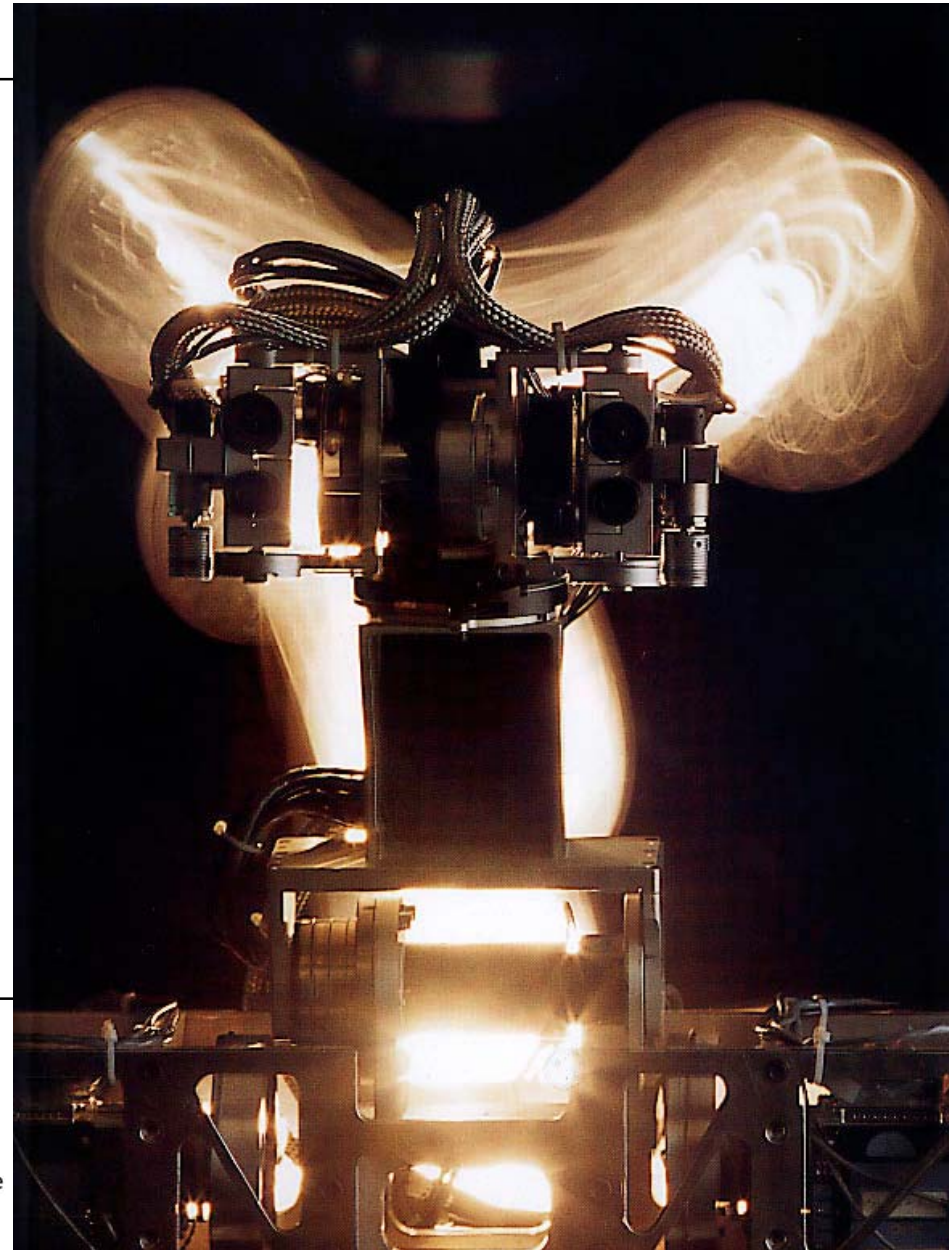
Die Verarbeitung von Text und Sprache und allem, was sich prinzipiell sprachlich beschreiben läßt, ist charakteristisch für das Arbeitsgebiet KI. Auch nichtsprachliche Vorgänge wie das Sehen und Erkennen sowie Planungs- und Problemlöse-Prozesse sind über die Beschreibung von Sachverhalten der KI zugänglich. ...
Auf diese Weise (Symbolverarbeitung), so scheint es, kann ein Großteil des menschlichen Denkens, Handelns und Kommunizierens prinzipiell dargestellt werden.
Christian Freksa: Wörterbuch der Kognitionswissenschaft. S. 344ff

Cog from MIT AI Lab

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Definitions of Artificial Intelligence (ctd.)

AI is the enterprise of constructing an intelligent artifact. ...

So what is intelligence? ...

There is something else outside the scope of AI that people are good at. People are good at being people. ...

AI is the enterprise of constructing a physical-symbol system that can reliably pass the Turing test. Matt Ginsburg: Essentials of AI. 1993, p. 3-17

Scorpion from Frank Kirchner

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The Turing Test

Three individuals: a woman, a man, an interrogator

- All separated from each other

The man must convince the interrogator that he is a woman

The woman should not reveal her gender explicitly

IF the man is replaced by a machine AND

It does as well in fooling the interrogator THAN

The machine must be considered to be intelligent

Smiling

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Physical Symbol System Hypothesis (PSSH)

Symbols are grounded in physical structures and processes

You may abstract without any loss from the physical substrate if

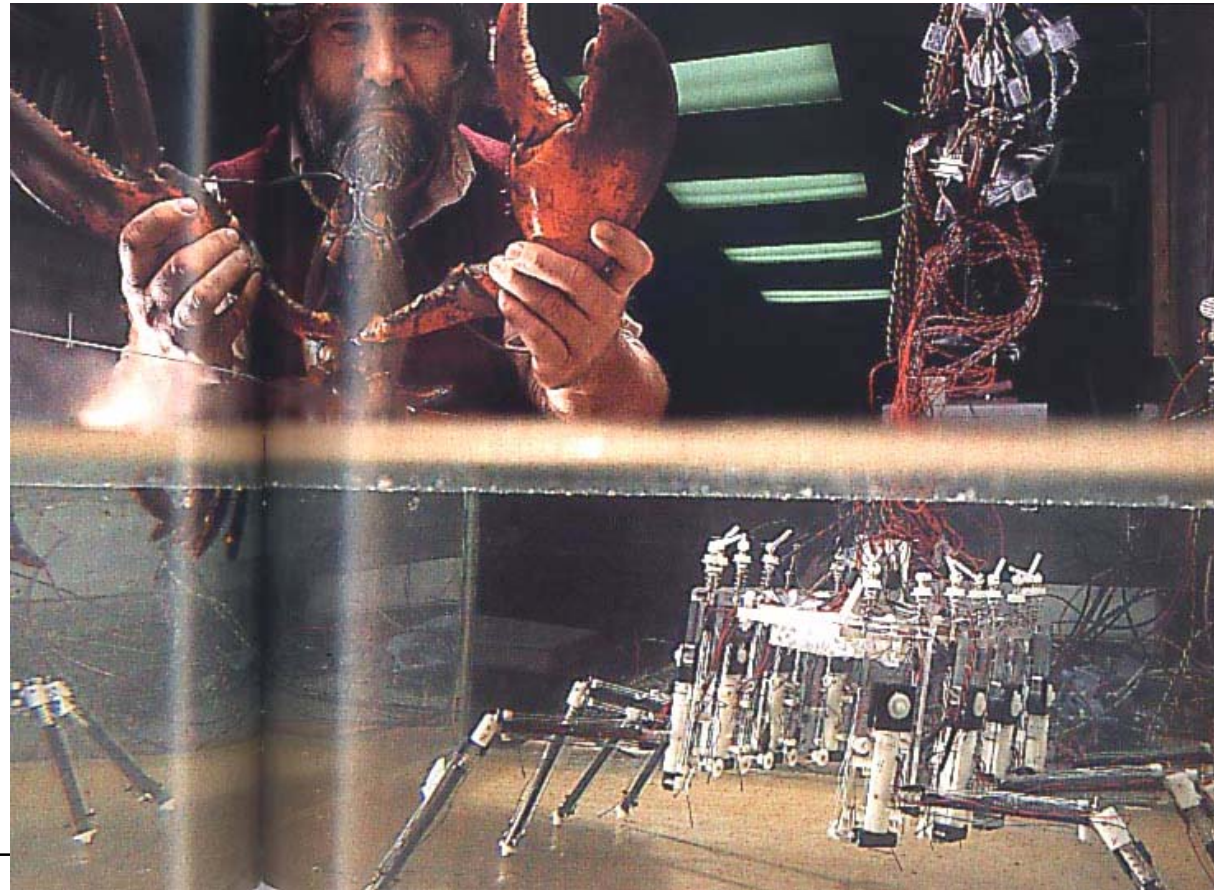
- the same symbol yields the same physical state
- the symbol manipulation rules are representable with symbols

Applying these rules is equivalent to "running" their physical processes

Intelligence IS computation/symbol processing

Newell and Simon:
Computer science as
empirical inquiry:
Symbols and search.
CACM, Vol. 19, 1976

Joe Ayers with his Lobsters



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MIT Press, 2000

Computer Systems Today

Computability (Universal Turing-Machine)

Abstraction from the physics (PSSH)

discrete, digital systems (von Neumann-Architecture)

Human modelling vs machine symbol manipulation

Divide and conquer: Moduls with interfaces

Abstraction via mappings preserving semantics
preformation

- stationar and rigid
- System closing before its use

Sir Arthur's Shadow



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Will a Machine be as Intelligent as a Human?

Only if a machine is like a human

- which does not make any sense

It might be intelligent in a different way

The compute power is a necessary but not a sufficient criteria

- sensors and actuators
- richness of behaviours
- long-term and short-term adaptation (evolution and learning)
- growing and socialising in a group of conspecifics

Two Traditions to Approach Cognition

Logic, Inference, Symbolic Representations

- Artificial Intelligence is the enterprise of constructing a physical-symbol system that can reliably pass the Turing test. [Ginsberg: Essentials of Artificial Intelligence. 1993, p.8]

Differential Equations, Dynamics, Variables and Scalars

- Structured, Symbolic, Representational and Computational views of cognition are mistaken. Embodied cognition is best studied using non-computational and non-representational ideas and explanatory schemes involving e.g. the tools of Dynamical Systems Theory. [Mark Clark: The Dynamical Challenge. In: Cognitive Science Vol. 21 (4), p. 461]