# Artificial Intelligence

## Definition, Realization and Consequences

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# Artificial General Intelligence

**Weak**

**Specialized**

**Strong**

**Universal**

# The definition of the Council of Europe (2020)

*AI is actually a young discipline of about sixty years, which brings together sciences, theories and techniques (including mathematical logic, statistics, probabilities, computational neurobiology and computer science) and whose goal is to achieve the imitation by a machine of the cognitive abilities of a human being.*

# Approaches

**Full Observability**

**Device without Memory**

**or**

**function**

**Partial Observability**

**Device with Memory**

# Full Observability

$f : Observations \rightarrow Actions$

$$f(o_i) = a_i$$

*Training Data is:*

$$\{ \langle o_i, a_i \rangle \mid i \in I \}$$

# Partial Observability

$f : Memory \times Observations \rightarrow Actions \times Memory$

$$f(m_i, o_i) = \langle a_i, m_{i+1} \rangle$$

*Training Data is:*

$o_0, \quad a_0, \quad o_1, \quad a_1, \quad \ldots \quad , o_{n-1}, \quad a_{n-1}, \quad o_n$

# Partial Observability

$f : Memory \times Observations \rightarrow Actions \times Memory$

$g : States \times Actions \rightarrow Observations \times States$

$$f(m_i, o_i) = \langle a_i, m_{i+1} \rangle$$

$$g(s_i, a_i) = \langle o_{i+1}, s_{i+1} \rangle$$

*Training Data, state and memory:*

$m_0, o_0, s_0, a_0, m_1, o_1, s_1, a_1, \ \ldots \ , o_{n-1}, s_{n-1}, a_{n-1}, m_n, o_n, s_n$

# Partial Observability

$f : Memory \times Observations \rightarrow Actions \times Memory$

$g : States \times Actions \rightarrow Observations \times States$

$$f(m_i, o_i) = \langle a_i, m_{i+1} \rangle$$

$$g(s_i, a_i) = \langle o_{i+1}, s_{i+1} \rangle$$

*Training Data and state:*

$o_0, s_0, a_0, \quad o_1, s_1, a_1, \quad \ldots \quad , o_{n-1}, s_{n-1}, a_{n-1}, \quad o_n, s_n$

# How will we understand the world?

**We will approximate the function $g$**

**(and the current state $s_n$ )**

**and we will obtain the function $g'$**

**(and the state $s'_n$ ).**

**$s'_n = n$ – this is a possible solution but not a good idea.**

# Where will we look for the function $g'$

**We can think that:**

$g' : \mathbb{N} \times Actions \rightarrow Observations \times \mathbb{N}$

**or**

$g' : \mathbb{N} \rightarrow \mathbb{N}$

1. *Computable*
2. *Computable with randomness*
3. *Computable with agents*

## What will be the structure of $s'_n$

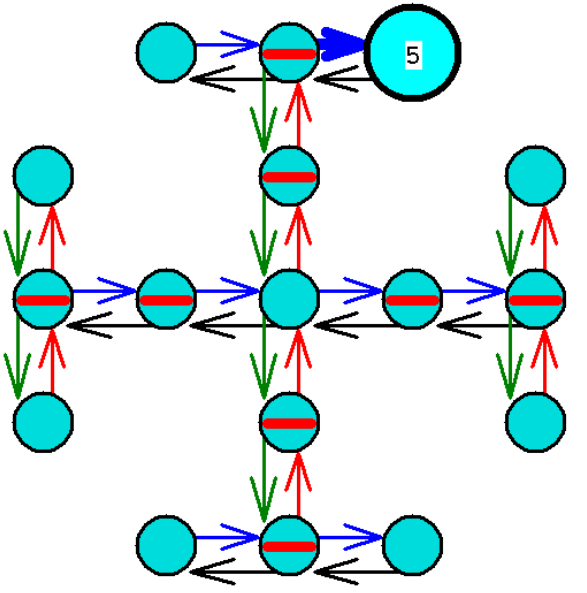
$$s'_n = \langle Arg_1, \ldots, Arg_k \rangle$$

***Arg*** **is a state of Event-Driven model.**

***Arg*** **is an array.**

# Event-Driven models

## the algorithm of the knight



# One proposition

$p \in [0, 1]$ – possibility

$\omega = b_1, \ldots, b_n$ – Boolean sequence

$P(b_i = 1) = p$ or $L_1\omega = [p.n]$

$b_{n+1}$ is the natural continuation of $\omega$

$$\lim_{n\to\infty} P(b_{n+1} = 1) = p$$

It does not depend on the definition of natural continuation.

# The second part of the dissertation

## Language for Description of Worlds

# The third part of the dissertation

# Consequences