Mappism – Philosophy of Mind from the Perspective of Mathematics and Computer Science

Iwo Błądek, Konrad Miazga

Poznań University of Technology, Faculty of Computing

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Outline

Introduction

- Mind-body problem.
- How can one be conscious in an unconscious world?
- Do philosophical zombies exist?

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- Physics suggests that the world can be described with precise math.
- The world that we know is composed of high level abstractions (i.e., atoms, molecules, cells, organisms) built upon the underlying laws of physics.
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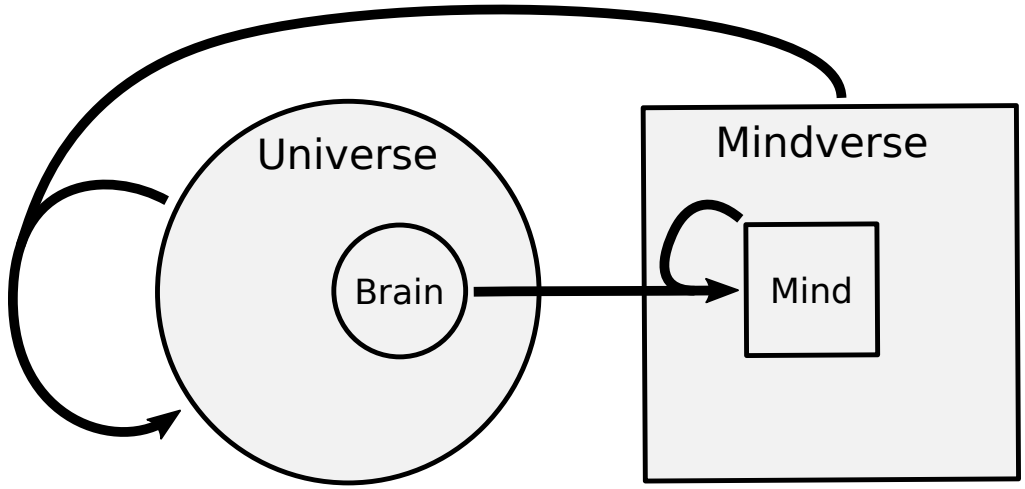
Mappism

*I. Błądek, M. Komosinski, K. Miazga, "**Mappism: formalizing classical and artificial life views on mind and consciousness**", Foundations of Computing and Decision Sciences, special issue "Philosophy in Computer Science", 2018*

http://www.framsticks.com/files/common/MappismConsciousness.pdf

So, what does mappism look like?



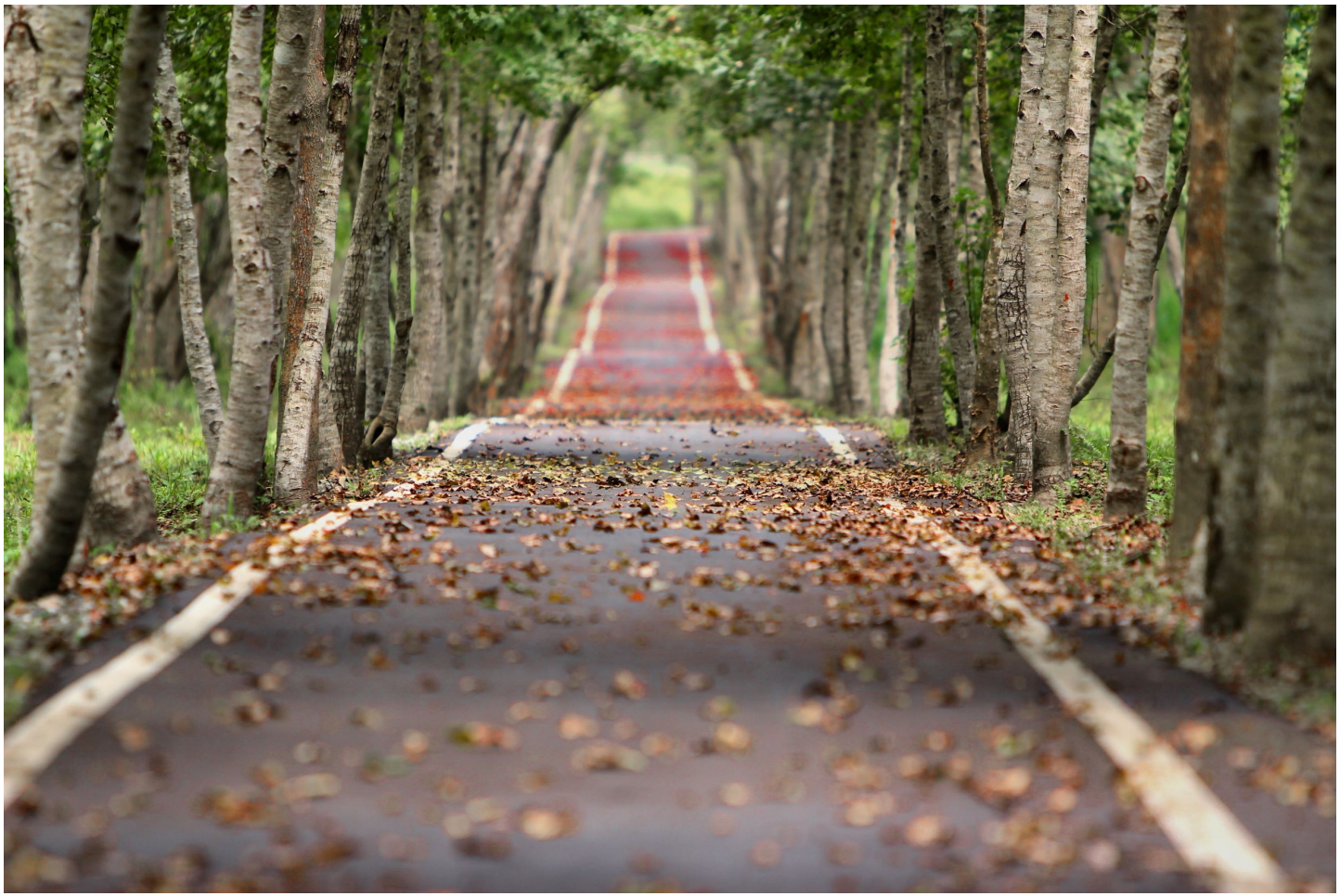
$$\boldsymbol{Universe}(t+1) = transitionUniverse(\boldsymbol{Universe}(t), \boldsymbol{Mindverse}(t)) \quad (1)$$

$$\boldsymbol{Brain_x}(t) = limitscope_x(\boldsymbol{Universe}(t)) \quad (2)$$

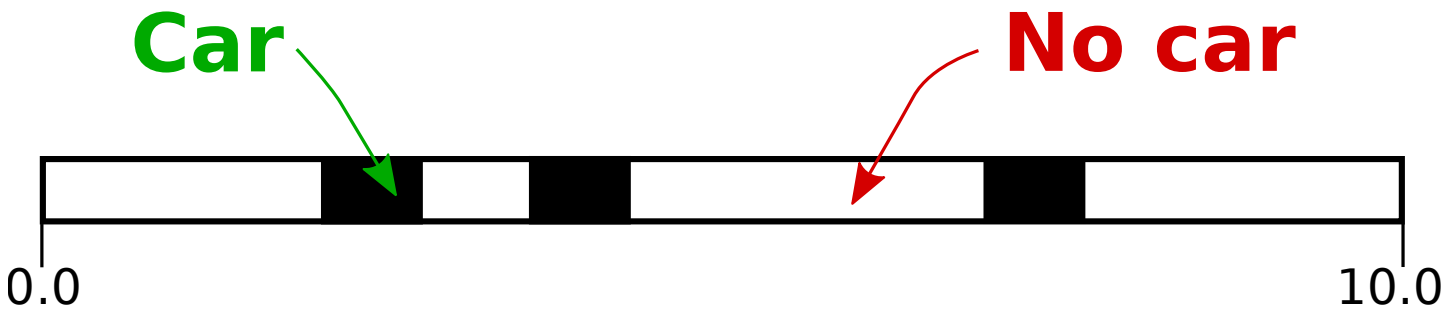
$$\boldsymbol{Mindverse}(t) = \cup_x \boldsymbol{Mind_x}(t) \quad (3)$$

$$\boldsymbol{Mind_x}(t+1) = transitionMind_x(\boldsymbol{Mind_x}(t), \boldsymbol{Brain_x}(t)) \quad (4)$$

A road



A road



Fact, Language

Fact –

a smallest, indivisible piece of information in a given representation.

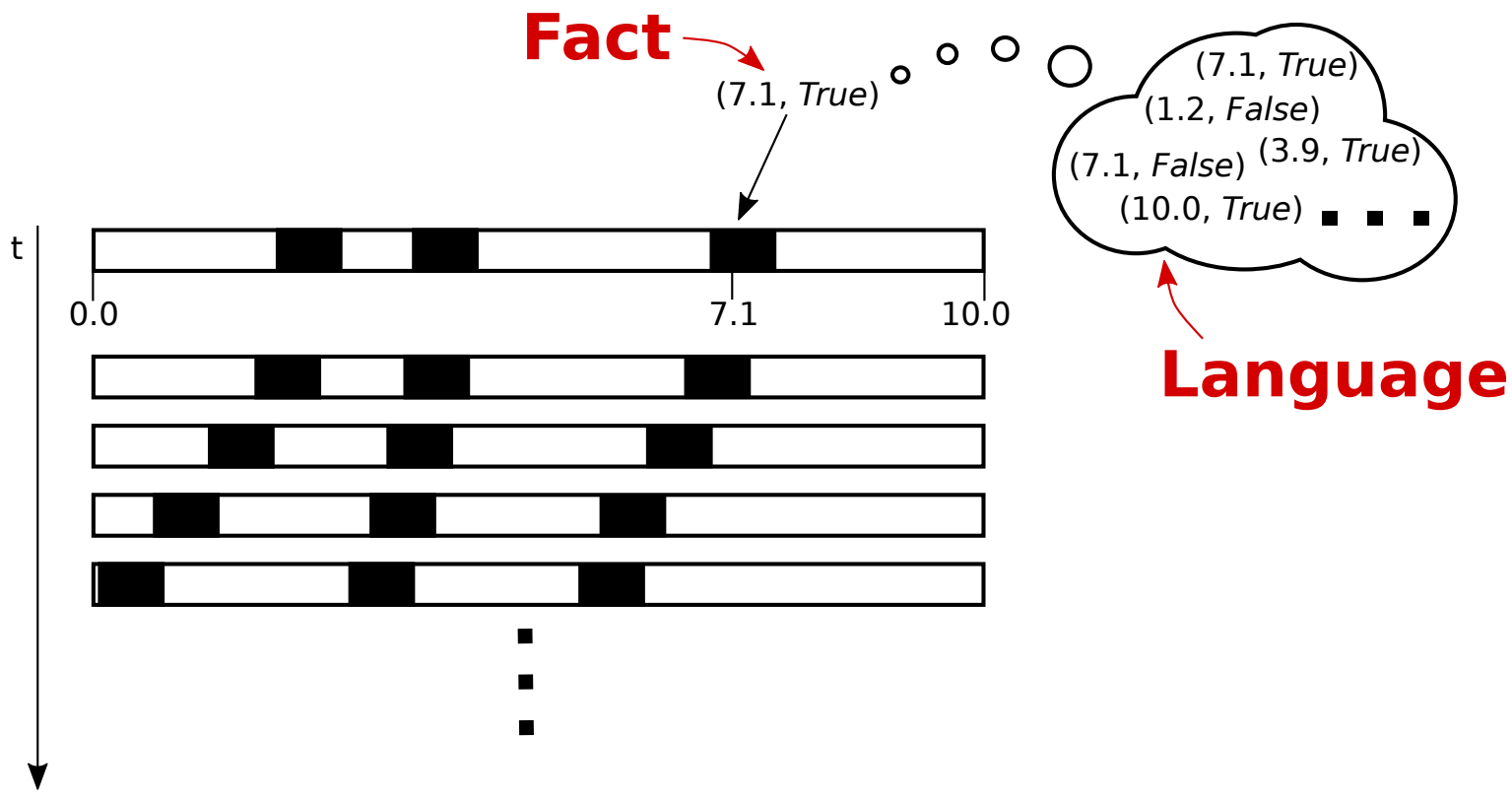
A pair (d, b) where d is a real-valued coordinate and b is a boolean value at that coordinate.

Language –

a set of all possible facts in a given representation.

$L = \{(d, b) \ : \ d \in \mathbb{R}, b \in \{False, True\}\}$, where L is the set of all possible combinations of a real-number coordinate d and a boolean value b.

Fact, Language: a visual example



State, Object

State –

a subset of facts from a certain language L.

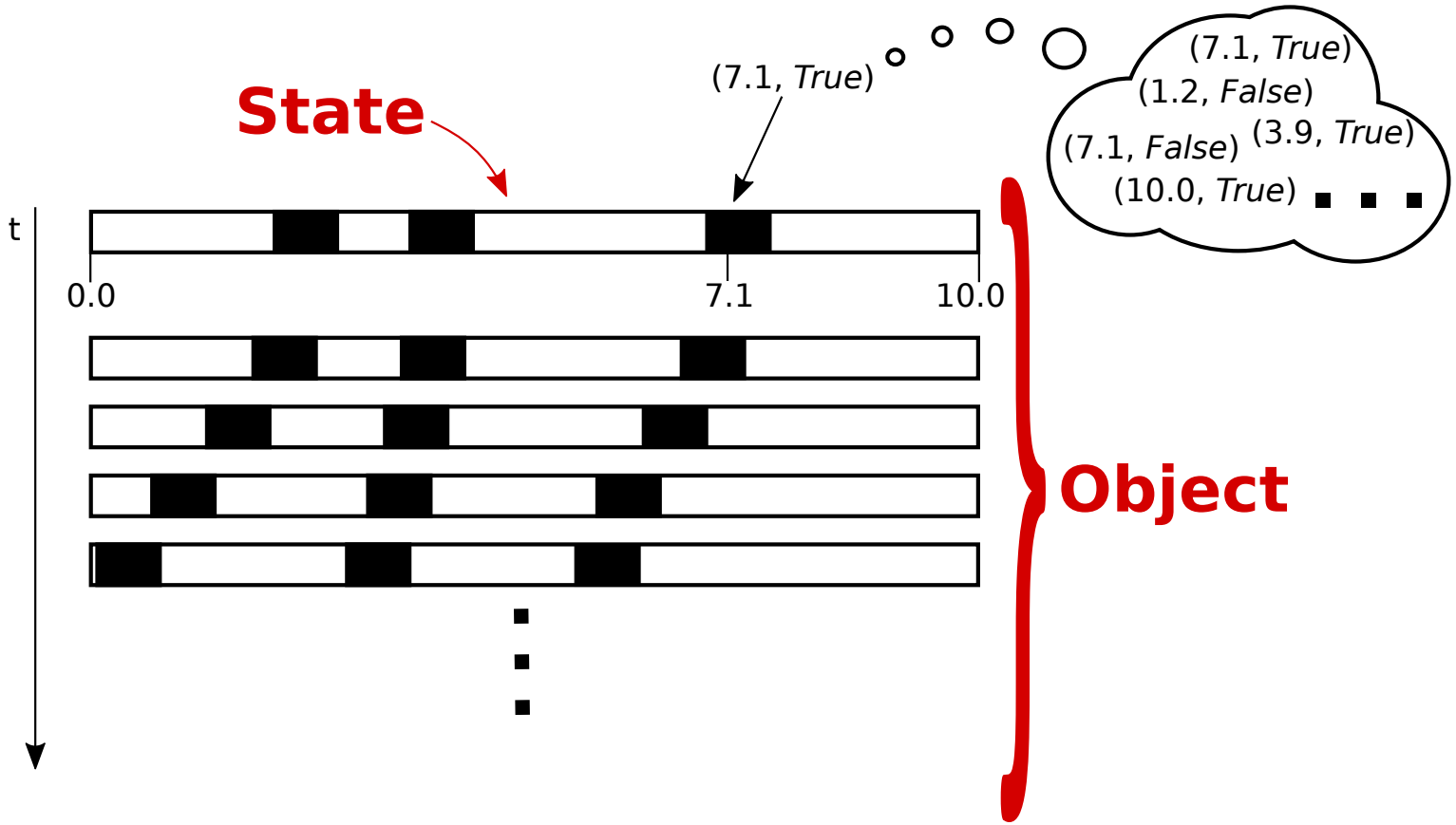
$S = \{(1.2, \mathit{False}),\ (2.3, \mathit{True}),\ (7.1, \mathrm{True}),\ \cdots\}$.

Object –

a process or a structure that constitutes some entity that consists of one or more states.

$\mathit{Road}(t) : \mathbb{R} \to \mathcal{P}(L)$, where $\mathcal{P}(L)$ denotes the power set of L.

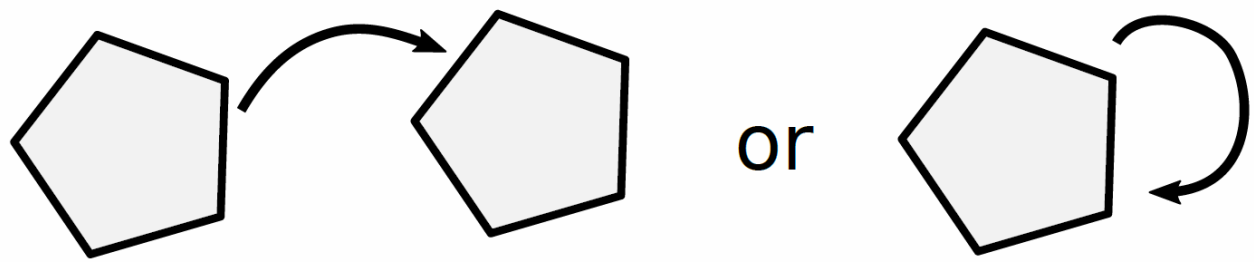
State, Object: a visual example



Transformations

- *transition*
- *limitscope*
- *map*
- *remap*

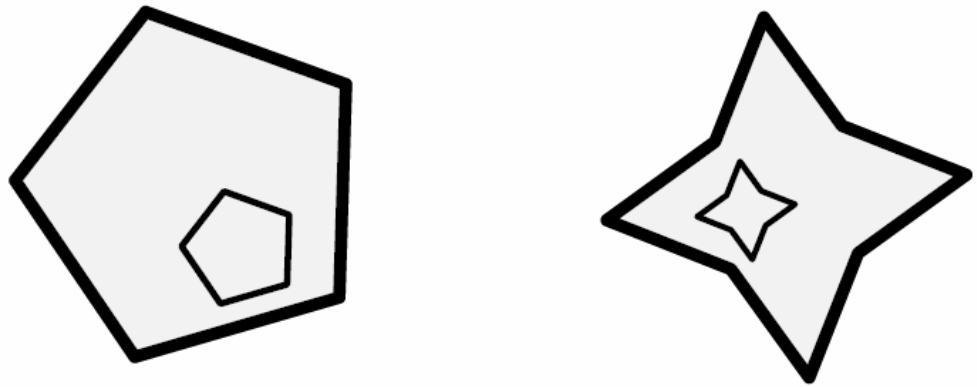
Transformations: *transition*



$$A(t+1) = \mathit{transition}(A(t))$$

The *transition* transformation is used to define how the state of some object changes as the values of its parameters change.

Transformations: *limitscope*

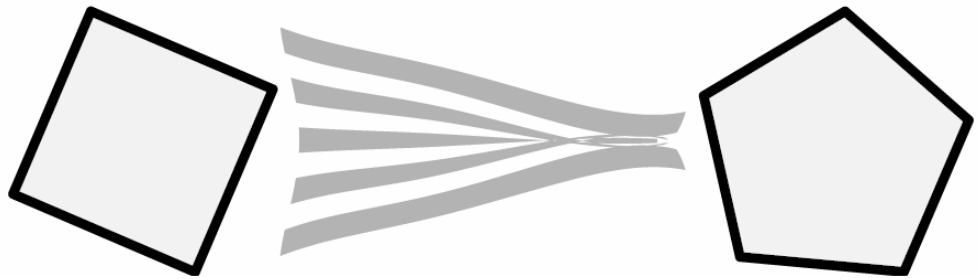


$$A(t) = \mathit{limitscope}(B(t))$$

$$\Longrightarrow\ A(t) \subset B(t) \subseteq L$$

The *limitscope* transformation is used to define some object as a specific part (a subset of facts) of some other object.

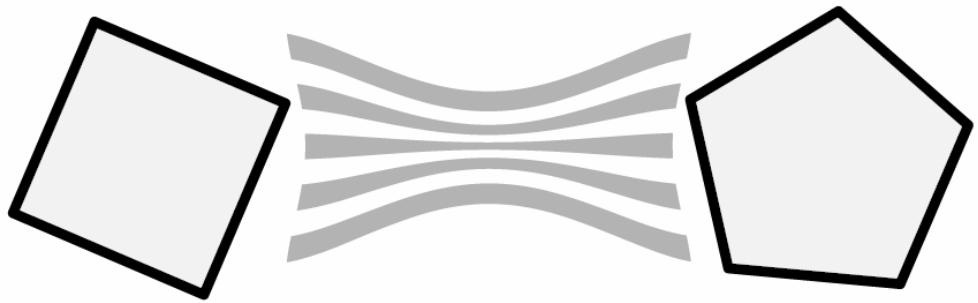
Transformations: *map*



$$A(t) = map(B(t)) \implies \nexists_{map2}\ B(t) = map2(A(t))$$

The *map* transformation always leads to some loss of information. It is used to change the language in which an object is described to another (usually higher level) language, or to reformulate the description of an object using the same language.

Transformations: *remap*



$$A(t) = \mathit{remap}(B(t))$$

$$\iff \; B(t) = \mathit{remap}^{-1}(A(t))$$

The *remap* transformation always preserves the entire information. It is used to change the language in which an object is described, or to reformulate the description of an object using the same language.

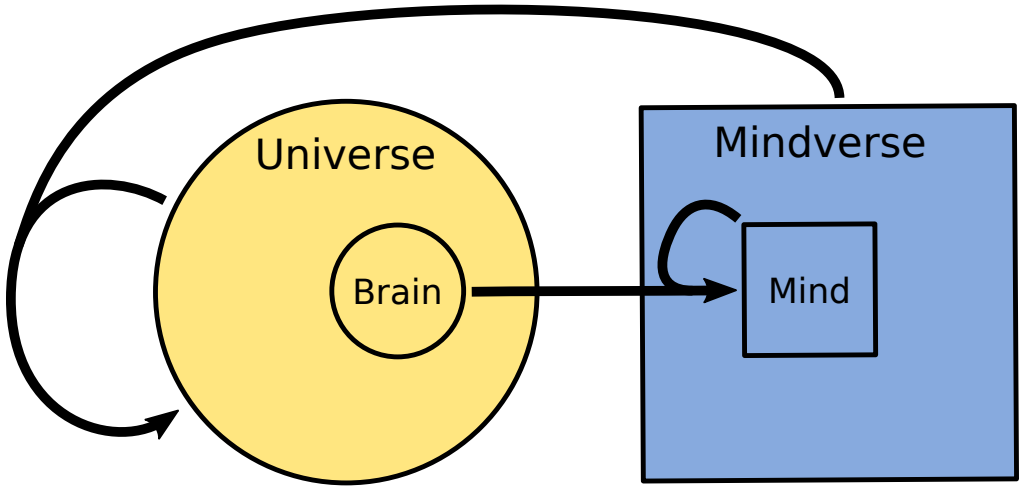
Outline

Substances

Substance (in philosophy) – a fundamental building medium of which all objects or processes of a certain kind (e.g., physical objects, thoughts) are made of or based on.

Substance (in mappism) – a property of an object, shared among all objects that can be derived from one another through a combination of *limitscope*, *map* and *remap* transformations.

Interactionism



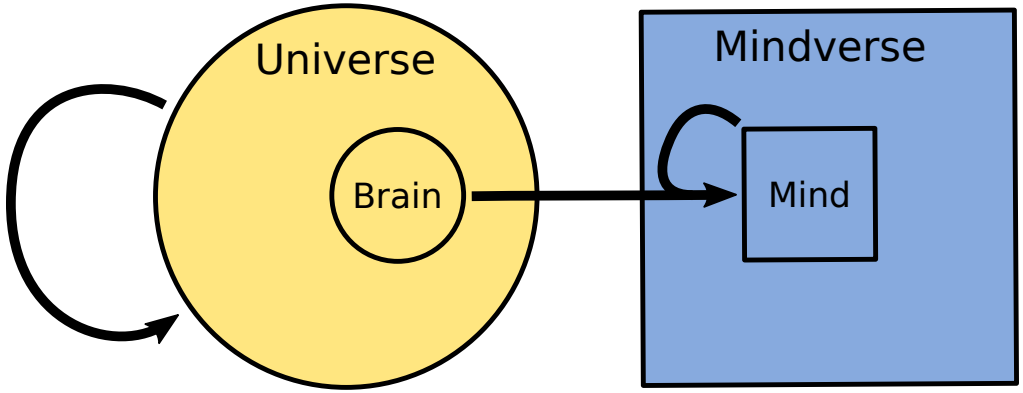
$$\boldsymbol{Universe}(t+1) = transitionUniverse(\boldsymbol{Universe}(t), \boldsymbol{Mindverse}(t)) \quad (5)$$

$$\boldsymbol{Brain_x}(t) = limitscope_x(\boldsymbol{Universe}(t)) \quad (6)$$

$$\boldsymbol{Mindverse}(t) = \cup_x \boldsymbol{Mind_x}(t) \quad (7)$$

$$\boldsymbol{Mind_x}(t+1) = transitionMind_x(\boldsymbol{Mind_x}(t), \boldsymbol{Brain_x}(t)) \quad (8)$$

Epiphenomenalism (weak)



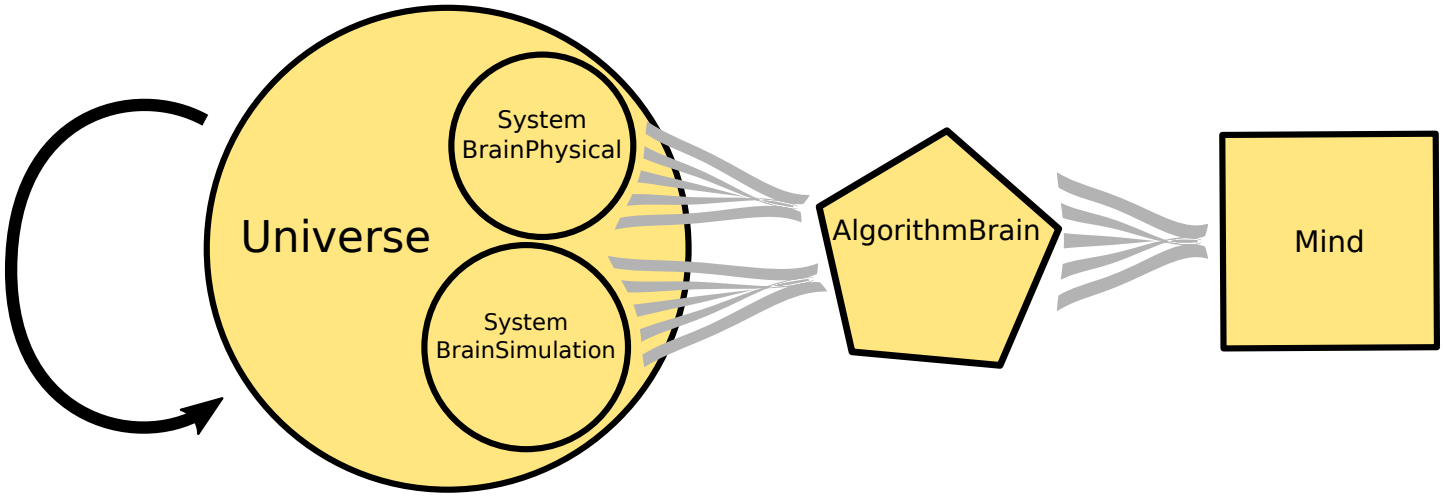
$$\boldsymbol{Universe}(t+1) = transitionUniverse(\boldsymbol{Universe}(t)) \quad (9)$$

$$\boldsymbol{Brain_x}(t) = limitscope_x(\boldsymbol{Universe}(t)) \quad (10)$$

$$\boldsymbol{Mindverse}(t) = \cup_x \boldsymbol{Mind_x}(t) \quad (11)$$

$$\boldsymbol{Mind_x}(t+1) = transitionMind_x(\boldsymbol{Mind_x}(t), \boldsymbol{Brain_x}(t)) \quad (12)$$

Functionalism



$$\boldsymbol{Universe}(t+1) = transition(\boldsymbol{Universe}(t)) \tag{13}$$

$$\boldsymbol{System_x}(t) = limitscope_x(\boldsymbol{Universe}(t)) \tag{14}$$

$$\boldsymbol{Algorithm_x}(t) = mapAlgorithm_x(\boldsymbol{System_x}(t)) \tag{15}$$

$$\boldsymbol{Mind_x}(t) = mapMind(\boldsymbol{Algorithm_x}(t)) \tag{16}$$

$$\forall_{y,z}\ \boldsymbol{Algorithm_y}(t) = \boldsymbol{Algorithm_z}(t) \implies \boldsymbol{Mind_y}(t) = \boldsymbol{Mind_z}(t) \tag{17}$$

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Simulation: Dualism vs physicalism

From the perspective of *agents* (simulated creatures), simulation environments can be categorized as:

- **Dualistic** – agents cannot observe their thought processes in the world.
- **Physicalistic** – agents can observe their own thought processes, either directly or using some intermediary.

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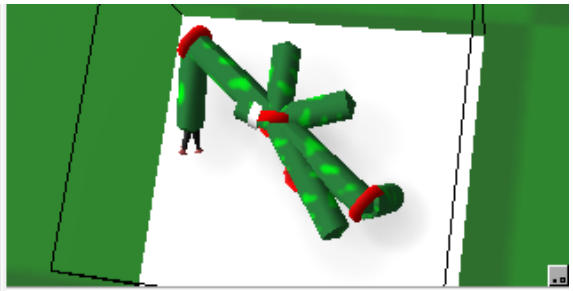
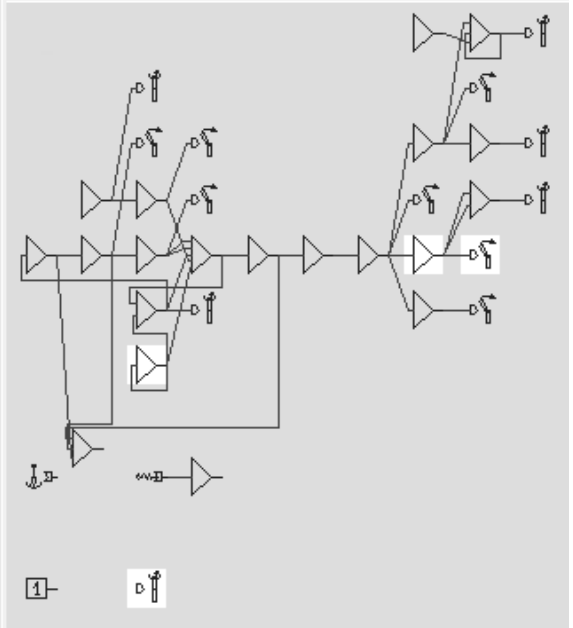
Framsticks: a dualistic environment

Name: Creature #63903

Genotype:

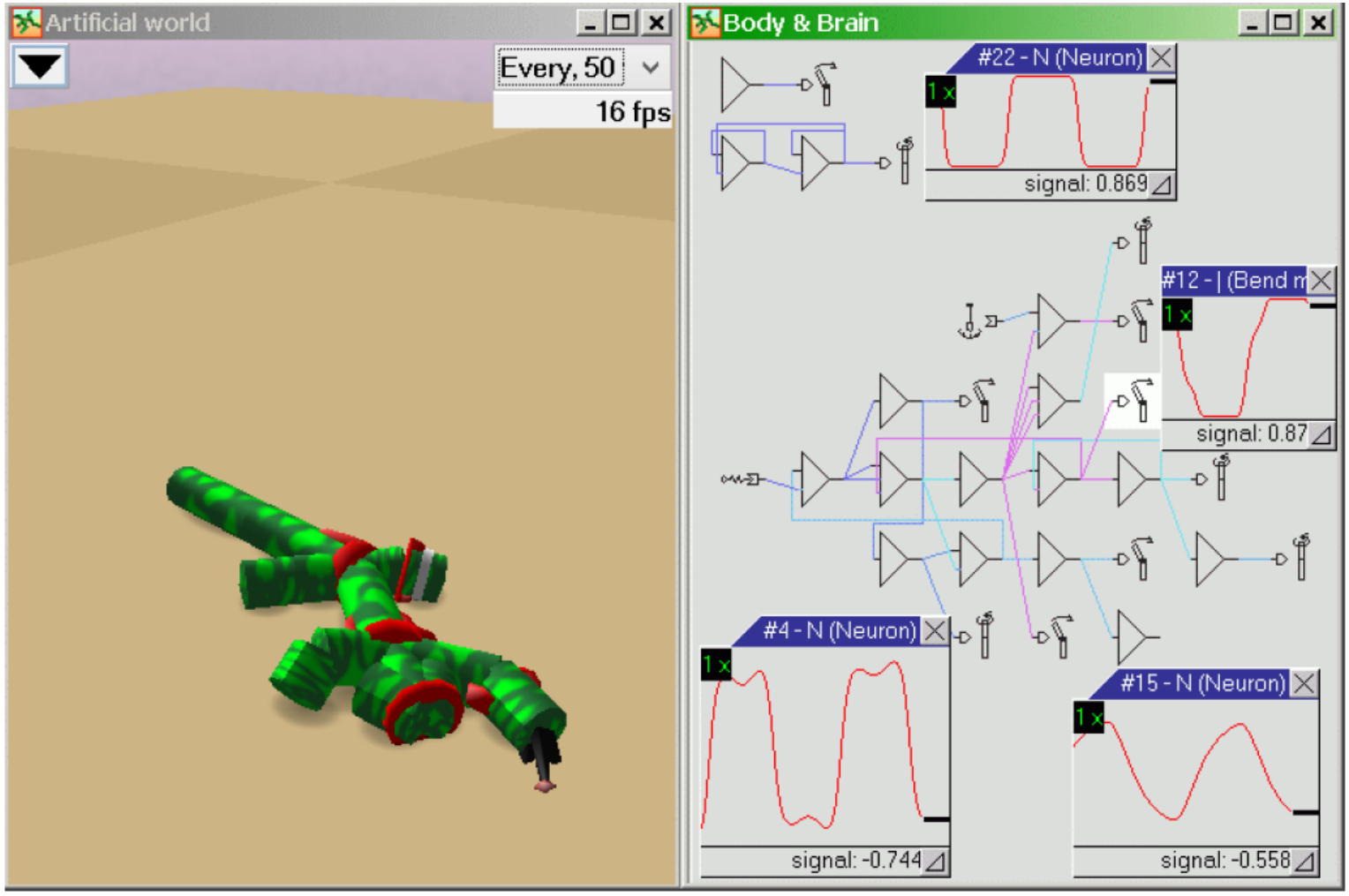
```
M((lfffffiX[1:17.379, fo:0.04, in:0.8][@1:0.673,
12:-1.225][1:2.711, 1:-1.987, -1:1.386, s:0.19,
4:1, 11:1][|1:13.634, si:2](CFFFiX[|-4:-0.961]), ,
qfMMMX[*][|1:-5.32,s:0][@!:1,s:0.332,in:0.8]
[si:2][1:2.525, fo:0.04, s:-0.227][-8:22.434], ,
cffMMMMMMMMiX[-1:-715.787, -7:5.959, -
11:3.461, s:-0.31][@, p:1, p:1][0:-7.993][|
4:11.103, in:0.8, in:0.8, s:-0.1], , llRRcMMMMMX
[G][@/:-0.603, -2:-8.453, -2:-7.856][N, 3:3.203]
[|-9:-0.399, in:0.876462, in:0.8, si:1.86919,
fo:0.04], , LLLq(QFMMMMsX[|-1:-3.125](LRQ(, ,
, , lFIIX[T][@1:-5.39, fo:0.04, fo:0.04])), ,
rqMMiX[|-4:-7.583, fo:0.04]Rq(, , lFFQX[@-
1:6.079, 0:-3.934, s:0, -15:1]))))
```





http://www.framsticks.com

Framsticks: a dualistic environment



`http://www.framsticks.com`

Physicalistic environment

- In such a model, simulated creature can sense activations of their neurons (mind), and therefore their thought processes.
- There are many indications that we humans are in a physicalistic environment.

Interesting research questions

- Assuming the simulated creatures are intelligent, what would be happening in their brains when they try to understand their own minds?
- Would they inevitably fall into having some illusion of self vastly different from the reality?
- How language would affect their thinking?
- Would such computational experiments be ethical?

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Final words

Thank you for your attention.

Discussion. Questions.