On non-traditional uses of gaming technologies and simulations of human behaviour

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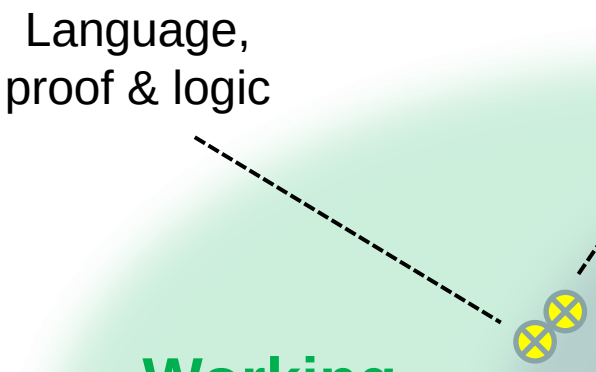
1. Gaming vs. working on a computer

Gaming or Working?



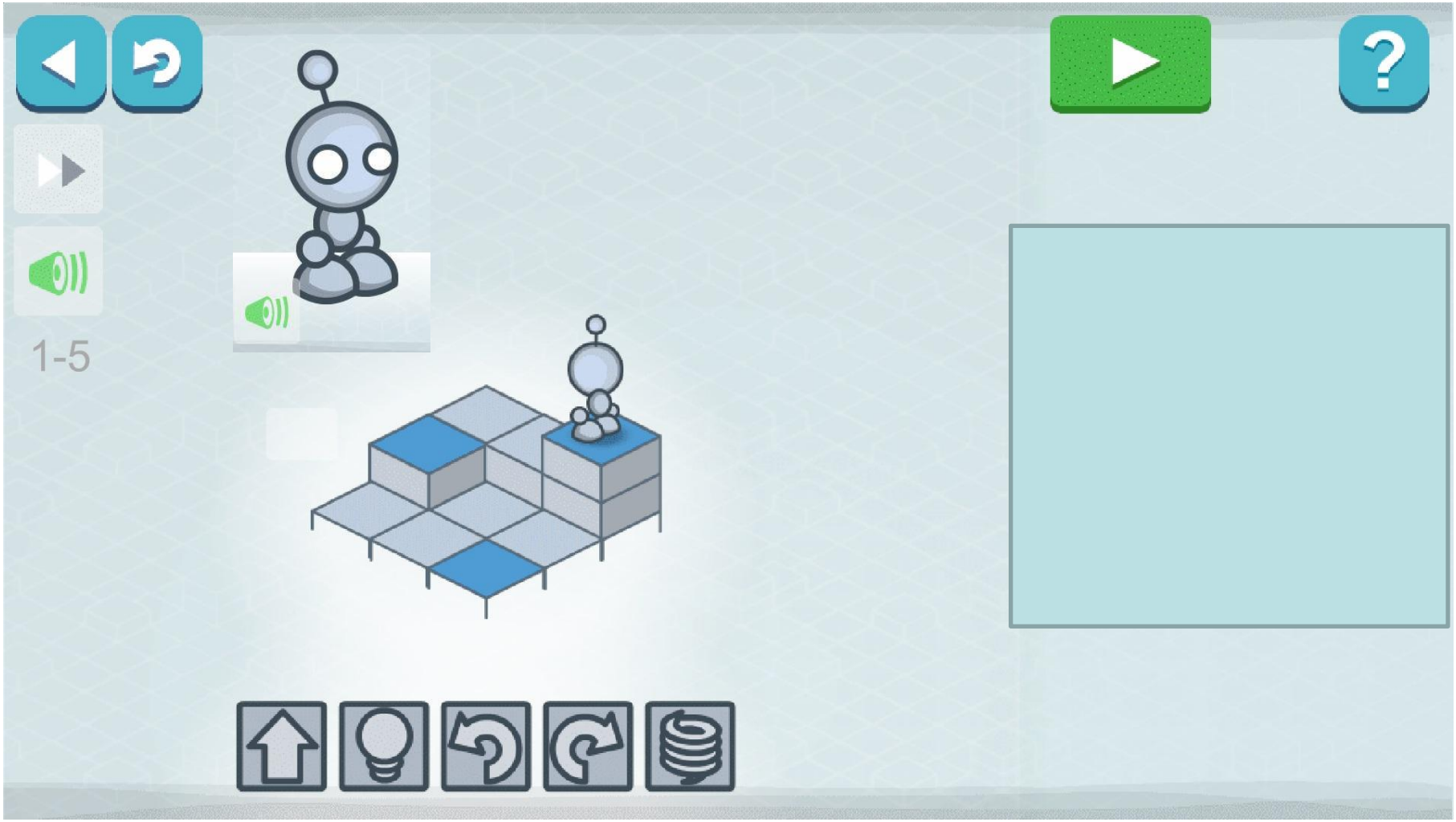
Working on a computer

Serious games

- *education*
- *training*
- *planning*
- *therapy*

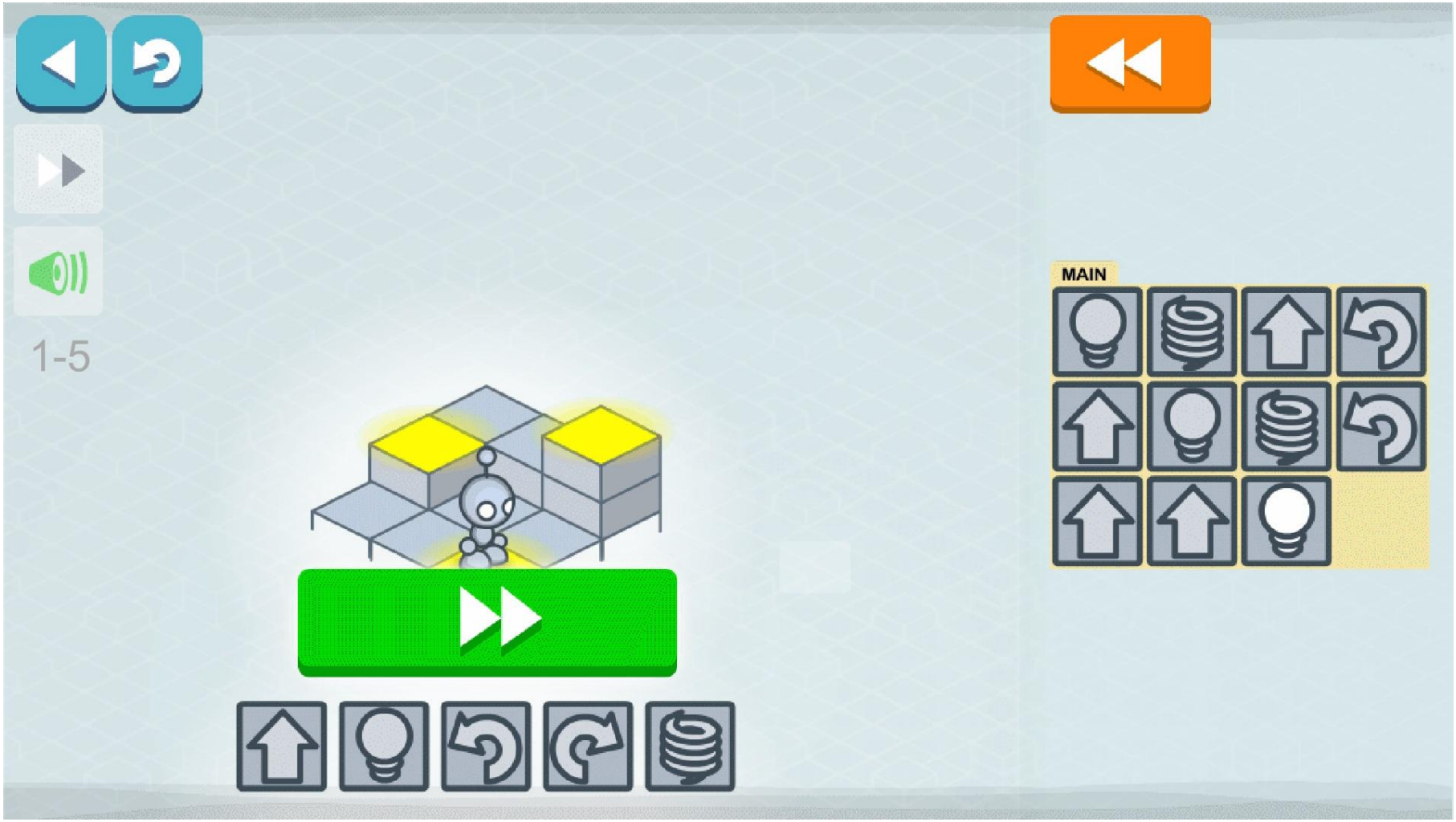
Games for entertain-ment

Lightbot (1) – learning to program



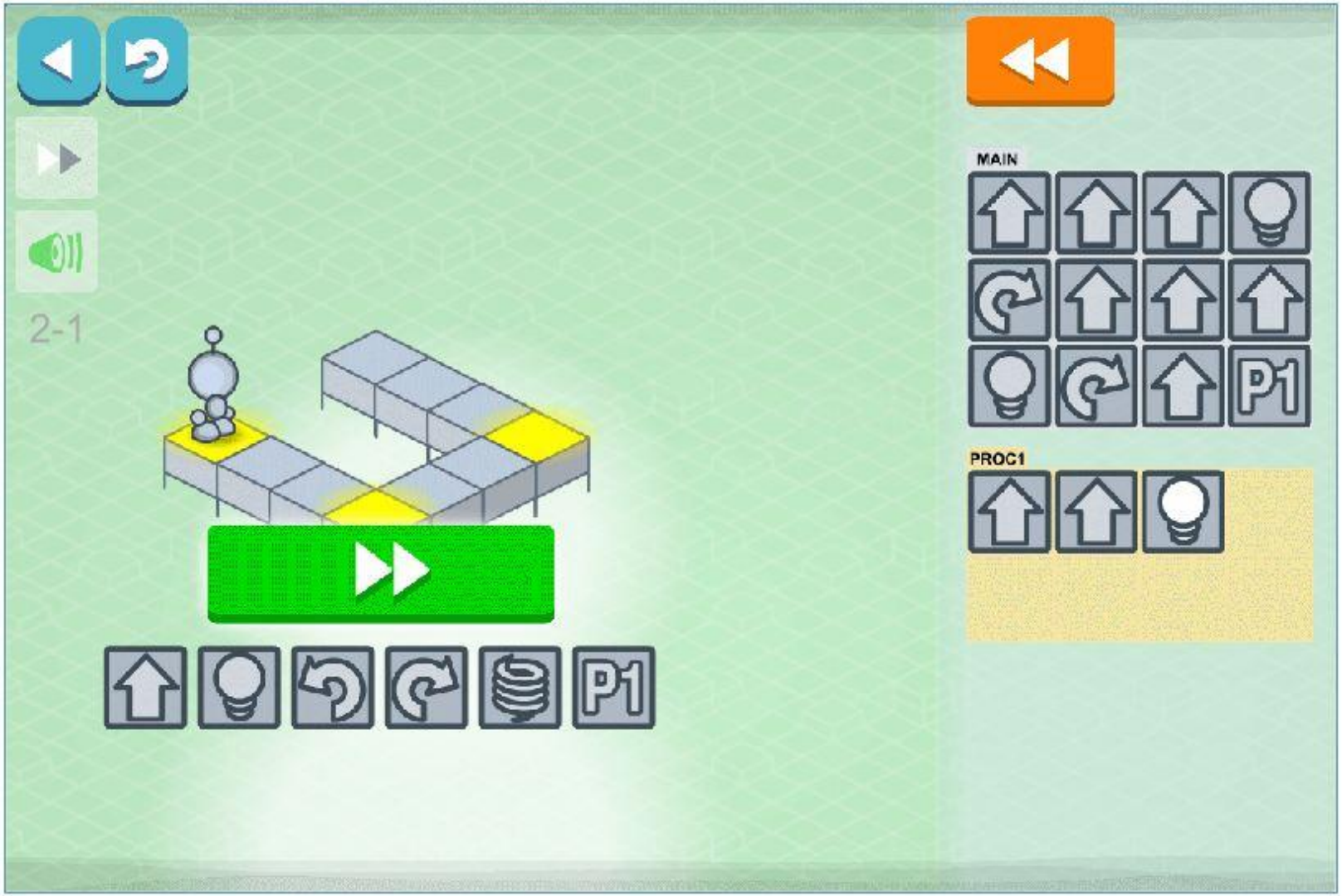
http://lightbot.com/flash.html *20 free tasks (the game costs 5 €)*

Lightbot (2) – successful command sequence



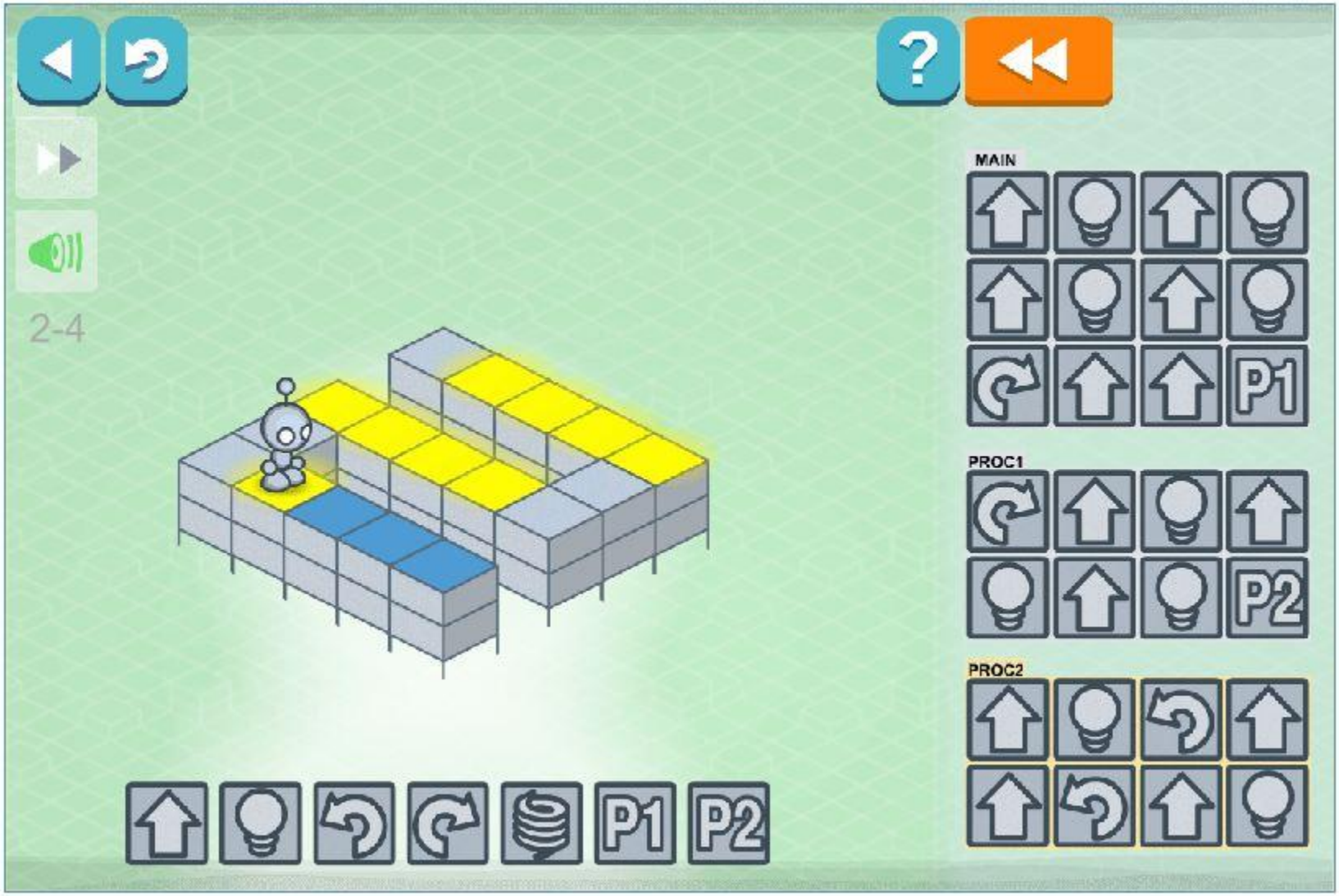
http://lightbot.com/flash.html

Lightbot (3) – Preparation for structured coding



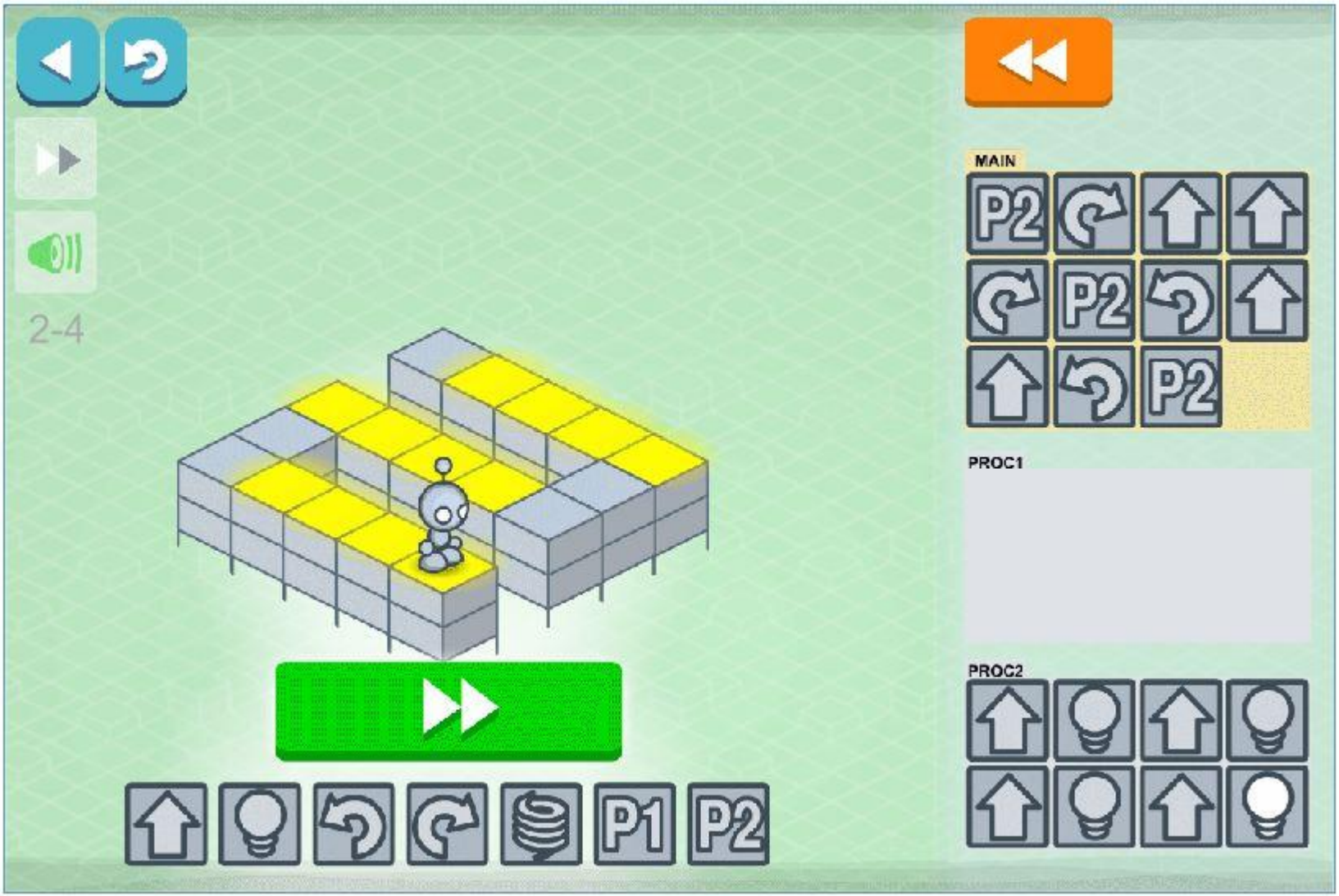
http://lightbot.com/flash.html

Lightbot (4) – Necessity of structuring the code



http://lightbot.com/flash.html

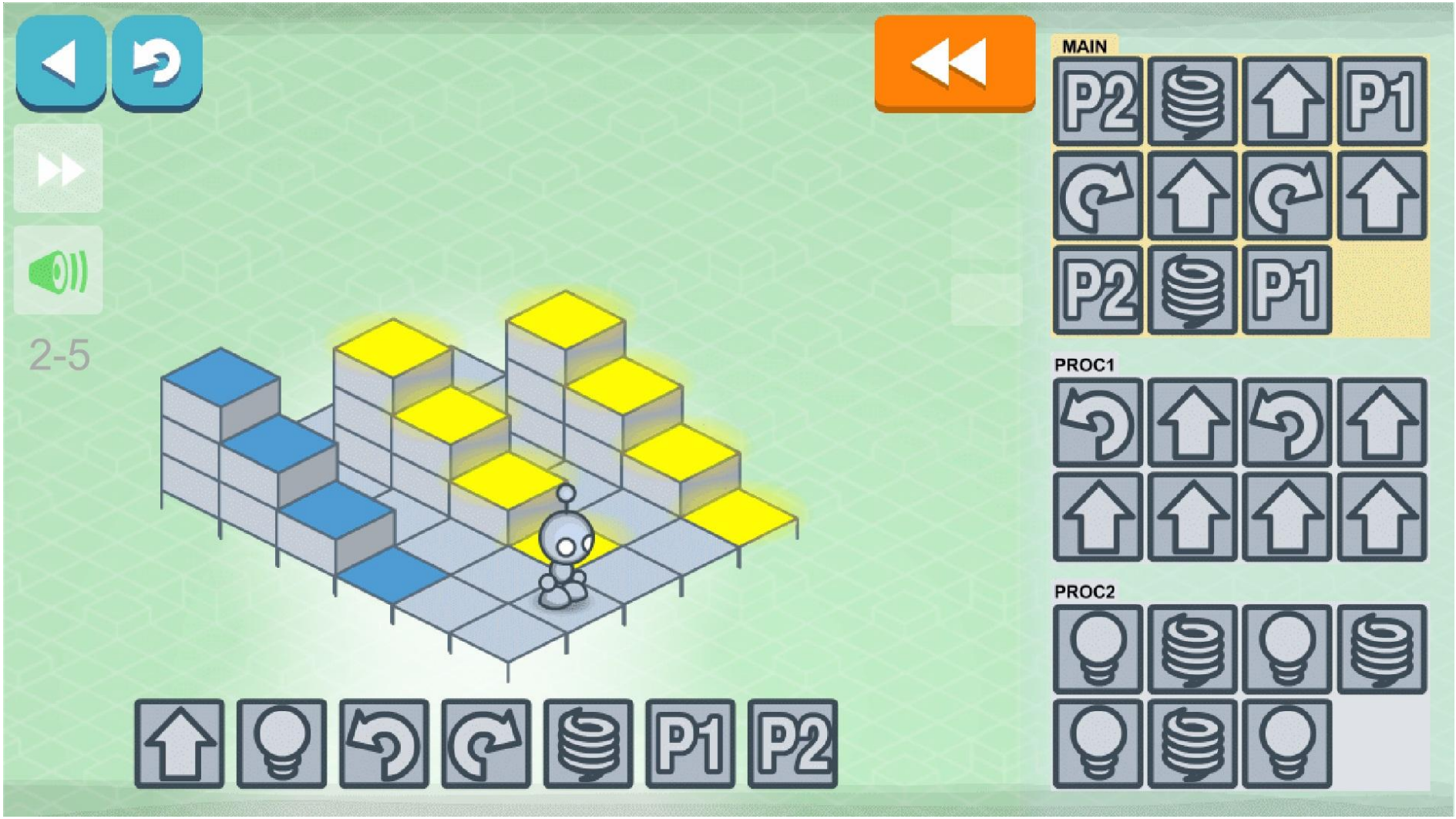
Lightbot (5) – First structural success



http://lightbot.com/flash.html

Lightbot (6) – advanced task for adults

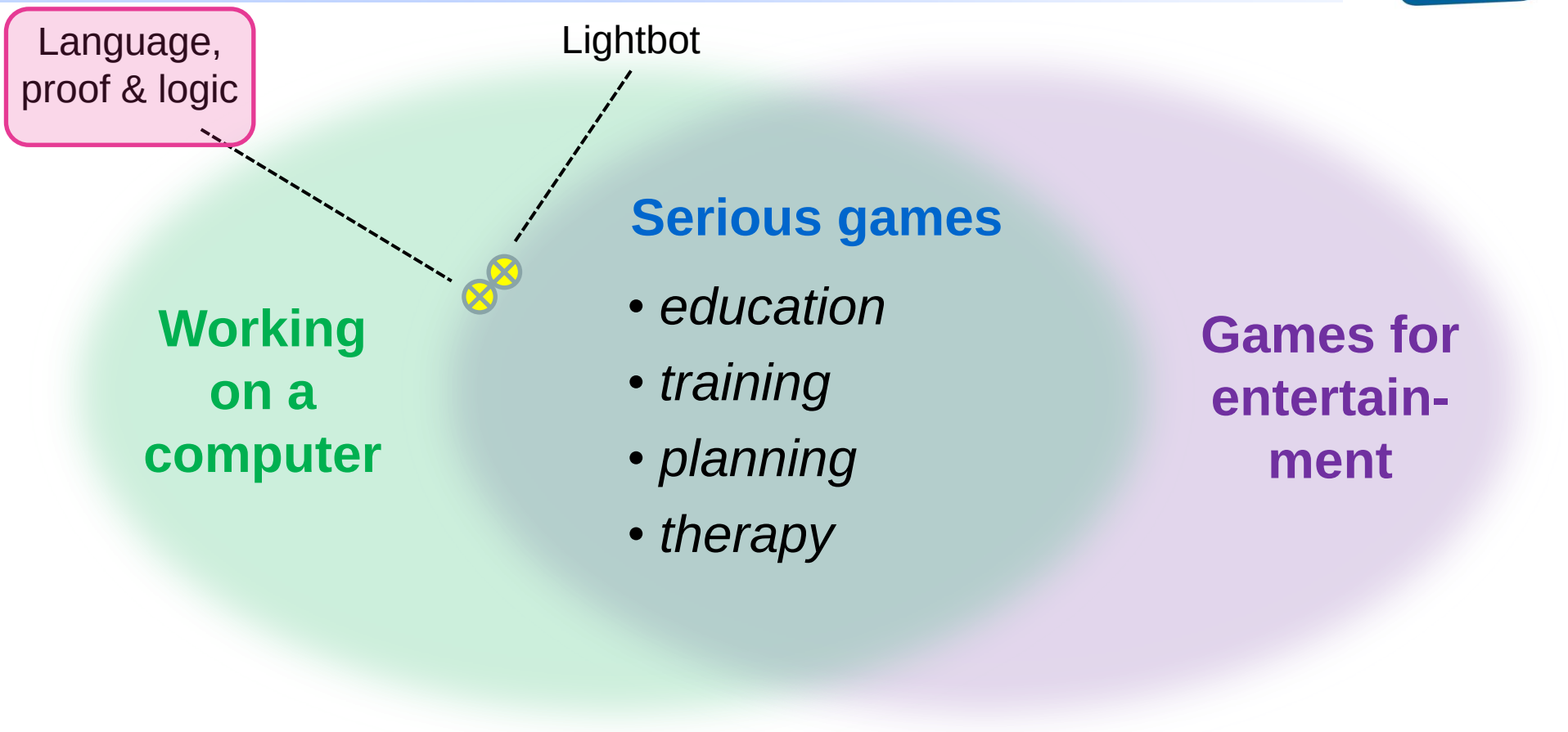
3 approaches: OK on 1st try / fastest / most compact



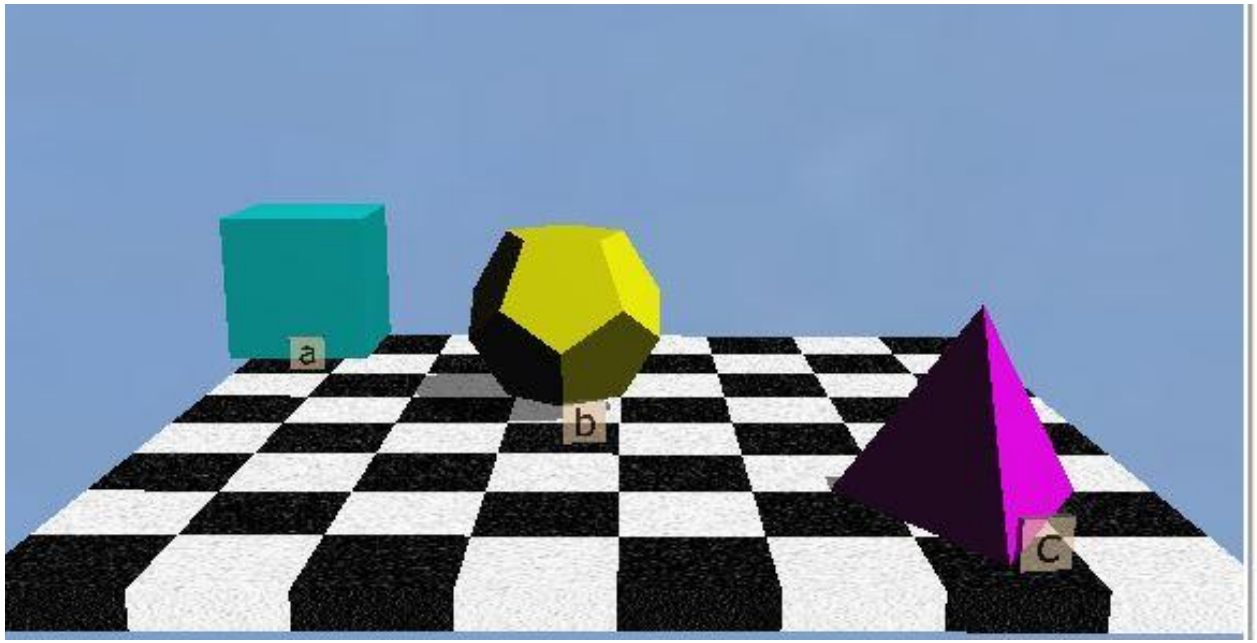
Programming is a form of planning

http://lightbot.com/flash.html

Language, Proof and Logic: Textbook of logic from Stanford University



Language, Proof and Logic: application Tarski's World



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Task: Move one object in such a way that all the four propositions turn false.

1. (***a*** is between ***b*** and ***c***) OR (***b*** is between ***a*** and ***c***)
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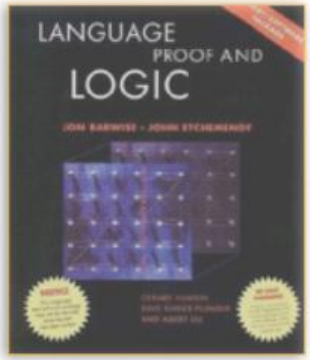
4. (***b*** is right of ***a***) OR (***a*** is a tetrahedron)

Language, Proof and Logic: Webpage

Language, Proof and Logic consists of a book, three logic programs, and an Internet-based grading service (which is free to students who purchase the package).

We constructed an online course based on *Language, Proof and Logic*. You can sign up at Stanford Online to get access to video lectures, quizzes and assignments.



Learn about the book

Learn about the online course

Learn about the software

Language, Proof and Logic (LPL) is published by CSLI Publications and distributed by the University of Chicago Press—ISBN (Paperback): 978-1-57586-632-1 (second edition). *LPL* is available as a paperless package, which may be purchased and downloaded directly from our store, or in physical form available from bookstores (brick or click), and CSLI publications.

Learn about the team responsible for the package.

Language, Proof and Logic has been translated into Portuguese, German and Japanese.

- Textbook Webpage:
  URL: *https://www.gradegrinder.net/Products/lpl-index.html*
- Free online logic course from Stanford University based on this textbook:
  https://lagunita.stanford.edu/courses/Philosophy/LPL-SP/SelfPaced/about

Main topic of the presentation

Working on a computer

Serious games

- *Training of security forces*

Project EUSAS

Games for entertain-ment

2. Project EUSAS

Project EUSAS

European Urban Simulation for Asymmetric Scenarios

Institut "Jožef Stefan"

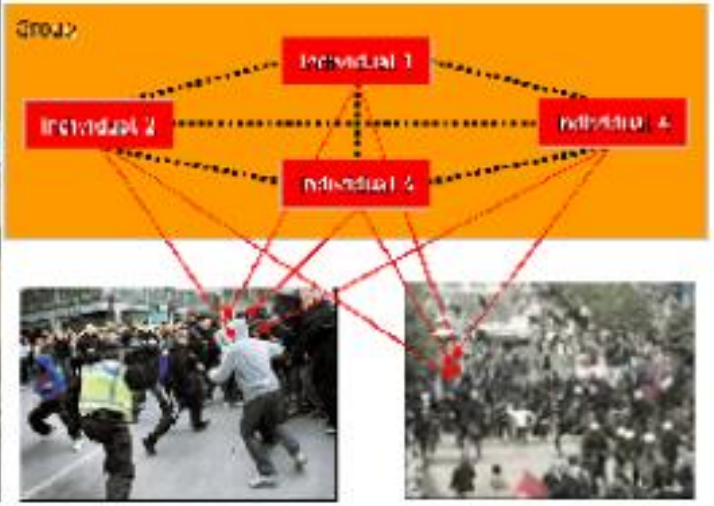
INSTITUTE OF INFORMATICS
SLOVAK ACADEMY OF SCIENCES

FOI

CYFRONET

EADS DEFENCE & SECURITY

EUSAS: Virtual training environment for security forces

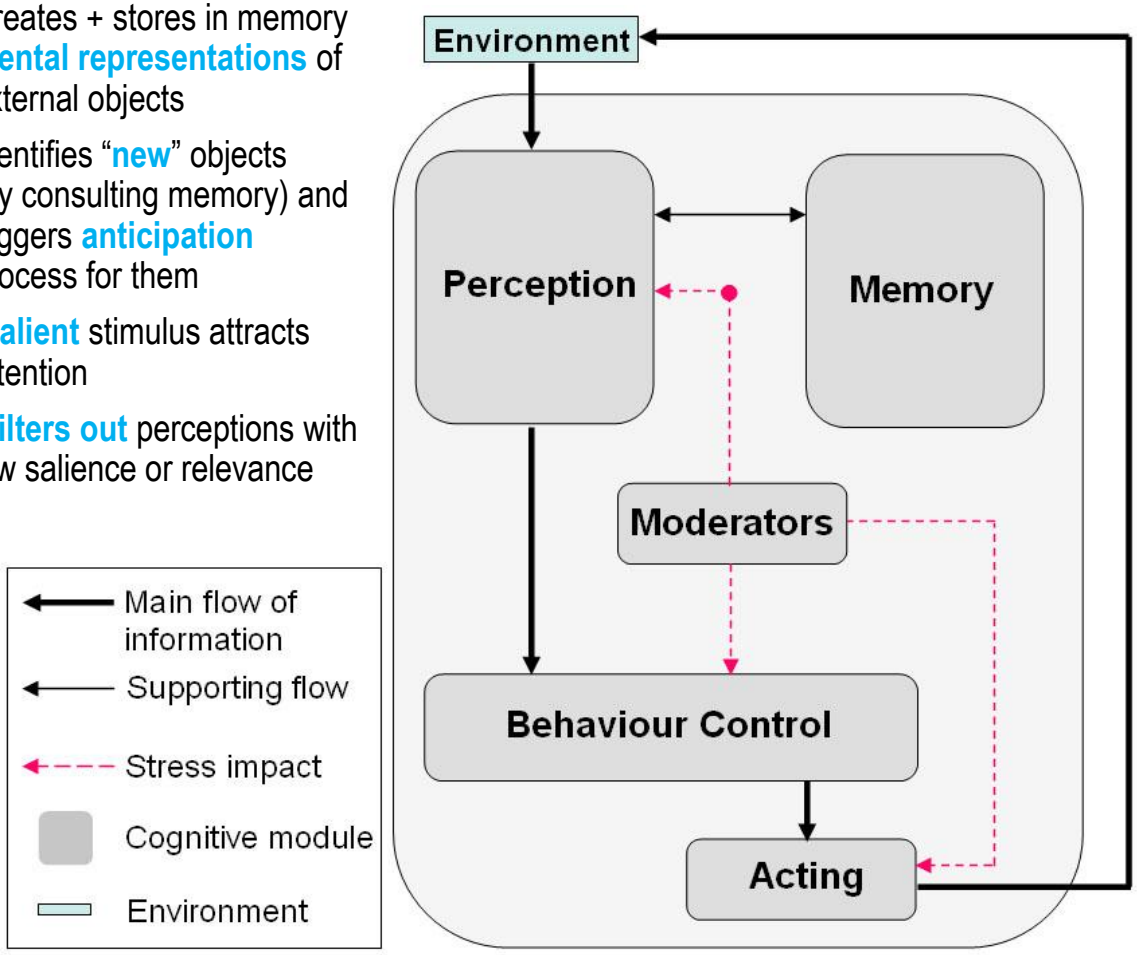


3. Realistic simulations of human behaviour

Human Information Processing
(Modules and flow of information)

Perception:

1. Creates + stores in memory **mental representations** of external objects
2. Identifies "**new**" objects (by consulting memory) and triggers **anticipation** process for them
3. **Salient** stimulus attracts attention
4. **Filters out** perceptions with low salience or relevance



Memory:

1. mental **representations of objects**
2. **Cognitions**, i.e. **relations** between objects: **A** ***rel*** **B**
   rel = {approaching, threatening…}
   A, B = object representations
3. **Expectations** = results of mental simulation

Moderators ***(stressors):***

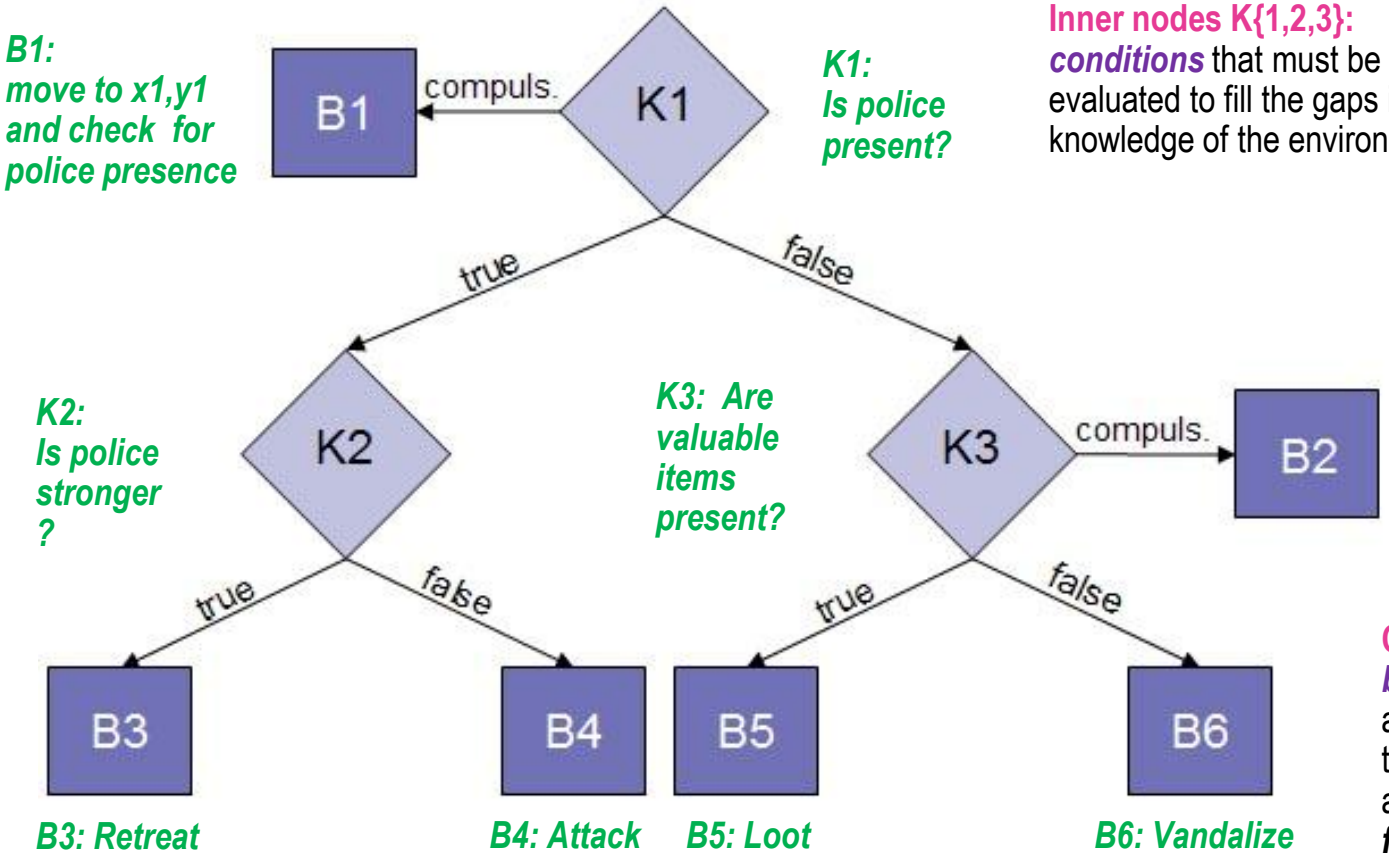
1. **Emotional arousal**
2. **Exhaustion**
3. **Time pressure**

Behaviour definition and control:

1. **Rule Set** assigns strategies to cognitive tasks
2. **Anticipation** evaluates future threat through mental simulation
3. **Decision Trees** for situation-dependent behaviour

Use of Decision Trees for Situation-Dependent Behaviour

EXAMPLE: Simple Decision Tree for rioting



Inner nodes K{1,2,3}:
conditions that must be evaluated to fill the gaps in the knowledge of the environment

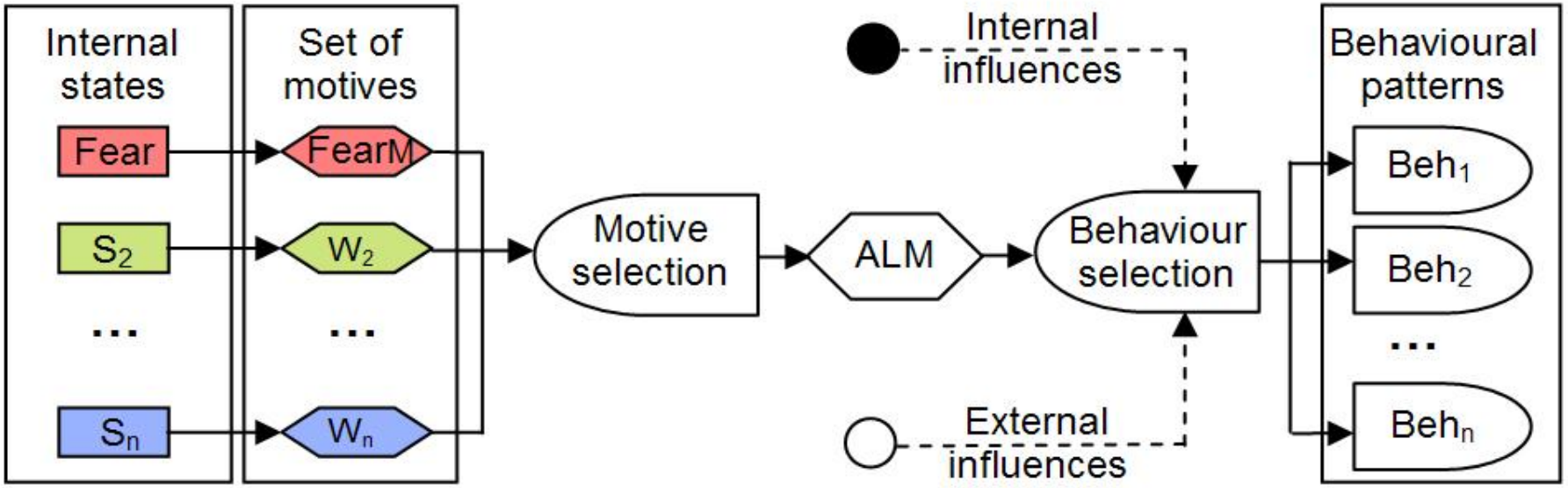
Leaves B[1..6]:
prefabricated behaviour patterns

B2:
move to x2,y2 and check for the presence of valuable items in a shop

Compulsory nodes B{1,2}:
behaviour patterns executed always, (regardless of whether the condition to which they are attached evaluates to ***true*** or ***false***).

Advantage over a simple rule set:
priority of rules in the tree is defined implicitly by the tree's structure

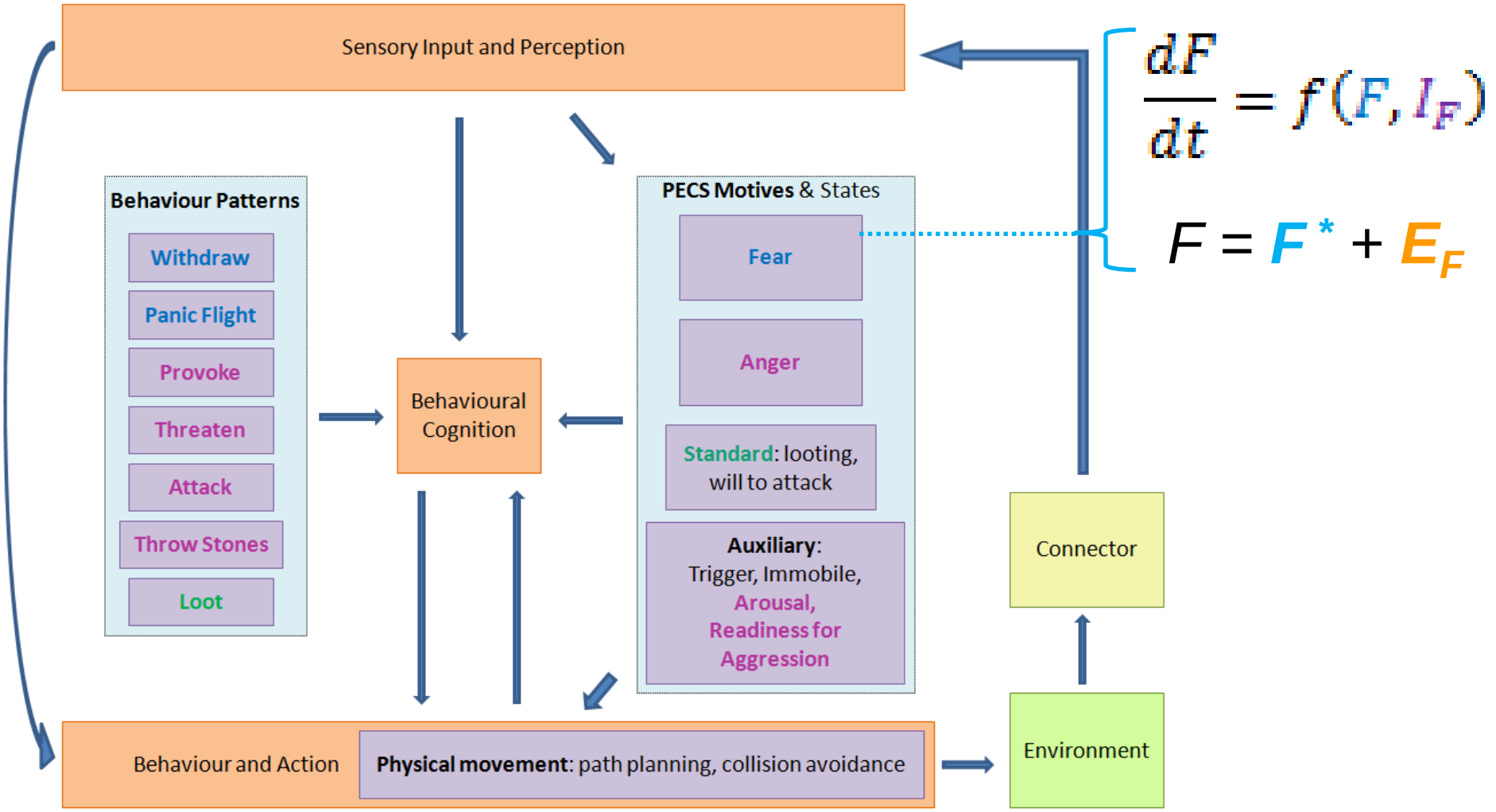
PECS: States, motives and motive selection



Motives are ***normalized*** to 0..1 (or 0..100%) scale in order to be numerically comparable. Normalized 0 represents the minimum possible value of any given motive and normalized 1 (100%) its maximum possible value

reproduced from: B. Schmidt, "Modelling of Human Behaviour: The PECS Reference Model," in *Proc.14th European Simulation Symposium*, A. Verbraeck, W. Krug, Eds. SCS Europe BVBA, 2002.

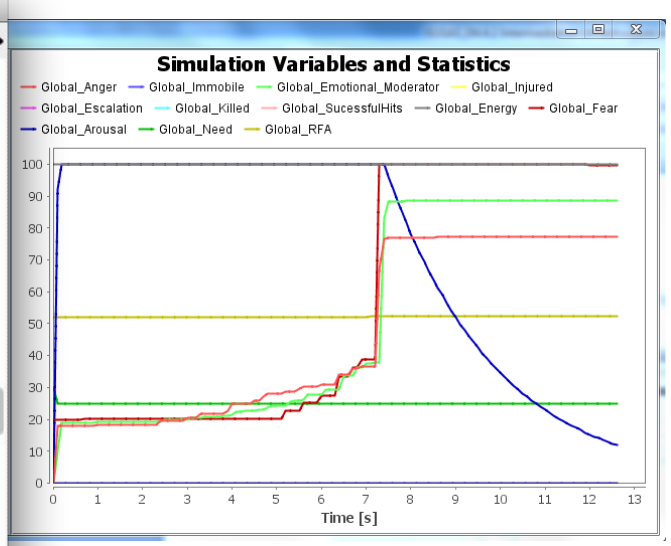
Actual implementation of simulated civilians



4. Example simulation videos (2D, 3D)

3D visualisations in VBS2 (Virtual Battle Space)
by Bohemia Interactive *(ARMA, Operation Flashpoint)*

EUSAS use-case 1: Afghanistan, turmoil in front of the pedestrian entrance to a military base

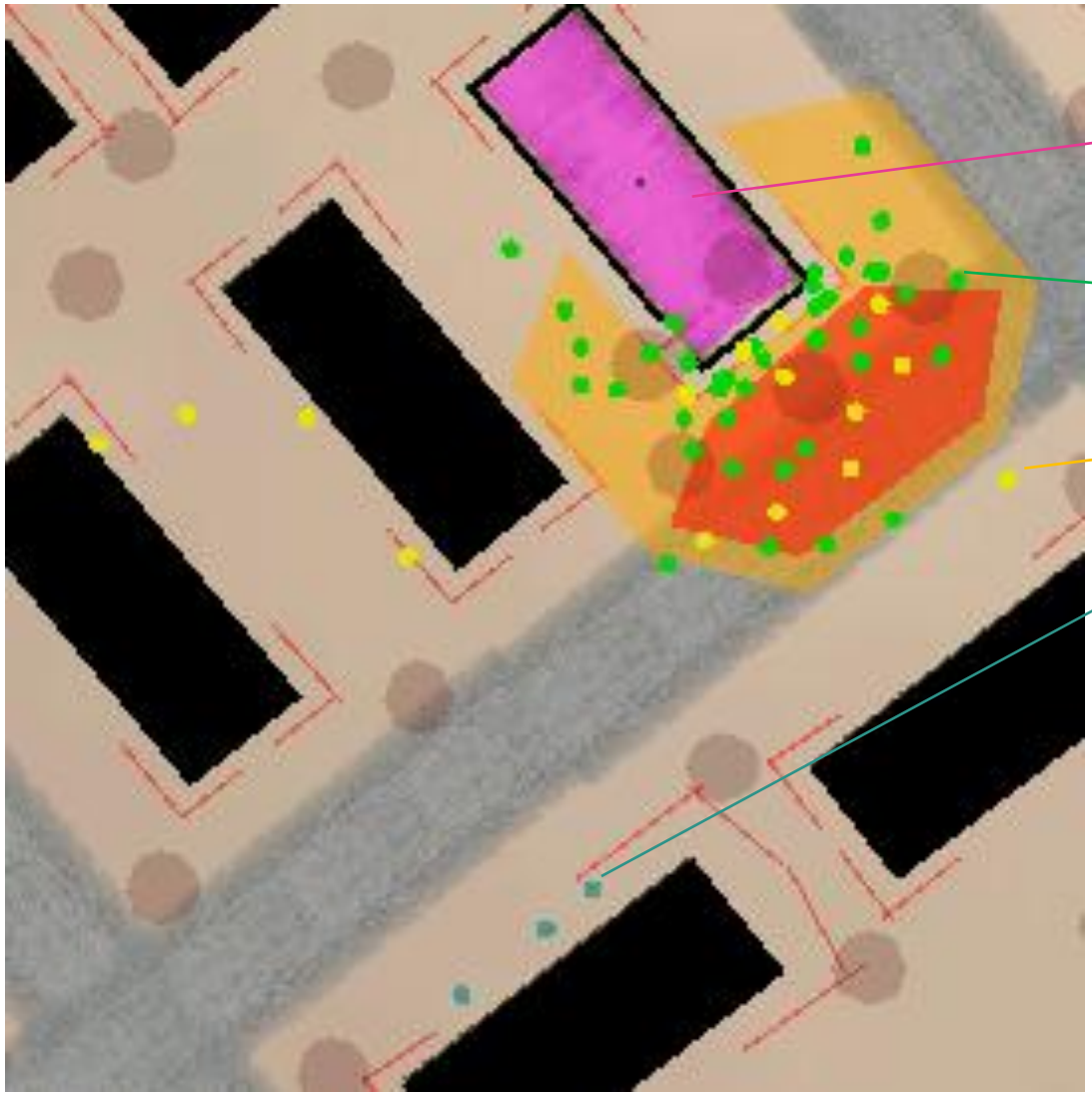


3D- visualisations:

vbs2_RFA_20
vbs2_RFA_80

24

EUSAS use-case 2: Afghanistan, looting of a shop near a military base



ISAF mission in Afghanistan

Looted shop

Looters

Aggressive individuals

Security patrol

MASON: mixed course (2D)

VBS2: real players (3D)

Virtual training of a French army squad

5. IT, Artificial intelligence & Philosophy:

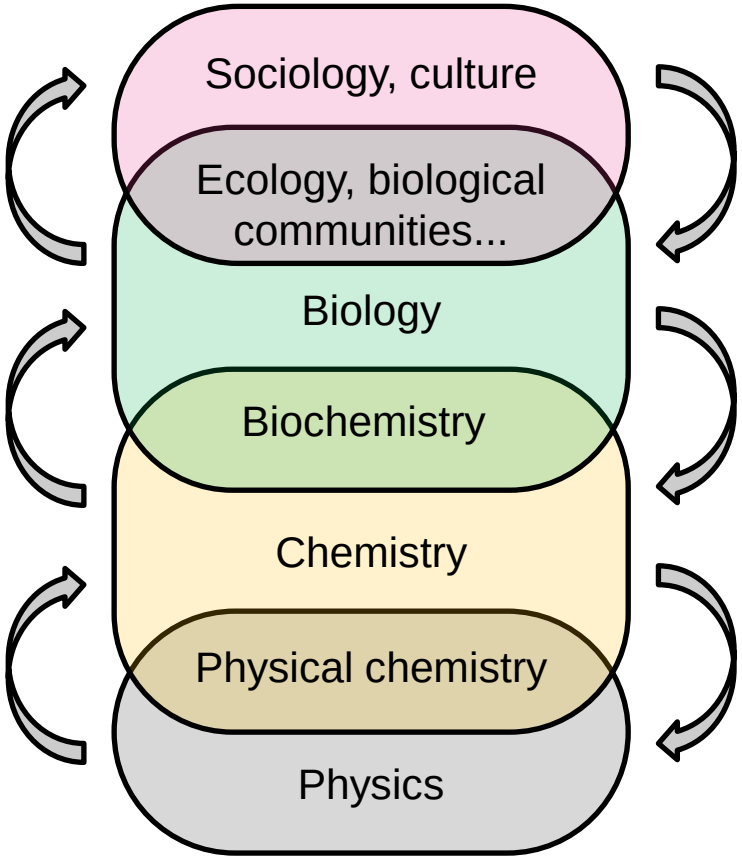
Can we reproduce human consciousness and genuine subjective experience in a computer?

Strong AI thesis: YES (or nearly so)

Reductionist approach to consciousness

Emergence

Supervenience



Advanced forms of consciousness (humans, maybe some primates...)

Simple forms of consciousness (mammals, birds...)

Propagation, adaptation...

Reaction heat and speed ...

Kinetic energy $E = \frac{1}{2}(mv^2)$, momentum, pressure...

Mass m, charge q, velocity v, time t ...

Some non-reductionists (regarding consciousness)

John Searle (biological naturalist):

- All mental phenomena are caused by low-level neurobiological processes in the brain.
- Computer only simulates them (e.g. A simulation of storm cannot make us really wet).

David Chalmers („naturalistic dualist“):

- Physics describes everything from outside (extrinsically), but conscious subjective experience cannot be so captured.
- Ontology of physics therefore needs to be expanded with new primitive concepts capturing subjective aspect of conscious experience („*experience*“ or „*proto-experience*“).
- Apart from subjective experience, functions and structure of human consciousness can be investigated extrinsically by standard methods of neuroscience and cognitive science.

Jonathan Lowe („dualistic interactionist“):

- Subjective aspect permeats functions and structure of human cosciousness to such an extent that the standard approaches of neuroscience and cognitive science are inadequate.

For more information, see a related introductory review article

Machines, Intelligence, Consciousness

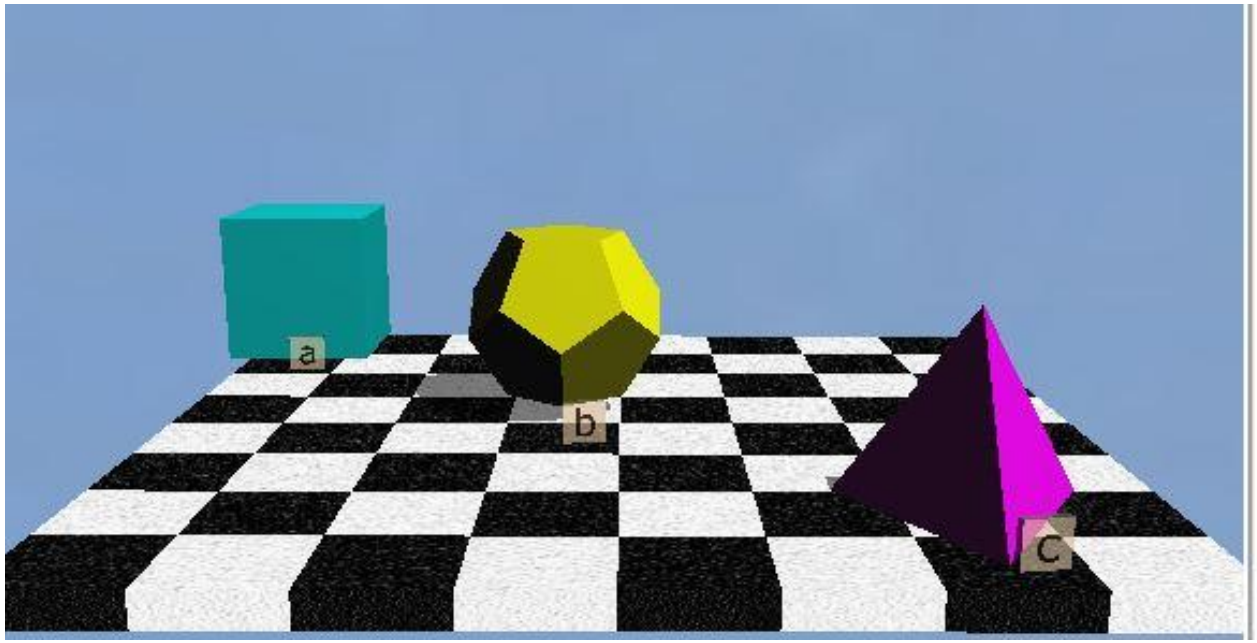
at *http://marcelkvassay.net*

Thank you

Email: marcel [dot] kvassay [at] savba [dot] sk

http://marcelkvassay.net

Language, Proof and Logic: application Tarski's World



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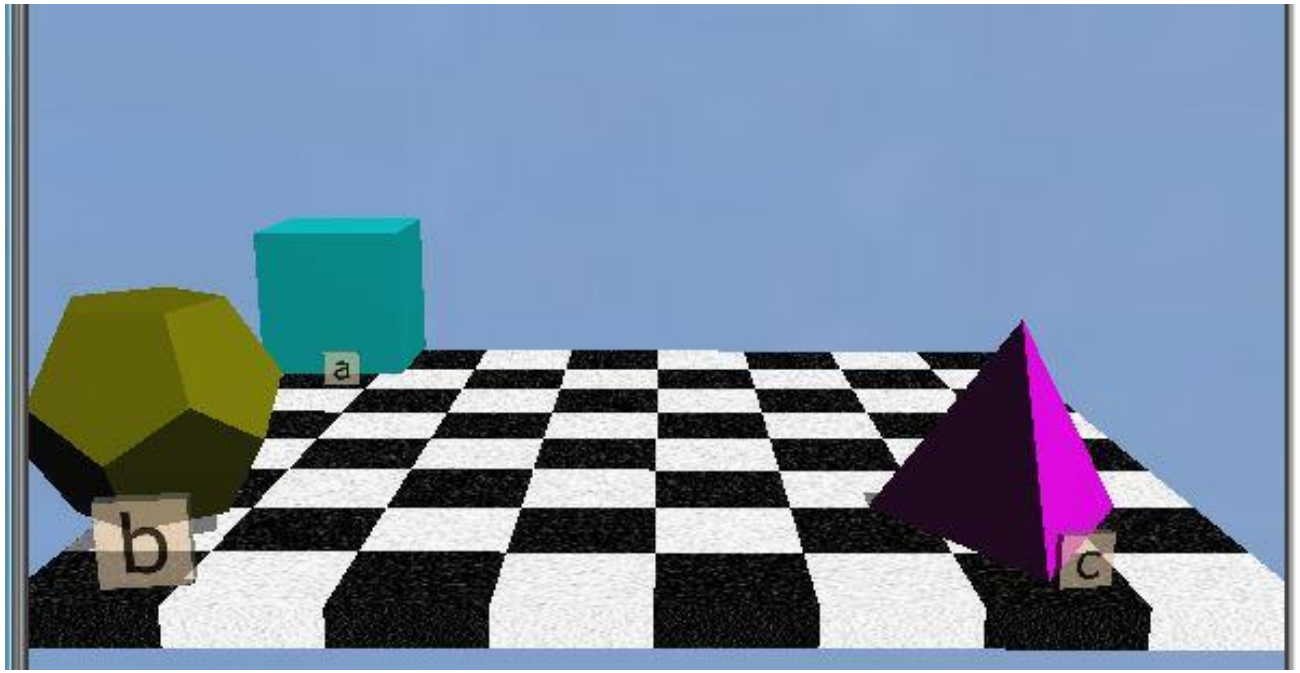
Language, Proof and Logic: Tarski's World – solution



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