11th International Symposium on Intelligent Distributed Computing
7th Workshop on Applications of Software Agents (WASA)

Teaching, Learning and Assessment of Agents and Robotics in a Computer Science Curriculum

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Our Aim

To report our experience from teaching a number of modules with agents, MAS and Robotics as a core technology.

Our Contribution

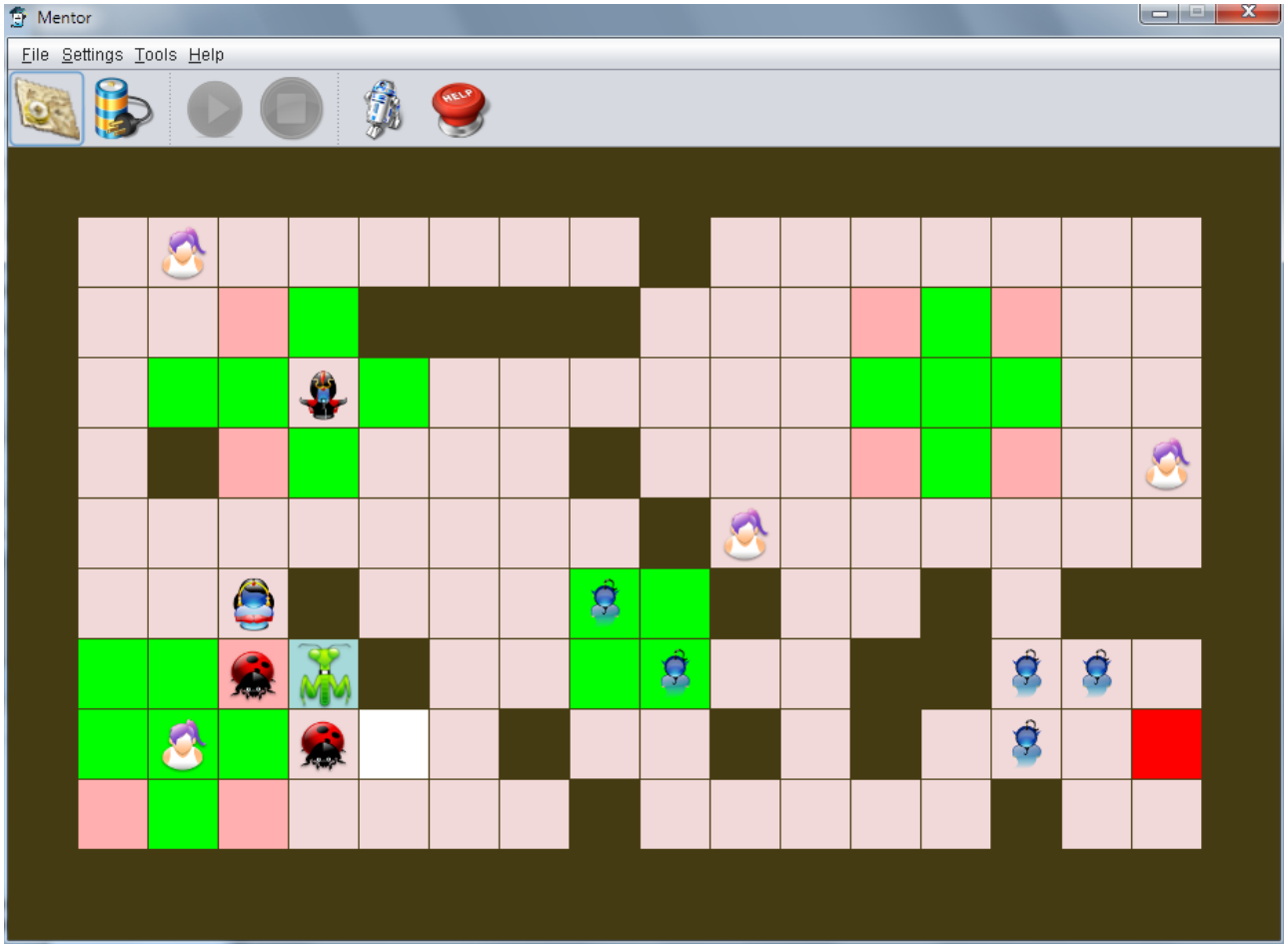
Ideas and practices for Teaching, Learning and Assessment methods for Agents and Robotics,
so that we encourage colleagues to borrow and expand
our proposal for their own teaching.

Agents in our CS Curriculum

Programming Principles and Algorithms

Problem analysis, algorithmic thinking, and design practices, such as incremental code writing.

Reactive Agents



Agents in our CS Curriculum

Knowledge Technologies for Innovation

An overview of KTI, a series of case studies; applicability on smart systems and their potential for business innovation.

Agents and Robotics

Fundamentals of IA, MAS design, principles of robotics, through hands-on implementation

Intelligent Systems

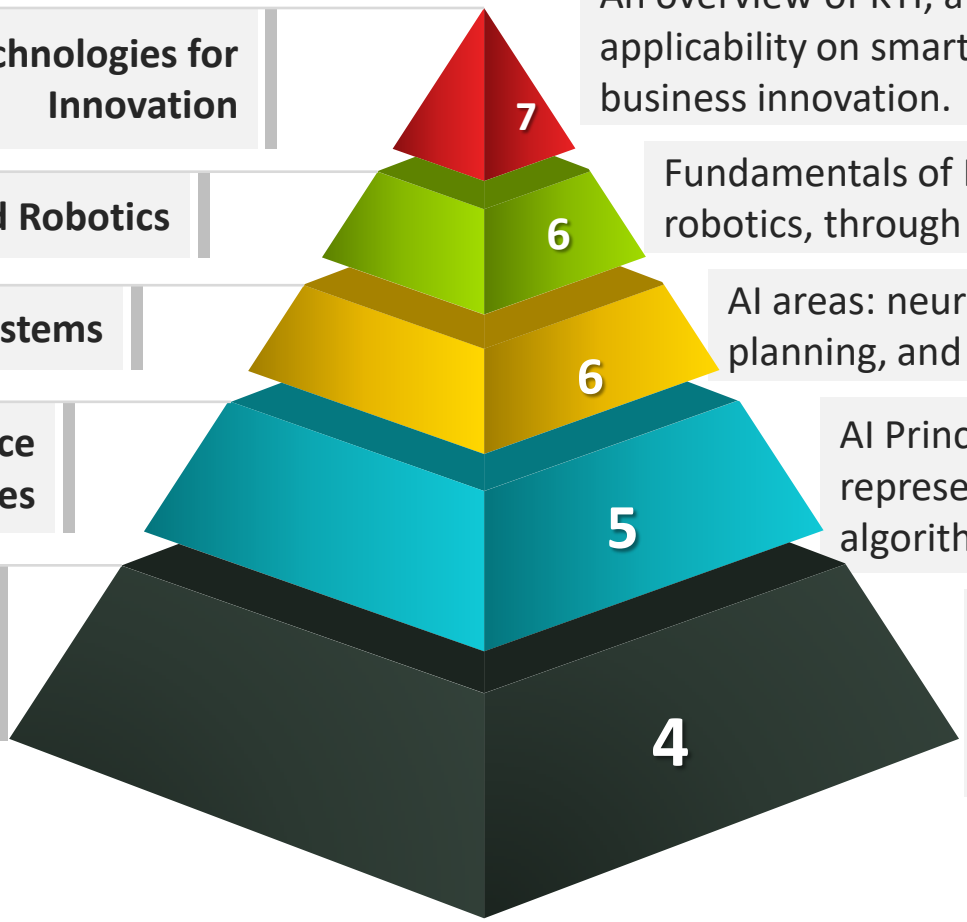
AI areas: neural networks, fuzzy systems, planning, and machine learning

Artificial Intelligence Techniques

AI Principles: knowledge representation, reasoning and search algorithms, NLU

Programming Principles and Algorithms

Problem analysis, algorithmic thinking, and design practices, such as incremental code writing.



Agents in our CS Curriculum

Knowledge Technologies for Innovation

An overview of KTI, a series of case studies; applicability on smart systems and their potential for business innovation.

Stamatopoulou, I., Fasli, M., Kefalas, P.: **Introducing AI and IA into a non Computer Science graduate programme.**

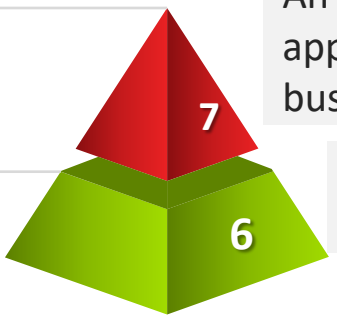
Sakellariou, I., Kefalas, P., Stamatopoulou, I.: **Teaching intelligent agents using NetLogo.**

Sakellariou, I., Kefalas, P., Stamatopoulou, I.: **Enhancing NetLogo to simulate BDI communicating agents.**

Agents in our CS Curriculum

Knowledge Technologies for Innovation

An overview of KTI, a series of case studies; applicability on smart systems and their potential for business innovation.



Agents and Robotics

Fundamentals of IA, MAS design, principles of robotics, through hands-on implementation

This is the module we are going to discuss here.

Learning Outcomes (agents)

1. **explain** the basic notions of agent systems and the difference between agents and other programs
2. **describe** the fundamental agent architectures and sensibly design reactive and BDI agents
3. discuss the issues involved in **designing** MAS, communication and interaction, and apply techniques for addressing them
4. **demonstrate** an overall understanding of biology inspired agents
5. **argue** that the agent paradigm is an alternative to software engineering and realise the related agent-based software engineering methodologies

Learning Outcomes (robotics)

6 appropriately **taxonomise** robots

7 **explain** the problems involved in designing new robots regarding sensing and perceiving, controlling the movement

8 **design** and **construct** simple robotic automata capable of performing simple behaviours

Content

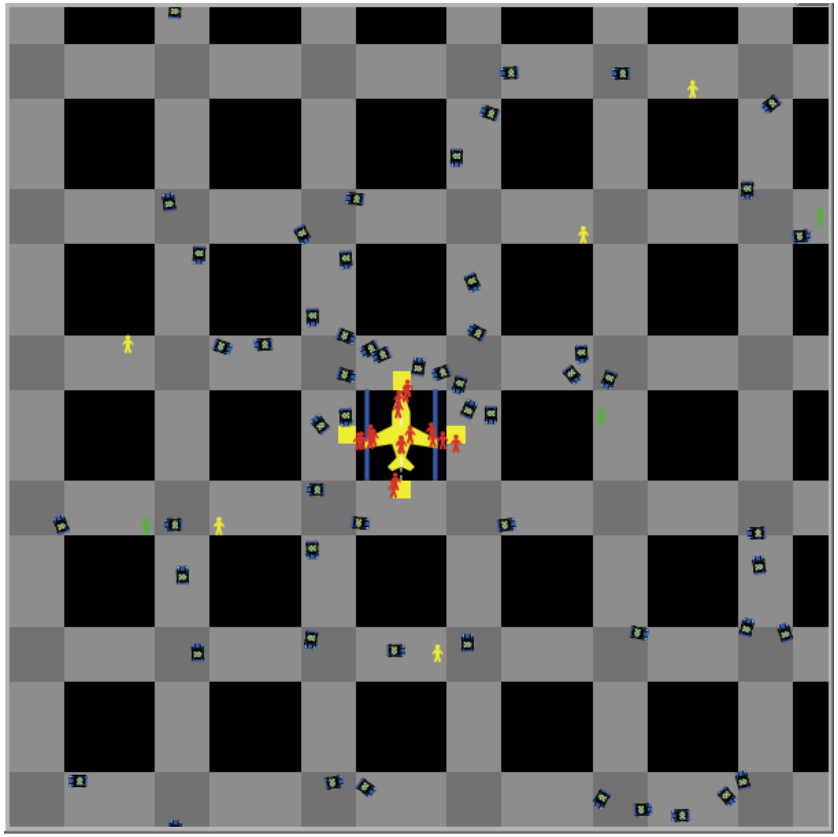
Agents

- definition of the notion of agency
- agents types and architectures (primarily reactive and BDI)
- multi-agent systems, agent communication and interaction
- biology inspired agents

Robotics

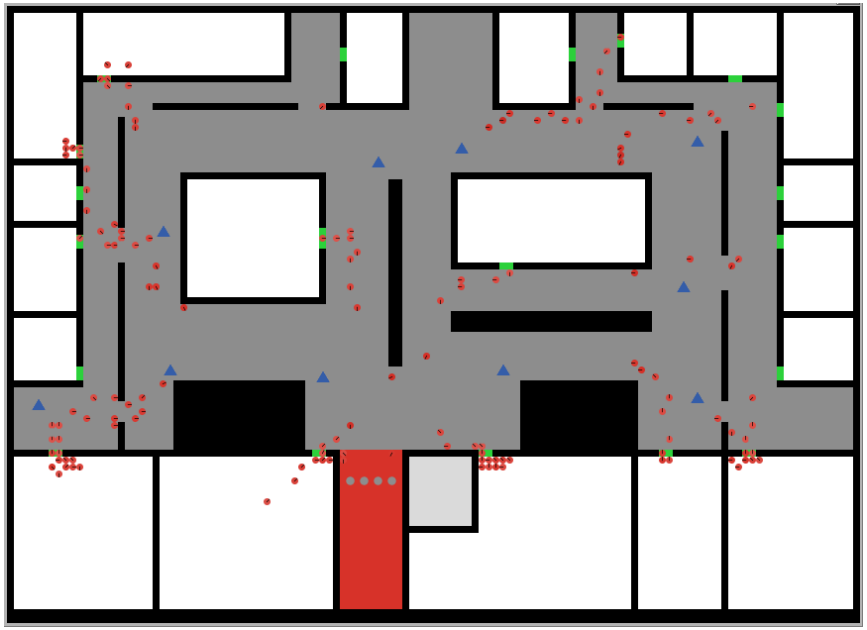
- types and classification of robots
- sensor types, robot movement and actuation
- Kinematics of mobile robots
- controlling motors and servos

Assessment (agents)

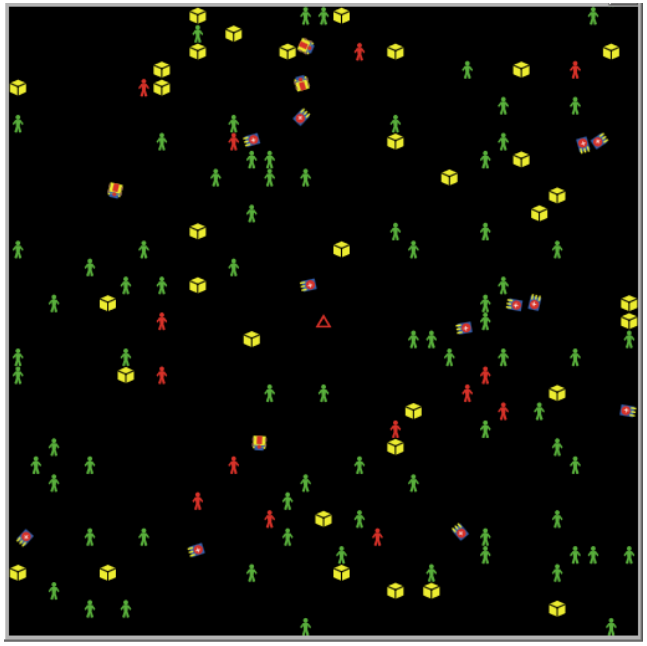


- Design
- Implementation
- Collaboration
- Competition
- BDI architecture
- FIPA messages
- Contract Net protocol
- NetLogo

Similar Coursework



Building Evacuation
(emotional agents)

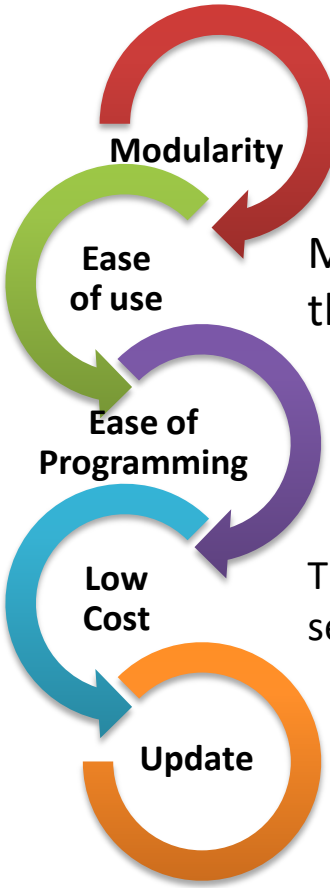


Rescue Civilians
(disaster area)

Assessment Robotic Challenge

- A celebration in the Department of Computer Science and the Faculty as a whole.
- Students and academic staff from other Departments are watching the setup, preparation and experimentation until the final demonstration.
- Takes place over two full days with the final challenge taking place at the end of the second day.
- Students are divided to teams of 4-5
- The number of teams depends on the available resources and the number of students in the cohort (usually in the range of 20-25).

Why Lego Mindstorms



The Lego platform is inherently modular, allowing for a wide range of robotic constructs.

Most students are familiar with Lego-type toys, and this helps them kick-start building a robot.

Variety of programming languages available for programming, many of which are direct imports of known languages (LeJOS).

The Lego Mindstorms platform costs a little over 300 € per set, and includes all the basics needed.

New version of Lego EV3

LEGO® MINDSTORMS® Education EV3

Robotic Challenge

Robotic Challenge

Robotic Challenge Workshop Day

Evaluation

Students agreed (100%):

- The Robotics Challenge was a positive experience.
- The timing of the Robotics Challenge was good, taking into account my other study obligations in the Department.
- The Lego platform used for the Robotics Challenge was appropriate.
- LeJos used to program the robot for the Robotics Challenge was appropriate.

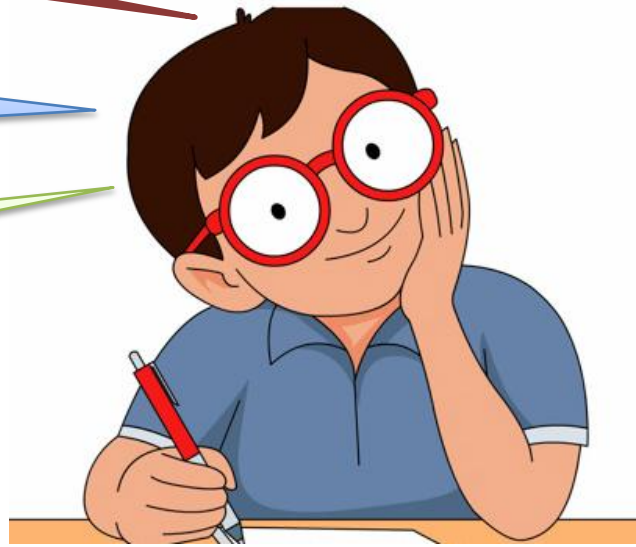
Comments

Everything that was taught through all the lectures of the unit, was practically demonstrated in the challenge.

It was a very fun process and very helpful.

A very very positive experience, it was one of the best moments of the semester.

Presenting it to people outside the Department was very interesting.



Dissemination

- 7th International Mathematics Week (Greek Mathematical Society)
http://www.emethes.gr

- 1st Thessaloniki Science Festival (British Council)
https://www.britishcouncil.gr/en/events/thessaloniki-science-festival

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SCIENCE
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Conclusions

- The concept of intelligent agents is spread throughout the modules at all years of studies.
- A specialised final year module around multi-agent systems and principles of robotics.
- Students integrate the knowledge they obtained in a number of AI modules.
- Opportunity to demonstrate student work outside the University and thus promote agents and robotics in particular to the public.

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Thank you!!