Automated Planning

- Work plan -
2023-2024

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Objectives

- Define the concept of automated planning and model classic planning domains and problems with different representations.
- Explain the different search methods and algorithms, as well as the most relevant heuristics, in classical planning.
- Explain how to integrate expert knowledge about an automatic planning domain through hierarchical planning and refinement.
- Develop software-based actors who use the techniques studied to operate in dynamic environments.

Syllabus - Theory

- Topic 1: Introduction to Automatic Planning
- Topic 2: Classical Planning and Representations
- Topic 3: Searching the State Space
- Topic 4: Adding Search to the Actor
- Topic 5: Domain-Independent Heuristics
- Topic 6: Plan Space Search (PSP)
- Topic 7: Refinement Planning
- Topic 8: Introduction to Temporal Planning

Syllabus - Laboratory

- Practice 1
  - Introduction to PDDLs and Planners
  - PDDL 1.2 – Classic Planning
  - PDDL 2.1 – Numbers and Costs
  - PDDL 2.1 – Actions with duration
- Practice 2:
  - HTN Hierarchical Planning – Pyhop / GPPyhop
- Practices can be carried out in groups of up to 3 students.

Schedule

Clase	Teoría	Laboratorio
24-ene	Tema 1	NO HAY LABS
31-ene	Tema 2	PDDL 1.2
07-feb	Tema 3	Trabajo
14-feb	Temas 3 y 4	PDDL 2.1 (fluents)
21-feb	Ejercicios / Repaso	Trabajo
28-feb	Tema 5	PDDL 2.1 (durative act.)
06-mar	Tema 5	Trabajo
13-mar	Ejercicios / Repaso	**Defensa práctica 1**
20-mar	**Examen parcial**	**Defensa práctica 1**
27-mar	FESTIVO	FESTIVO
03-abr	Tema 6	HTN - Pyhop / GTPyhop
10-abr	Tema 7 (1/2)	HTN - Pyhop / GTPyhop
17-abr	Tema 7 (2/2)	Trabajo
24-abr	Tema 8	Trabajo
01-may	FESTIVO	FESTIVO
08-may	Ejercicios / Repaso	**Defensa práctica 2**
15-may	**Examen final**	**Defensa práctica 2**

Evaluation

- Continuous evaluation:
  - Theory exams – 60%
    - PEI – 30% | PEF – 30%
    - Theoretical exams with a test, development question and exercises
  - Laboratory practices – 40%
    - PL1 – 25% | PL2 – 15%
    - There will be 2 practices throughout the course.
    - Practices will have to be defended in the laboratory

Evaluation

- Final assessment (for students who receive it):
  - Single theory exam– 60%
    - PEF – 60%
    - Theoretical exam with test, development question and exercises
  - Laboratory practices – 40%
    - PL1 – 25% | PL2 – 15%
    - Both practices must be submitted at the end of the course
    - Practices will have to be defended

Evaluation

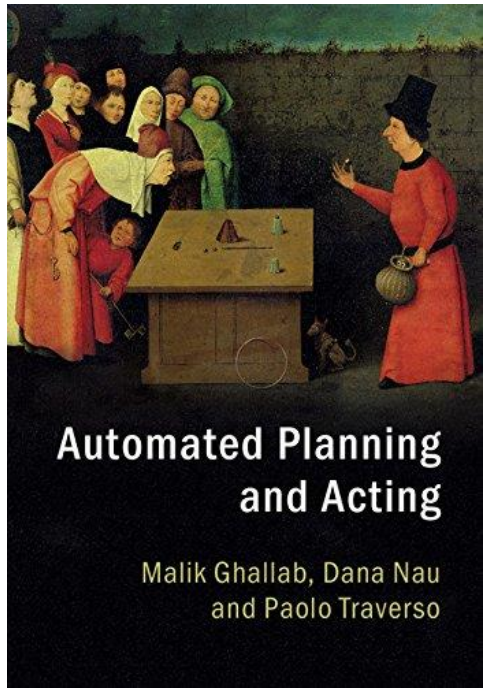
- Extraordinary evaluation:
  - Single theory exam – 60%
    - PEF – 60%
    - Theoretical exam with test, development question and exercises
  - Laboratory practices – 40%
    - PL1 – 25% | PL2 – 15%
    - It will be possible to raise the grade by improving the practices done in ordinary
    - Practices will have to be defended

Evaluation

- AUTO-FAIL IF:
  - Plagiarism is detected in exams or practices
    - Use plagiarism detection software
    - **Both the one who copies and the one who to be copied will be suspended**
    - Do not copy solutions from other colleagues
    - Do not copy solutions from the Internet
  - Failure due to plagiarism means going directly to an extraordinary call

Bibliography

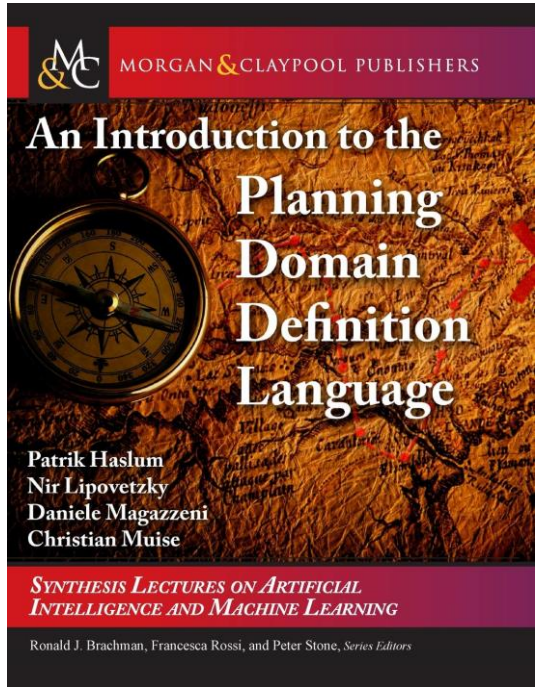
- The theory of the subject is based on the book "Automated Planning and Acting" (2016)
  - Chapters 1, 2 and 3. Recent book, focused on the integration of planning and action.
- The transparencies used are a translation and adaptation of those provided by Dana Nau
- All of this can be downloaded from their website: http://projects.laas.fr/planning/



Ghallab, M., Nau, D., & Traverso, P. (2016).
Automated planning and acting. Cambridge University Press.

Bibliography

- For the lab we will use the PPDL guide https://planning.wiki/
  - In it you will find additional references.
- Recommended reading: “An Introduction to the Planning Domain Definition Language” (2019)
  - Detailed explanations of the use of this language, its particularities and problems that we may encounter.
- This subject's website is interesting Automated Planning at the Linkoping University
  - In the introduction to labs, it explains very practical details about planner usage.



Haslum, P., Lipovetzky, N., Magazzeni, D., & Muise, C. (2019). An introduction to the planning domain definition language. *Synthesis Lectures on Artificial Intelligence and Machine Learning*, *13*(2), 1-187.

Bibliography

- Other recommended references:
  - Ghallab, M., Nau, D., & Traverso, P. (2004). *Automated Planning: theory and practice*. Elsevier.
    - First book by the authors of "Automated Planning and Acting", has a
      It is more classic and is ideal for learning about the origins and bases of automatic planning.
  - Russell, S., & Norvig, P. (2021). Artificial Intelligence: A Modern Approach, Global Edition 4th. *Foundations*, *19*, 23.
    - ➢ Chapter 11 is dedicated to automatic planning, with excellent explanations for several of the topics that we will see in the course. Highly recommended.
  - Geffner, H., & Bonet, B. (2013). A concise introduction to models and methods for automated planning. *Synthesis Lectures on Artificial Intelligence and Machine Learning*, *8*(1).
    - ➢ Chapters 1, 2 and 3 on classical planning with very good explanations and with additional information on more recent algorithms and planners.