Agent Based Model and Simulation with Learning Syllabus

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Welcome to the course of Agent Based Modeling and Simulation (ABMS) and Learning. The course intends to explore the use of learning techniques in ABMS. For this, traditional ABMS, as developed using NetLogo, is introduced; as well as the BDI approach to social simulation. Then, Reinforcement Learning is reviewed in detail. This self learning approach is complemented with the study of Intentional Learning for BDI agents, i.e., learning when to adopt an intention from experience. After that, the interaction between Data Minining and ABMS is explored. Objectives, evaluation, and organization of the course are as follows.

1 Objectives

- The studen will identify the fundamental concepts of ABMS and the use of learning techniques in this context.
- The student will be able to design and implement ABMS using NetLogo.
- The student will be able to design and implement ABMS using Jason.
- The student will be able to apply learning techniques, e.g., Reinforcement Learning, Induction of Decision Trees, Bayesian Networks, etc., in the context of ABMS.

```
1 %%% allPerms computa todas las permutaciones de los elementos de la
2 %%% lista L en la lista L2. Ejemplo de llamada: ?-
3 %%% allPerms([1,2,3],Resp). Resp = [[1, 2, 3], [1, 3, 2], [2, 1, 3],
4 %%% [2, 3, 1], [3, 1, 2], [3, 2, 1]].
6 allPerms(L,L2) :-
7 findall(Perm,permutation(L,Perm),L2).
```

Table 1: Properly documented code sample (Prolog).

2 Evaluation

Evaluation is as follows:

- Homework, 50%.
- Midterm exam, 20%.
- Project, 30%.

In order to obtain the grade, all the elements of evaluation must get a score $\geq 70/100$.

2.1 Homework

Homework uses to involve bibliographical research, theoretical exercises, programming, and/or recitations. Please, observe the following indications:

- **Submission.** Homework assignments are provisionally signaled in the calendar. They must be rendered two weeks after the assignment, at the beginning of the corresponding course meeting. The score decreases 25% each 24 hours of delay. In order to obtain the homework **score**, all the assignments must get a score $\geq 70/100$.
- **Format.** Reports must be processed with LATEX, using the template applied to this document. Code must be properly documented (See Table 1).
- **Completeness.** In order to be evaluated, at least the half of any exercise must be correctly solved. Code that does not compile/interpret is considered as incomplete.

Cheating causes definite expelling from this course.

2.2 Midterm exam

It uses to be an examination of the theoretical issues of the course, in the format of one hour quizze.

2.3 Project

The project involves the application of the techniques introduced in the course to a particular problem, usually related to the students' research. The dates for defining the projects and their evaluation are signaled in the calendar. Evaluation involves a written report and a recitation. Submitting the results of the final project to a national congress is encouraged.

3 Resources

Resources as slides, code, etc., can be found at:

http://www.uv.mx/personal/aguerra/abms/

The bibliography is available in our library, in my office, or in the central library. Some papers are available electronically thanks to Conacyt support. We will use the following programming languages and tools:

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- https://ccl.northwestern.edu/netlogo/
- http://jason.sourceforge.net/wp/
- https://www.cs.waikato.ac.nz/ml/weka/downloading.html
- https://sourceforge.net/projects/jacaddm/
- http://jildt.sourceforge.net

4 Calendar

The course is planned for a semester (60 hours), organized in two weekly sessions (Monday and Wednesday, 10:00-12:00, room Emilio Gidi).

Date	Торіс	Homework
12/08/2018	Introduction	
14/08/2018	Agent Based Modeling and Simulation	
19/08/2018		
21/08/2018	Getting Started with NetLogo	
26/08/2018		1
28/08/2018	The ODD Protocol	
02/09/2018		
04/09/2018	Implementing a First Agent Based Model	
09/09/2018		2
18/09/2018	Model Analysis	
23/09/2018		
25/09/2018		
30/09/2018	Reinforcement Learning	
02/10/2018	Evaluative Feedback	
07/10/2018	The RL Problem	
09/10/2018		
08/10/2018	Temporal-Difference Learning	
14/10/2018		3
16/10/2018	BDI agents in Social Simulation	
21/10/2018		
23/10/2018	Agent Mining	
28/10/2018	JaCa-DDM	
30/10/2018		
04/11/2018		
06/11/2018		4
11/11/2018	Intentional Learning	
13/11/2018	Jildt	
25/11/2018		
27/11/2018	Project Definition	
087/01/2019	Project Evaluation	

References

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Xalapa, Ver., México Agosto 2019 Alejandro Guerra-Hernández