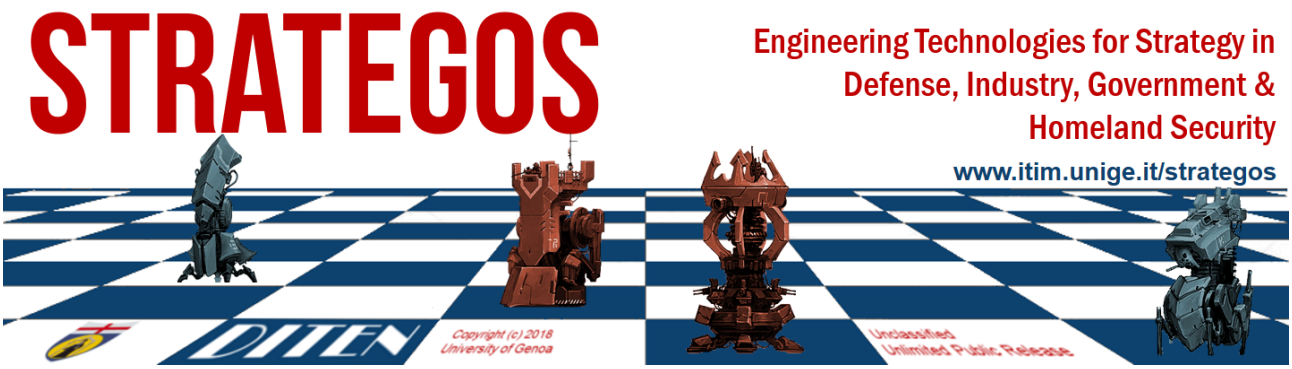


STRATEGOS

Master of Science on Engineering Technologies for Strategy and Security,

Modelling, Simulation, Data Analysis, AI/IA for Strategies on Operations and Systems

Course: Autonomous Agents in Games

SSD ING-INF/01

Credits: ***5***

Schedule & Timetable:

Schedule 2nd Year, 1st Semester

Teachers, Email, URL:

- **Riccardo Berta, riccardo.berta@unige.it**
  www.linkedin.com/in/riccardoberta

Assistants for Exercises & Simulation Lab Experience: ***TBF***

Education Objectives:

The course presents algorithms and strategies for autonomous intelligent agents that move and interact with an unknown space. In particular, the space is represented by a virtual world created through video games technology.

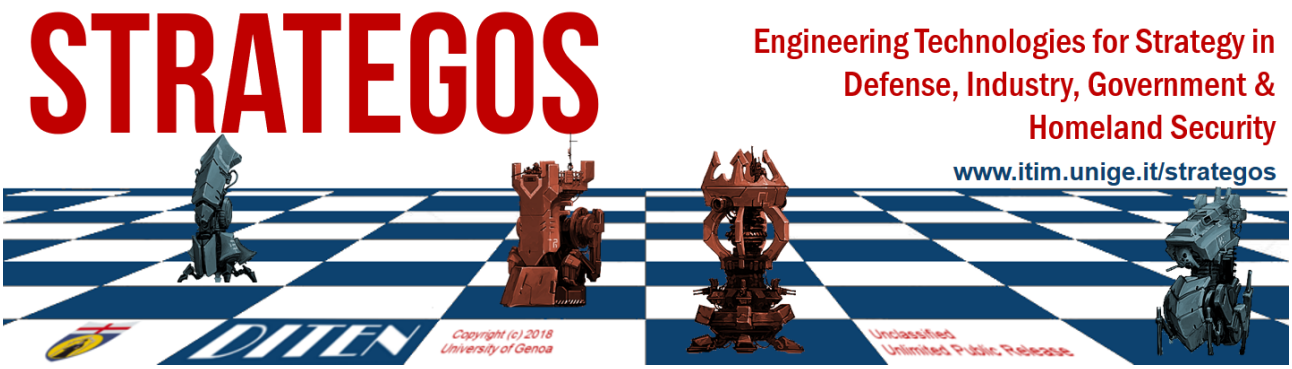
Learning Outcomes

The course provides algorithms and strategies to develop autonomous agents using a game engine.

Aims

The aim of the course is to provide the basis for the design and development of software algorithms capable of autonomously acting within a virtual world. The student is introduced to different concepts of artificial intelligence (path finding, decision tree, reinforcement learning, etc.) and supported through extensive exercises during lectures.

The course aims to train a professional figure capable of designing and implementing complex software applications using video game technologies and artificial intelligence algorithms.



Course Program & Elements:

The titles of the main contents discussed during frontal lessons are provided in the following list. Each title is associated with a relevatn link where it is possible to obtain the lecture notes:

01 - Introduction [LINK]

02 - Unity Engine Recap [LINK]

03 - Path Finding [LINK]

04 - Steering [LINK]

05 - Influence Maps [LINK]

06 - Tree Search [LINK]

07 - Tic-Tac-Toe [LINK]

08 - Reinforcement Learning [LINK]

09 - Uncertain Reasoning [LINK]

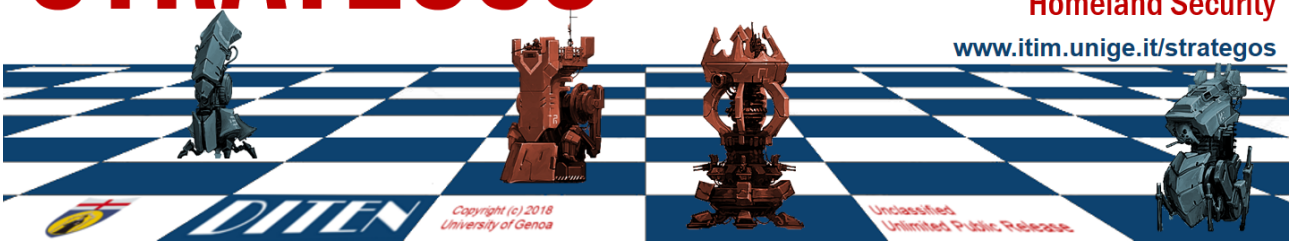
10 - Genetic Algorithms [LINK]

11 - Decision Trees [LINK]

12 - Conversational Agents [LINK]

Teaching Approach:

The course is composed of a set of frontal lessons and a set of practice sessions. During the frontal lesson, the teacher presents the topics providing also examples of live code that are tested on a real game engine (Unity 3D). Students can use their own laptops during the lecture in order to reproduce what is proposed by the teacher. During the practice sessions, the students have to face up with real problems that they should solve by applying the techniques learnied during the lectures.



Evaluation and Final Exam:

The exam is an oral examination on the theoretical topics covered during lectures. In particular, the student has to provide fluency in the description of the main concept of autonomous agents development.

Assessment Methods

During the oral exam, the teacher asks the student to illustrate some concepts learned in class. For each concept, the student has to present the definition, the conditions of applicability and pros/cons in relation to other approaches. During the examination, the teacher verifies that the concepts have been learned at a level of knowledge that allows the student to apply them in real cases.

Time Zone:

Italy (CET), GMT+1

Prerequisites:

The Course does not require specific prerequisites, therefore the students should have knowledge of programming and statistic.

References

- Lecture notes (from AulaWeb)
- Books (as references):
- 01 - B. Tristem, M. Geig. Unity Game Development in 24 Hours. Sams Teach Yourself
- 02 - J. Hocking. Unity in Action: Multiplatform Game Development in C# with Unity 5. Manning
- 03 - M. Buckland. Programming Game AI By Example. Jones & Bartlett Learning.
- 04 - I. Millington, J. Funge. Artificial intelligence for games. CRC Press.
- 05 - S. Rabin. AI Game Programming Wisdom, Vol. 1-4, Charles River Media
- 06 - S. Russell, P. Norvig. Artificial Intelligence: A Modern Approach. Prentice Hall
- 07 - G. N. Yannakakis, J. Togelius. Artificial Intelligence and Games. Springer.