804245 - IAVJ - Artificial Intelligence

**Coordinating unit:** 804 - CITM - Image Processing and Multimedia Technology Centre

**Teaching unit:** 804 - CITM - Image Processing and Multimedia Technology Centre

**Academic year:** 2019

**Degree:**
- BACHELOR'S DEGREE IN VIDEO GAME DESIGN AND DEVELOPMENT (Syllabus 2014). (Teaching unit Compulsory)
- BACHELOR'S DEGREE IN VIDEO GAME DESIGN AND DEVELOPMENT (Syllabus 2014). (Teaching unit Compulsory)

**ECTS credits:** 6

**Teaching languages:** Catalan, Spanish, English

**Teaching staff**

**Coordinator:** Pillosu González, Ricard

**Prior skills**

Knowledge about graph theory and coding in C++

**Teaching methodology**

During each class, the lecturer will first show the students the theory behind the problem that needs solving. Together with the students, the lecturer will explore the different solutions that exist in the present that solve and simplify the complexities of real-time applications like videogames.

**Learning objectives of the subject**

- Understand the basis of classic Artificial Intelligence areas like genetic algorithms and neural networks.
- Good knowledge of the most common AI techniques used in video games like hierarchical state machines and rule systems.
- Get familiar with advanced navigation tools like sectorization.
- Explore the newest methods in video game AI like Behavior Trees and Planners.

**Study load**

<table>
<thead>
<tr>
<th>Total learning time: 150h</th>
<th>Hours large group: 18h</th>
<th>12.00%</th>
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<tbody>
<tr>
<td></td>
<td>Hours medium group: 30h</td>
<td>20.00%</td>
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<tr>
<td></td>
<td>Hours small group: 0h</td>
<td>0.00%</td>
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<tr>
<td></td>
<td>Guided activities: 12h</td>
<td>8.00%</td>
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<tr>
<td></td>
<td>Self study: 90h</td>
<td>60.00%</td>
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## Content

<table>
<thead>
<tr>
<th>Area</th>
<th>Learning time</th>
<th>Description</th>
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</table>
| **AI Agent navigation**                      | **20h**       | Theory classes: 8h  
Self study: 12h  
Kinetic movement  
Map Markup  
Steering behaviors  
Coordinating movement for groups |
| **Pathfinding systems**                      | **20h**       | Theory classes: 8h  
Self study: 12h  
The base of Dijkstra, A*  
Navigation Mesh and sectorization  
Path beautification  
Common improvements on A* |
| **Perception Systems**                       | **10h**       | Theory classes: 4h  
Self study: 6h  
Simulating senses  
Level Markup techniques |
| **Decision making for videogames**           | **15h**       | Theory classes: 6h  
Self study: 9h  
Hierarchical state machines  
Rule systems  
Fuzzy logic  
Scripting |
### Advanced systems for decision making

**Learning time:** 15h  
- Theory classes: 6h  
- Self study: 9h

**Description:**  
- Sharing information with Blackboards  
- SmartObjects  
- Behavior Trees  
- Planners

### Tactic and strategic systems

**Learning time:** 15h  
- Theory classes: 6h  
- Self study: 9h

**Description:**  
- Code Structure  
- Waypoints Markup  
- Tactical Pathfinding

### Learning systems

**Learning time:** 15h  
- Theory classes: 9h  
- Self study: 6h

**Description:**  
- Reinforced Learning  
- Neural Networks  
- Genetic Algorithms

### AI game design

**Learning time:** 20h  
- Theory classes: 8h  
- Self study: 12h

**Description:**  
- Shooters and 3rd person  
- Driving  
- RTS  
- RPGs & Turn Based
**Qualification system**

Final Exam 40% about all the knowledge of the entire subject.
First assignment about steering behaviors and pathfinding with a weight of 15%.
Second assignment about decision taking using behavior trees with a weight of 15%.
Third assignment about a playable demo that uses all the IA technologies explained with a weight of 20%.
A revaluation exam with the same weight as the final exam (40%).
Attitude and class participation will weight 10% of the final grade.

**Bibliography**

**Basic:**
