

MODULE CODE: M6X01080
TITLE: Advanced AI and Machine Learning
DATED: 03/06/2014

LEVEL: 6
CREDITS: 20

JACS CODE: I460

AIM(S)

- To develop students' systematic understanding of AI and machine learning principles and techniques used in Games, Visualisation and Interactive Applications.

LEARNING OUTCOMES

Upon the successful completion of this module, the student should be able to demonstrate the ability to:

1. Critically analyse, evaluate and apply A.I. and machine learning methods to solve given problems.
2. Analyse practical problems and synthesise appropriate software solutions using selected AI/machine learning methods.

INDICATIVE CONTENT

- Definition and review of Artificial Intelligence, General History, and Games AI.
- Review of probability and statistics
- Trigger systems, terrain analysis, obstacle evasion, movement, influence maps
- Decision making and the development of methods for controlling and implementing behaviour of agents (bots). For example, fuzzy logic, knowledge representation, rule based systems, decision trees, etc.
- Local search methods, evolutionary computing.
- Machine Learning: unsupervised/ supervised learning, Classifying, Naïve Bayes, Clustering, K-means, Function approximation/ neural nets, Bayesian networks
- Complexity and Emergent Behaviour including swarming, flocking and particle systems

LEARNING AND TEACHING STRATEGY

This module will build upon the work covered in the pre-requisite level 5 module *Agent AI*. Lectures will be used to deliver the concepts and more advanced ideas underpinning AI and machine learning topics.

Tutorial work will be used to develop specific A.I. techniques used in games programming. This will include group discussions and the implementation of algorithms using appropriate game Software Development Kits and Applications.

The allocation of teaching to deliver the module is:

Activity type	Hours	Percentage
Scheduled learning	60	30%
Independent learning	140	70%
Placement learning	0	
TOTAL	200	100%

ASSESSMENT

Description of each assessment component and its weighting, together with an example for new forms of assessment:

Assessment Component 1 – Written - 50%

Exam: Analyse, evaluate and use AI and machine learning techniques to solve given problems.

Assessment Component 2 – Coursework – 50%

Use a programming language or scripting tools and SDK to solve problems using AI/machine learning methods.

Exemplar:

“ Development of an opponent combat assessment system using Naive Bayes classification”

Assessment Summary

Activity type	Percentage
Written	50%
Coursework	50%
Practical	0%
TOTAL	100%

BIBLIOGRAPHY

Essential

Russell, S. and Norvig, P. (2009) *Artificial Intelligence: A Modern Approach* (3rd edition)
Prentice Hall

Bishop, C.M. (2007) *Pattern Recognition and Machine Learning*, Springer

Background

Millington, I. (2009) *Artificial Intelligence for Games, 2nd edition*, CRC Press

Rabin, S. (2013) *Game AI Pro: Collected Wisdom of Game AI Professionals*, CRC Press

Mark, D. (2009) *Behavioral Mathematics for Game AI*, Delmar

Schwab, B. , *AI Game Engine Programming*
(2nd Edition), Charles River Media (2008)

Barber, M. (2012) *Bayesian Reasoning and Machine Learning*, Cambridge University Press

Websites

<http://www.acm.org>

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