Liverpool John Moores University

Title:	COMPUTER VISION AND AI
Status:	Definitive
Code:	**6052COMP** (117464)
Version Start Date:	01-08-2019
Owning School/Faculty:	Computer Science
Teaching School/Faculty:	Computer Science

Team	Leader
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Academic Level:	FHEQ6	**Credit Value:**	24	**Total Delivered Hours:**	74
Total Learning Hours:	240	**Private Study:**	166		

Delivery Options
Course typically offered: Standard Year Long

Component	Contact Hours
Lecture	24
Practical	24
Tutorial	24

Grading Basis: 40 %

Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Essay	AS1	State-of-the-art Computer Vision, Machine Vision, Artificial Intelligence in modern computer games.	20	
Technology	AS2	Design and implement efficient and robust solution to games development problems using advanced techniques. Group based and must include peer assessment report.	40	
Exam	AS3	Examination.	40	2

Aims

To provide a broad introduction to Computer Vision and Image Interpretation.
To develop the concepts and algorithmic tools of Computer Vision as a tool in computer games development.
To understand the principles of artificial intelligence techniques, gain a familiarity with the most commonly used algorithms and see examples of their application to real-world data.
To develop the concepts and algorithmic tools of Artificial Intelligence as a tool in computer games development.

Learning Outcomes

After completing the module the student should be able to:

1	Critically analyse theoretical and practical capabilities and limitation of Computer Vision.
2	Critically evaluate common Computer Vision and Machine Vision algorithms.
3	Critically analyse the fundamental principles of advanced artificial intelligence techniques.
4	Provide critical analysis on the usability of advanced artificial intelligence techniques in games development.
5	Identify tasks that can be tackled through advanced computer game techniques and select the appropriate technique for the problem under investigation.
6	Design and implement efficient and robust solution to games development problems using advanced techniques

Learning Outcomes of Assessments

The assessment item list is assessed via the learning outcomes listed:

Individual essay	2	4
Design and implement	5	6
Examination	1	3

Outline Syllabus

Computer Vision.
The tools and algorithms of computer vision are introduced in the context of two major capabilities required of visual systems: recognition - finding and identifying expected things in images and 3D interpretation - understanding a dynamic 3D scene from 2D images or sequences of images. These capabilities are explored using applications of varying levels of complexity: recognising man-made objects, interpreting medical images, face recognition, robotics, scene reconstruction and surveillance. Its uses in modern hands-free controller are discussed in detail.

Artificial Intelligence in Games: Neural Networks
Fundamental principles of artificial neural networks: from biology to computational

paradigms.
Clustering and incremental learning - Adaptive Resonance Theory (ART).
Visualising complex data - the Self-Organising Map (SOM).
Most popular neural network – the Multi-layer Perceptron (MLP).
Localised learning algorithms: Radial Basis Function (RBF)
Methods from computational learning theory: Support Vector Machines (SVM)

Artificial Intelligence in Games: Fuzzy Logic
Artificial Intelligence in Games: Genetic Algorithm
Adaptive AI in Games using Scripting

Learning Activities

Lectures incorporating demonstrations will be followed by tutor-led seminar sessions. These will be supported by practical hands-on work in the laboratory.

Notes

This module teaches students advanced and emerging technologies that are used in games development. These technologies are either recently used in modern games or expected to be usable in the near future. Examples of such technologies are computer vision, advanced AI techniques using Neural Networks, Fuzzy Logic and Genetic Algorithms and also simulation of complex and adaptive AI agent behaviour.