MONASH University
Information Technology

FIT3094
AI for gaming

Unit Guide

Semester 1, 2010

Last updated: 19 Feb 2010

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FIT3094 AI for gaming - Semester 1, 2010

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Contact hours: appointment via email, also 4-5pm Thursdays (after the lecture)

Lecturer(s) / Leader(s):

Caulfield

as above

Introduction

Welcome to FIT3094, AI In Gaming, a unit about Artificial Intelligence applications in Computer Games. We examine different approaches to designing intelligent agents for use as non-player characters, search techniques for path planning, and Artificial Life techniques for automating and coordinating group behaviour of complex agents.

Unit synopsis

This unit will introduce Artificial Intelligence (AI) techniques that can be used in games development. General capabilities of AI technology, behaviours/circumstances that need to be simulated/learned/reproduced by the smart non-player characters/environments in smart games, AI techniques (such as evolutionary and neural computations) used in the development of smart games will be discussed at length. This unit will build upon previous programming skills, and provide a strong grounding for further study in this area, especially related to games engine development. The unit will examine intelligent game creation using C++.

Learning outcomes

At the completion of this unit students will have:

- an ability to select and use various Artificial Intelligence techniques to build intelligent games;
- an understanding of the general capabilities of Artificial Intelligence (AI) technologies;
- an understanding of the possible opportunities where intelligence can be applied in the game development world;
- an ability to apply AI techniques in building games that challenge the players by learning/adapting to their style over time and thereby developing new strategies to take the games into the next level;
- an ability to evaluate the suitability of AI techniques in the development of various games;
- enthusiasm for the endless possibilities that AI technologies can enrich the game development world;
- motivation to develop further skills in AI techniques for games development;
- appreciation and open-mindedness that better collaborations between the game development industry and the academic AI research will open wider opportunities in the enhancements of smart games;
- skills in developing smart games using AI techniques;
- ability to design, develop and debug game applications written in C++;
- create interactive (2D and 3D) smart game environment that displays the AI techniques learnt in the unit;
- ability to engage in technical discussions on AI technologies for games.

Contact hours

2 hrs lectures/wk, 2 hrs laboratories/wk

Workload

Every week you will need to attend:

- a two hour lecture
- a two hour laboratory session

You will also need to spend 2-3 hours of personal study per one hour of contact time in order to satisfy the reading and assignment expectations.

Unit relationships

Prerequisites

FIT2049

Teaching and learning method

Teaching approach

Students will need to:

- attend lectures, listen attentively and respond in class to questions from the lecturer and their peers.
- actively participate in laboratory classes, completing practical exercises and participating in discussions with the tutors.
- complete homework study tasks, readings set for each week and practical tasks.

Timetable information

For information on timetabling for on-campus classes please refer to MUTTS,
http://mutts.monash.edu.au/MUTTS/

Tutorial allocation

On-campus students should register for tutorials/laboratories using the Allocate+ system:
http://allocate.its.monash.edu.au/

Unit Schedule

Week	Date*	Topic	Key dates
1	01/03/10	Introduction to Artificial Intelligence (AI)	
2	08/03/10	Introduction to Artificial Life (AL)	
3	15/03/10	History of AI and AL	
4	22/03/10	The interactive game loop, Finite State Machines	
5	29/03/10	Neural Networks	
Mid semester break			
6	12/04/10	Mid-course revision	Assignment 1 due
7	19/04/10	Vectors and Steering Behaviour, Introduction to Search Algorithms	
8	26/04/10	Cooperative strategies for agent behaviour	
9	03/05/10	Growing plants and forests	
10	10/05/10	A* Search algorithm	
11	17/05/10	Artificial Evolution	
12	24/05/10	Virtual Ecosystems	Assignment 2 due
13	31/05/10	Revision	

*Please note that these dates may only apply to Australian campuses of Monash University. Off-shore students need to check the dates with their unit leader.

Improvements to this unit

The lecture notes and tutorial material now provide further detail on vector arithmatic for applications in steering behaviour computation.

Unit Resources

Prescribed text(s) and readings

Textbook: no prescribed text is required. Recommended reading lists will appear each week with the lecture notes.

Some useful web resources:

www.ai-depot.com www.gameai.com www.generation5.org www.ai-junkie.com www.gamedev.net www.google.com

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Required software and/or hardware

On-campus students may use the software which is installed in the computing labs. Information about computer use for students is available from the ITS Student Resource Guide in the Monash University Handbook.

You will need access to:

- Current C++ compiler (e.g. GNU)
- Current OpenGL and GLUT libraries
- Unix-based operating system (e.g. Linux, BSD, MacOS X)

Equipment and consumables required or provided

Students studying off-campus are required to have the minimum system configuration specified by the Faculty as a condition of accepting admission, and regular Internet access.On-campus students, and those studying at supported study locations may use the facilities available in the computing labs.Information about computer use for students is available from the ITS Student Resource Guide in the Monash University Handbook.You will need to allocate up to **6** hours per week for use of a computer.

Study resources

Study resources we will provide for your study are:

Online lecture notes, reading lists, practical exercises, assignment specifications practice examination paper

Assessment

Overview

Examination (2 hours): 60%; In-semester assessment: 40%

Faculty assessment policy

To pass a unit which includes an examination as part of the assessment a student must obtain:

- 40% or more in the unit's examination, and
- 40% or more in the unit's total non-examination assessment, and
- an overall unit mark of 50% or more.

If a student does not achieve 40% or more in the unit examination or the unit non-examination total assessment, and the total mark for the unit is greater than 50% then a mark of no greater than 49-N will be recorded for the unit.

To pass a unit which includes an examination as part of the assessment a student must obtain:

- a pass or better in the unit's examination
  and
- a pass or better in the unit's total non-examination assessment
  and
- an overall unit mark of 50% or more

Assignment tasks

Assignment coversheets

Assignment coversheets are available via "Student Forms" on the Faculty website:
http://www.infotech.monash.edu.au/resources/student/forms/
You MUST submit a completed coversheet with all assignments, ensuring that the plagiarism declaration section is signed.

Assignment submission and return procedures, and assessment criteria will be specified with each assignment.

- **Assignment task 1**

  Title:
  > Non-Player Character Game Controller

  Description:
  > Write an intelligent game controller for a non-player character. A detailed document describing what is required will be distributed to students via the online materials.

  Weighting:
  > 20%

  Due date:
  > End of week 6, 6pm 15th April 2010

- **Assignment task 2**

    Title:
    Coordinated Non-Player Character Game Controller
    Description:
    Write software to generate emergent group behaviour of non-player characters. A detailed document describing what is required will be distributed to students via the online materials.
    Weighting:
    20%
    Due date:
    End of week 12, 6pm 27 May 2010

Examination

- **Weighting:** 60%
  Length: 2 hours
  Type (open/closed book): Closed book

See Appendix for End of semester special consideration / deferred exams process.

Due dates and extensions

Please make every effort to submit work by the due dates. It is your responsibility to structure your study program around assignment deadlines, family, work and other commitments. Factors such as normal work pressures, vacations, etc. are not regarded as appropriate reasons for granting extensions. Students are advised to NOT assume that granting of an extension is a matter of course.

Students requesting an extension for any assessment during semester (eg. Assignments, tests or presentations) are required to submit a Special Consideration application form (in-semester exam/assessment task), along with original copies of supporting documentation, directly to their lecturer within two working days before the assessment submission deadline. Lecturers will provide specific outcomes directly to students via email within 2 working days. The lecturer reserves the right to refuse late applications.

A copy of the email or other written communication of an extension must be attached to the assignment submission.

Refer to the Faculty Special consideration webpage or further details and to access application forms: http://www.infotech.monash.edu.au/resources/student/equity/special-consideration.html

Late assignment

Assignments received after the due date will be subject to a penalty of 10% of the total possible mark per 24 hours late including weekends and public holidays. Assignments received later than one week after the due date will not normally be accepted.

Return dates

Students can expect assignments to be returned within two weeks of the submission date or after receipt, whichever is later.

Appendix

Please visit the following URL: http://www.infotech.monash.edu.au/units/appendix.html for further information about:

- Continuous improvement
- Unit evaluations
- Communication, participation and feedback
- Library access
- Monash University Studies Online (MUSO)
- Plagiarism, cheating and collusion
- Register of counselling about plagiarism
- Non-discriminatory language
- Students with disability
- End of semester special consideration / deferred exams