



MONASH University
Information Technology

FIT3094
Artificial life, artificial intelligence and virtual environments

Unit Guide

Semester 1, 2015

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FIT3094 Artificial life, artificial intelligence and virtual environments - Semester 1, 2015

This unit will introduce Artificial Life (A-Life) and Artificial Intelligence (AI) techniques that can be used in the production of virtual environments. It also addresses the general capabilities of A-Life and AI technology, behaviours/circumstances that need to be simulated, learned or reproduced by virtual agents or characters and environments in virtual worlds. Techniques such as evolutionary computation and neural networks used in the development of intelligent, life-like agents in games and virtual worlds will be discussed in detail. This unit will build upon previous programming skills, and provide a strong grounding for further study in this area. The unit employs the fundamentals of C++ programming within a UNIX environment.

Mode of Delivery

Caulfield (Day)

Workload Requirements

Minimum total expected workload equals 12 hours per week comprising:

(a.) Contact hours for on-campus students:

- Two hours of lectures
- One 2-hour laboratory

(b.) Additional requirements (all students):

- A minimum of 8 hours independent study per week for completing lab and project work, private study and revision.

See also Unit timetable information

Unit Relationships

Prerequisites

FIT2049

Chief Examiner

Dr Alan Dorin

Campus Lecturer

Caulfield

Alan Dorin

Consultation hours: 4-5pm, Wednesday. During labs, lectures or by email, please let me know you would like to meet.

Tutors

Caulfield

Alan Dorin

Zoe Bukovac

Your feedback to Us

Monash is committed to excellence in education and regularly seeks feedback from students, employers and staff. One of the key formal ways students have to provide feedback is through the Student Evaluation of Teaching and Units (SETU) survey. The University's student evaluation policy requires that every unit is evaluated each year. Students are strongly encouraged to complete the surveys. The feedback is anonymous and provides the Faculty with evidence of aspects that students are satisfied and areas for improvement.

For more information on Monash's educational strategy, see:

www.monash.edu.au/about/monash-directions/ and on student evaluations, see:
www.policy.monash.edu/policy-bank/academic/education/quality/student-evaluation-policy.html

Previous Student Evaluations of this Unit

Previous feedback has highlighted that the unit's assignments are considered to be exciting and engaging for students.

Previous feedback has also indicated that vector arithmetic is now being covered in other units within the degree and the amount of time dedicated to this aspect of the FIT3094 unit can be reduced. The material on using vector arithmetic for steering behaviour will remain a component of the course but a knowledge of the fundamentals of vectors will be assumed.

If you wish to view how previous students rated this unit, please go to
<https://emuapps.monash.edu.au/unitevaluations/index.jsp>

Academic Overview

Learning Outcomes

At the completion of this unit, students should be able to:

- select and use Artificial Life, Artificial Intelligence and virtual environment construction techniques to build coherent virtual worlds;
- develop new strategies to extend virtual environments beyond the current state of the art;
- demonstrate independent research skills in understanding pioneering and recent A-Life and AI techniques;
- design, develop and debug applications written in C++ under a UNIX environment;
- create environments that display the techniques learned during the unit;
- engage in technical discussions on A-Life and AI technologies.

Unit Schedule

Week	Activities	Assessment
0	Download lecture notes and scan them. Begin Tutorial 0 (Unix familiarity)	No formal assessment or activities are undertaken in week 0
1	Introduction to Artificial Intelligence (AI) & Artificial Life (AL)	
2	A History of AI and AL in Games	
3	Basic Search Algorithms, their significance for AI and AL	
4	The Interactive Game Loop, Finite State Machines and Agent Decisions	
5	Steering Behaviour & Cooperative strategies for agent behaviour 1	
6	Cooperative strategies for agent behaviour 2 & Generative landscapes and cityscapes	Assignment 1 due Week 6, 15 April 2015, 6pm. Demonstrations in lab session
7	Mid-semester revision and assignment discussion	
8	Growing plants and forests intelligently and realistically	
9	Artificial Evolution	
10	Virtual Ecosystems	
11	Advanced Search Algorithms: A* Search	
12	Neural Networks	Assignment 2 due Week 12, 27 May 2015, 6pm. Demonstrations in lab session
	SWOT VAC	No formal assessment is undertaken in SWOT VAC
	Examination period	LINK to Assessment Policy: http://policy.monash.edu.au/policy-bank/academic/education/assessment/assessment-in-coursework-policy.html

*Unit Schedule details will be maintained and communicated to you via your learning system.

Teaching Approach

- **Lecture and tutorials or problem classes**

This teaching and learning approach provides facilitated learning, practical exploration and peer learning.

- **Laboratory-based classes**

This teaching approach is practical learning.

Assessment Summary

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

Assessment Task	Value	Due Date
Assignment 1 - Non-Player Character Game Controller	20%	Week 6, 15 April 2015, 6pm. Demonstrations in lab session
Assignment 2 - Evolving Flowers	20%	Week 12, 27 May 2015, 6pm. Demonstrations in lab session
Examination 1	60%	To be advised

Assessment Requirements

Assessment Policy

Faculty Policy - Unit Assessment Hurdles

(<http://intranet.monash.edu.au/infotech/resources/staff/edgov/policies/assessment-examinations/assessment-hurdles>)

Academic Integrity - Please see resources and tutorials at

<http://www.monash.edu/library/skills/resources/tutorials/academic-integrity/>

Assessment Tasks

Participation

Demonstrations and explanation of code submissions for Assignments 1 & 2 must be made by each student, in person. These occur in the lab sessions immediately before each assignment deadline. Failure to present these demonstrations results in a grade of 0N for the relevant assignment.

• Assessment task 1

Title:

Assignment 1 - Non-Player Character Game Controller

Description:

Write an intelligent game controller for a non-player character. Your controller will be pitted against those of your class-mates in a mass-game as part of the assessment process. A detailed document describing what is required will be distributed to students via the online materials.

Weighting:

20%

Criteria for assessment:

You will be assessed on how efficiently you write the software and on how well your controller plays the game including how frequently it hits and sinks other ships, how much gold it collects and how infrequently it is hit itself.

Please consult the detailed online document that will be provided for further info.

Due date:

Week 6, 15 April 2015, 6pm. Demonstrations in lab session

• Assessment task 2

Title:

Assignment 2 - Evolving Flowers

Description:

Write software to apply an evolutionary algorithm to the generation and aesthetic selection of novel flower structures. A detailed document describing what is required will be distributed to students via the online materials.

Weighting:

20%

Criteria for assessment:

You will be assessed on how efficiently you write the software to implement the evolutionary algorithm, and on how well your algorithm generates floral patterns through processes of cross-over and mutation.

Assessment Requirements

Please consult the detailed online document that will be provided for further info.

Due date:

Week 12, 27 May 2015, 6pm. Demonstrations in lab session

Examinations

- **Examination 1**

Weighting:

60%

Length:

2 hours

Type (open/closed book):

Closed book

Electronic devices allowed in the exam:

None

Learning resources

Reading list

Electronic access to a prescribed text (interactive e-book) written by the lecturer will be required. This is available for use on iPad/iPad-mini, Apple Macintosh computers running the OS X "Mavericks" operating system, online, and via PDF.

Recommended reading lists will appear each week with the lecture notes.

Video materials covering some background aspects of the course will also be available.

Monash Library Unit Reading List (if applicable to the unit)

<http://readinglists.lib.monash.edu/index.html>

Feedback to you

Types of feedback you can expect to receive in this unit are:

- Informal feedback on progress in labs/tutes
- Graded assignments with comments

Extensions and penalties

Submission must be made by the due date otherwise penalties will be enforced.

You must negotiate any extensions formally with your campus unit leader via the in-semester special consideration process: <http://www.monash.edu.au/exams/special-consideration.html>

Returning assignments

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

Resubmission of assignments

Assignments may not be resubmitted.

Assignment submission

It is a University requirement

(<http://www.policy.monash.edu/policy-bank/academic/education/conduct/student-academic-integrity-managing-pla>) for students to submit an assignment coversheet for each assessment item. Faculty Assignment coversheets can be found at <http://www.infotech.monash.edu.au/resources/student/forms/>. Please check with your Lecturer on the submission method for your assignment coversheet (e.g. attach a file to the online assignment submission, hand-in a hard copy, or use an electronic submission). Please note that it is your responsibility to retain copies of your assessments.

Online submission

If Electronic Submission has been approved for your unit, please submit your work via the learning system for this unit, which you can access via links in the my.monash portal.

Required Resources

Please check with your lecturer before purchasing any Required Resources. Limited copies of prescribed texts are available for you to borrow in the library, and prescribed software is available in student labs.

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)

Prescribed text(s)

Limited copies of prescribed texts are available for you to borrow in the library.

Alan Dorin. (2014). *Biological Bits: A brief guide to the ideas and artefacts of computational Artificial Life*. (1st Edition) Animaland (ISBN: 978-0-646-91871-6).

Other Information

Policies

Monash has educational policies, procedures and guidelines, which are designed to ensure that staff and students are aware of the University's academic standards, and to provide advice on how they might uphold them. You can find Monash's Education Policies at:

www.policy.monash.edu.au/policy-bank/academic/education/index.html

Faculty resources and policies

Important student resources including Faculty policies are located at

<http://intranet.monash.edu.au/infotech/resources/students/>

Graduate Attributes Policy

<http://www.policy.monash.edu/policy-bank/academic/education/management/monash-graduate-attributes-policy.h>

Student Charter

www.opq.monash.edu.au/ep/student-charter/monash-university-student-charter.html

Student services

The University provides many different kinds of support services for you. Contact your tutor if you need advice and see the range of services available at <http://www.monash.edu.au/students>. For Malaysia see <http://www.monash.edu.my/Student-services>, and for South Africa see <http://www.monash.ac.za/current/>.

Monash University Library

The Monash University Library provides a range of services, resources and programs that enable you to save time and be more effective in your learning and research. Go to www.lib.monash.edu.au or the library tab in [my.monash](#) portal for more information. At Malaysia, visit the Library and Learning Commons at <http://www.lib.monash.edu.my/>. At South Africa visit <http://www.lib.monash.ac.za/>.

Disability Liaison Unit

Students who have a disability or medical condition are welcome to contact the Disability Liaison Unit to discuss academic support services. Disability Liaison Officers (DLOs) visit all Victorian campuses on a regular basis.

- Website: <http://www.monash.edu/equity-diversity/disability/index.html>
- Telephone: 03 9905 5704 to book an appointment with a DLO; or contact the Student Advisor, Student Community Services at 03 55146018 at Malaysia
- Email: dlu@monash.edu
- Drop In: Equity and Diversity Centre, Level 1, Building 55, Clayton Campus, or Student Community Services Department, Level 2, Building 2, Monash University, Malaysia Campus

Other Information

Other

Some useful web resources

www.ai-depot.com

www.generation5.org

www.ai-junkie.com

www.gamedev.net