



National Unit specification: general information

Unit title: Artificial Intelligence for Games (SCQF level 6)

Unit code: H1ND 12

Superclass: CB

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Summary

The purpose of the Unit is to provide candidates with an understanding of the use of artificial intelligence (AI) in computer games. Candidates will gain knowledge and understanding of current computer games AI methods and how they can be used to simulate intelligence in computer games. Candidates will have opportunities to practice writing and coding their own AI algorithms for computer games.

Outcomes

- 1 Research current artificial intelligence methods and their purpose for computer games.
- 2 Develop artificial intelligence algorithms for computer games.
- 3 Produce code for artificial intelligence algorithms for computer games.

Recommended entry

While entry is at the discretion of the centre, candidates would normally be expected to have attained or be undertaking Units in the area of Computer Games Development at SCQF level 6.

Credit points and level

1 National Unit credit at SCQF level 6: (6 SCQF credit points at SCQF level 6*)

**SCQF credit points are used to allocate credit to qualifications in the Scottish Credit and Qualifications Framework (SCQF). Each qualification in the Framework is allocated a number of SCQF credit points at an SCQF level. There are 12 SCQF levels, ranging from Access 1 to Doctorates.*

General information (cont)

Core Skills

Achievement of this Unit gives automatic certification of the following Core Skills component:

Complete Core Skill None

Core Skill component Critical Thinking at SCQF level 5

There are also opportunities to develop aspects of Core Skills which are highlighted in the Support Notes of this Unit specification.

The Assessment Support Pack (ASP) for this Unit provides assessment and marking guidelines that exemplify the national standard for achievement. It is a valid, reliable and practicable instrument of assessment. Centres wishing to develop their own assessments should refer to the ASP to ensure a comparable standard. ASPs are available on SQA's secure website.

National Unit specification: statement of standards

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Acceptable performance in this Unit will be the satisfactory achievement of the standards set out in this part of the Unit specification. All sections of the statement of standards are mandatory and cannot be altered without reference to SQA.

Outcome 1

Research current artificial intelligence methods and their purpose for computer games.

Performance Criteria

- (a) Investigate the need for artificial intelligence in computer games.
- (b) Investigate the methods used to provide artificial intelligence for computer games.
- (c) Investigate artificial intelligence methods used in current computer games.

Outcome 2

Develop an artificial intelligence algorithm for a computer game.

Performance Criteria

- (a) Investigate tools and methods used in writing algorithms.
- (b) Write an algorithm to provide a solution to an artificial intelligence problem in a computer game.
- (c) Desk check an algorithm to ensure it performs as intended.

Outcome 3

Produce code for an artificial intelligence algorithm for a computer game.

Performance Criteria

- (a) Code an artificial intelligence algorithm for a computer game.
- (b) Test artificial intelligence code in a computer game.
- (c) Evaluate your solution to an artificial intelligence problem.

National Unit specification: statement of standards (cont)

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Evidence Requirements for this Unit

Evidence is required to demonstrate that candidates have achieved all Outcomes and Performance Criteria.

The Evidence Requirements for this Unit will be the production of a digital or paper portfolio containing the following items:

- ◆ A report (suggested length 750–1,000 words or a presentation of 5 to 10 minutes):
 - explaining the need for artificial intelligence in computer games
 - describing at least two current methods used to provide artificial intelligence in computer games
 - giving examples of existing computer games where such methods may be used.
- ◆ At least one algorithm written using appropriate tools and methods, providing a solution to a specified artificial intelligence problem in a computer game.
- ◆ Desk checking of at least one algorithm to ensure it provides a suitable solution to a specified artificial intelligence problem in a computer game.
- ◆ Code solving at least one specified artificial intelligence problem in a computer game.
- ◆ A test strategy.
- ◆ A record and analysis of the test results.
- ◆ An evaluation of how well the completed code meets the requirements of the original problem.

Evidence for this Unit is open-book where the candidates can access books, magazines or the internet.

National Unit specification: support notes

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This part of the Unit specification is offered as guidance. The support notes are not mandatory.

While the exact time allocated to this Unit is at the discretion of the centre, the notional design length is 40 hours.

Guidance on the content and context for this Unit

The purpose of the Unit is to provide candidates with an understanding of the use of artificial intelligence (AI) in games. Candidates will gain knowledge and understanding of current AI methods and how they can be used to simulate intelligence in computer games. Candidates will have opportunities to practice writing and coding their own AI algorithms for computer games.

When investigating the use of AI in computer games the candidate should become familiar with its use in a variety of genres, and recognise its application in the computer games that they play. Algorithms for searching, decision making, optimisation, pathfinding, obstacle avoidance, game agents, flocking, herding and formation movements could be explored, and the future use of fuzzy logic and genetic algorithms could be investigated.

Outcome 2 and Outcome 3 may be taught together allowing candidates to improve their AI algorithms following testing of their code.

This Unit is aligned to the following Skillset National Occupational Standards (NOS):

- ◆ IM20 Design Electronic Games
- ◆ IM21 Program Electronic Games to Develop Functionality
- ◆ IM22 Test Electronic Games

Guidance on learning and teaching approaches for this Unit

Candidates should be given access to books, magazines and the internet to explore the use of artificial intelligence in a computer games context. Candidates should be encouraged to discuss their findings and apply their AI research findings to computer games that they currently play.

Outcome 1

This Outcome encourages candidates to explore current methods of providing intelligence within computer games. Class discussion of existing computer games and their AI content may be beneficial to the delivery of this Outcome. Candidates should research AI methods such as:

National Unit specification: support notes (cont)

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- ◆ Decision making
- ◆ Pathfinding
- ◆ Optimisation
- ◆ Obstacle avoidance
- ◆ Search techniques
- ◆ Movement (flocking, herding, formation)
- ◆ Game agents
- ◆ Advanced agents
- ◆ Fuzzy logic
- ◆ Genetic algorithms
- ◆ Knowledge bases
- ◆ Expert systems

Examples of questions that can be used to focus research and aid report writing may be:

- ◆ How is the most suitable AI algorithm for a particular situation determined?
- ◆ In which game genre is this method of AI most appropriate?
- ◆ To what type of problem or situation could this method be applied?
- ◆ Are there any games that you play that use this method and how is it used?

Outcome 2

Candidates should be encouraged to use existing knowledge of methods and tools used to design programs as well as investigating less familiar methods. Methods and tools could include:

- ◆ Pseudocode
- ◆ Structured English
- ◆ Flow charts
- ◆ Finite state diagrams
- ◆ UML
- ◆ Pathfinding graphs
- ◆ Decision trees

Candidates can be introduced to a variety of simple algorithms to produce AI and shown how these algorithms can be extended to make them more efficient. Candidates should practice matching algorithms to required behaviours in the computer game.

Outcome 3

Candidates should be encouraged to experiment with coding and testing some simple algorithms in a suitable programming language. If existing game code is available then candidates could identify, introduce and test a suitable AI algorithm in the computer game. Candidates can then work to improve performance of the algorithm. Whilst candidates should be encouraged to explore coding algorithms, these should not be so complex as to be unachievable in the time allowed.

National Unit specification: support notes (cont)

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The actual distribution of time between Outcomes is at the discretion of the centre. However, the following distribution and order is suggested.

Outcome 1	10 hours
Outcome 2	15 hours
Outcome 3	15 hours

Guidance on approaches to assessment for this Unit

A portfolio approach to assessment should be taken. The portfolio may be paper or electronic (digital). The portfolio should be constructed over the period of the Unit, with candidates contributing material to the portfolio on an on-going basis. The contents of the portfolio must be clearly labelled and related to specific Evidence Requirements.

If an e-portfolio is used to capture candidates' work, it may take one of a variety of forms, ranging from general purpose digital repositories to specialised e-portfolio products. For example, a web log could be used to record candidate activity over the duration of the Unit. Specific entries to the blog could provide sufficient evidence in their own right (for example, a report or evaluation) or could link to a file stored in another web service (such as a file hosting site). The use of a blog would aid authentication since any record of a candidate's day-to-day activities would provide implicit evidence of participation and ownership.

Outcome 2 and Outcome 3 can be assessed holistically. Candidates should be supplied with a scenario and/or game prototype that requires game AI to be added. Candidates can then write and desk check their algorithm solution before producing code and testing the finished algorithm. Candidates should then evaluate their finished work.

Opportunities for the use of e-assessment

E-assessment may be appropriate for some assessments in this Unit. By e-assessment we mean assessment which is supported by Information and Communication Technology (ICT), such as e-testing or the use of e-portfolios or social software. Centres which wish to use e-assessment must ensure that the national standard is applied to all candidate evidence and that conditions of assessment as specified in the Evidence Requirements are met, regardless of the mode of gathering evidence. Further advice is available in *SQA Guidelines on Online Assessment for Further Education (AA1641, March 2003)*, *SQA Guidelines on e-assessment for Schools (BD2625, June 2005)*.

Opportunities for developing Core Skills

Candidates will have the opportunity to develop aspects of the Core Skills *Information Technology, Communication* during Outcome 1 when researching and preparing the report.

Candidates will have the opportunity to develop aspects of the Core Skill *Problem Solving* during Outcomes 2 and 3.

National Unit specification: support notes (cont)

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This Unit has the Critical Thinking component of Problem Solving embedded in it. This means that when candidates achieve the Unit, their Core Skills profile will also be updated to show they have achieved Critical Thinking at SCQF level 5.

Disabled candidates and/or those with additional support needs

The additional support needs of individual candidates should be taken into account when planning learning experiences, selecting assessment instruments, or considering whether any reasonable adjustments may be required. Further advice can be found on our website www.sqa.org.uk/assessmentarrangements

History of changes to Unit

Version	Description of change	Date

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