# Solent University

# Coursework Assessment Brief

# Assessment Details

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| Unit Title: | Intelligent Agents |
| Unit Code: | COM507 |
| Unit Leader: | Prins Butt |
| Level: | 5 |
| Assessment Title: | Intelligent Agents |
| Assessment Number: | 1 and 2 |
| Assessment Type: | (AE1) Report and (AE2) Software Artefact |
| Restrictions on Time/Word Count: | 2000 |
| Consequence of not meeting time/word count limit: | There is no penalty for submitting below the word/count limit, but students should be aware that there is a risk they may not maximise their potential mark. |
| Individual/Group: | Individual |
| Assessment Weighting: | 100% |
| Issue Date: | 11th March 2020 |
| Hand In Date: | 11th May 2020 |
| Planned Feedback Date: | 08st June 2020 |
| Mode of Submission: | Online |
| Number of copies to be submitted: | 1 (online) |
| Anonymous Marking | This assessment will be marked anonymously |

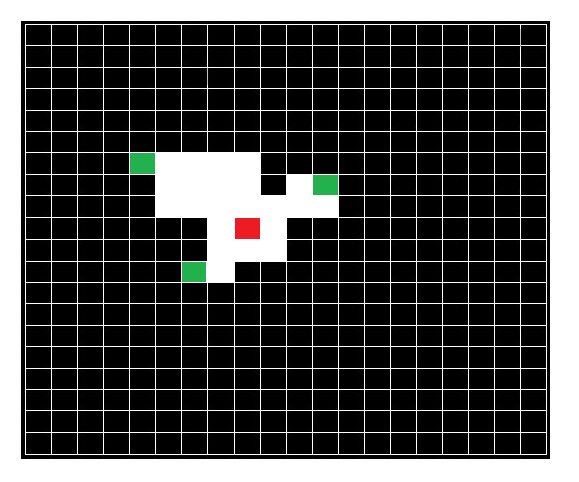
# Assessment Task

# You are required to design and implement a multi-agent system for the scenario given below (or an appropriate equivalent scenario of your choice):

Scenario: Mars Mission

The year is 2099. Earth’s resources are quickly depleting and the survival of humanity relies on finding new resources. Scientists have discovered that the rocks on the planet Mars can be used as a new source of energy. With this in mind, a mission has been launched to recover rocks from Mars. A space ship containing robots known as Rovers has been dispatched to Mars to collect the rocks and bring them back to Earth.

The following figure shows a simple visualisation containing a Space Ship (red), some Rovers (green) and Rocks (black).



You are required to implement a multi-agent system as described on the next page:

**Part A: Simple Reflex Agents (60% marks)**

You should implement a simulation with a graphical user interface for the above described scenario. Your implementation should contain at least the following classes:

- Location: This is a simple concrete class that represents a 2D location in a grid. It has the attributes x and y and concrete getter and setter methods.

- Agent: This is an abstract class that represents a basic agent. It has the attribute location, concrete getter and setter methods and an abstract method act that takes an Environment object as a parameter

- Environment: This is an abstract class that represents an environment consisting of agents. It only consists of abstract methods. These return the height and width of the grid, clear the grid and get and set agents in the grid.

- Mars: This is a concrete class that extends Environment. It has a 2D array of Agent objects as an attribute and provides an implementation for each abstract method in the Environment class.

- Gui: This a graphical user interface for the simulation which visualises the state of a Mars object.

- SpaceShip: This is a concrete class that extends Agent. This class has an attribute representing a list of rocks. This list contains each of the rocks that was collected by the Rovers. A space ship acts by looking for Rovers in neighbouring cells, emptying the Rovers of their rocks and adding these to the space ships’ list of rocks. The space ship also recharges the Rovers so that they have 100% battery life.

- Rover: This is a concrete class that extends Agent. This class has the following attributes:

* battery: this represents the current battery level for the Rover where 100 is fully battery and 0 is an empty battery
* rock: this represents a Rock object has been collected by the Rover
* space ship location: this represents the location of the space ship

A Rover acts by moving a single cell at a time in its environment if it has sufficient battery power otherwise it does not move. Each time it moves, the battery level of the Rover decreases. When a Rover has no rock it will move around its environment until it finds a rock. When a Rock object has been found, it will be collected (removed from the environment and added to the Rover) and taken back to the space ship.

- Rock: This is a concrete class that extends Agent. A rock has a single attribute representing the energy level of a rock. A rock starts with a maximum energy level and acts by decreasing in energy until it reaches a minimum energy level at which point the energy level of the rock remains at the minimum energy level.

- Simulation: This is a concrete class that is responsible for running the Mars Mission simulation. The simulation should do the following:

* prepare – this involves creating a Mars object, populating it with a single Space Ship, some Rovers in cells near the Space Ship and Rocks randomly in other cells.
* update – this should invoke the act methods on the Space Ship and the Rovers
* render – this should cause the graphical user interface to refresh so as to show the current state of Mars.

You should add any additional classes as is necessary. You should also select suitable values to configure your simulation e.g. for the maximum and minimum energy levels of the rocks, size of the grid, etc.

**Part B: Learning Algorithm (40%)**

Extend your previous implementation so that each Rover collects Rocks in a way that minimises the distance it needs to travel between the Space Ship and a Rock. Hence, rather than moving randomly, the Rover will remember its previous journey and use the information to guide its movement.

Due to the limited battery life of the Rovers they are only able to cover a certain distance from the space ship. Extend your implementation so that the Rovers are

a) able to share information regarding the locations of Rocks

b) able to co-operate together so as to cover a larger distance

**What to submit**

**Report**

You should submit your report using the appropriate submission link. This should not exceed 2000 words in length. Your report should consist of the following:

- Provide a summary of your solution with a particular focus on the technical implementation

- Include a class diagram for your final solution

**Software Artefact**

You should submit a zip file containing your final implementation using the appropriate submission link.

# Assessment criteria

AE1: Report

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| **Grade** | **Report** |
| N/S | No report present, or a token submission has been made. |
| F | The text in your report is of insufficient detail to demonstrate understanding of the implementation. |
| D | The report provides a basic summary of the implementation for Part A which demonstrates an understanding consistent with the minimum learning outcomes. |
| C | The report is unambiguous and clear and provides a detailed summary of the implementation for Part A. A small number of vague sections will result in a lower grade in this band. |
| B | The report is unambiguous and clear and provides a detailed summary of the implementation for Part A and some aspects of Part B. A small number of vague sections will result in a lower grade in this band. |
| A | The report provides a detailed summary of Part A and Part B that is unambiguous and clear. A small number of vague sections will result in a lower grade in this band. |

AE2: Software Artefact

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| --- | --- |
| **Grade** | **Implementation** |
| N/S | Little or no attempt at implementing simulation. |
| F | Implementation has been attempted but is incomplete, not working or insufficient. |
| D | Implementation of part A is significant and executable although not fully complete. A small number of omissions or errors will result in a lower grade in this band. |
| C | Implementations of part A is fully completed with appropriate supporting evidence. A small number of omissions or errors will result in a lower grade in this band. |
| B | Implementation of part A fully completed and part B has been attempted. Appropriate supporting evidence has been provided. A small number of omissions or errors will result in a lower grade in this band. |
| A | Implementations of part A and part B fully completed with appropriate supporting evidence. A small number of omissions or errors will result in a lower grade in this band. |

# Learning Outcomes

This assessment will enable students to demonstrate in full or in part the learning outcomes identified in the unit descriptors.

# Late Submissions

Students are reminded that:

1. If this assessment is submitted late i.e. within 5 working days of the submission deadline, the mark will be capped at 40% if a pass mark is achieved;
2. If this assessment is submitted later than 5 working days after the submission deadline, the work will be regarded as a non-submission and will be awarded a zero;
3. If this assessment is being submitted as a referred piece of work then it must be submitted by the deadline date; any Refer assessment submitted late will be regarded as a non-submission and will be awarded a zero.

<http://portal.solent.ac.uk/documents/academic-services/academic-handbook/section-2/2o-assessment-principles-and-regulations.pdf?t=1534423842941>

# Extenuating Circumstances

The University’s Extenuating Circumstances procedure is in place if there are genuine circumstances that may prevent a student submitting an assessment. If students are not 'fit to study’, they can either request an extension to the submission deadline of 5 working days or they can request to submit the assessment at the next opportunity (Defer). In both instances students must submit an EC application with relevant evidence. If accepted by the EC Panel there will be no academic penalty for late submission or non-submission dependent on what is requested. Students are reminded that EC covers only short term issues (20 working days) and that if they experience longer term matters that impact on learning then they must contact the Student Hub for advice.

A summary of guidance notes for students is given below:

<http://portal.solent.ac.uk/documents/academic-services/academic-handbook/section-2/2p-extenuating-circumstances.pdf?t=1534423896787>

# Academic Misconduct

Any submission must be students’ own work and, where facts or ideas have been used from other sources, these sources must be appropriately referenced. The University’s Academic Handbook includes the definitions of all practices that will be deemed to constitute academic misconduct. Students should check this link before submitting their work.

Procedures relating to student academic misconduct are given below:

<http://portal.solent.ac.uk/support/official-documents/information-for-students/complaints-conduct/student-academic-misconduct.aspx>

**Ethics Policy**

The work being carried out by students must be in compliance with the Ethics Policy. Where there is an ethical issue, as specified within the Ethics Policy, then students will need an ethics release or an ethical approval prior to the start of the project.

The Ethics Policy is contained within Section 2S of the Academic Handbook:

<http://portal.solent.ac.uk/documents/academic-services/academic-handbook/section-2/2s-university-ethics-policy.pdf>

**Grade marking**

The University uses a letter grade scale for the marking of assessments. Unless students have been specifically informed otherwise their marked assignment will be awarded a letter grade. More detailed information on grade marking and the grade scale can be found on the portal and in the Student Handbook.

<http://portal.solent.ac.uk/documents/academic-services/academic-handbook/section-2/2o-annex-2-assessment-regulations-grade-marking-scale.pdf?t=1534424273208>

**Guidance for online submission through Solent Online Learning (SOL)**

<http://learn.solent.ac.uk/onlinesubmission>