UNIVERSITY OF TEESSIDE
SCHOOL OF COMPUTING

ICA SPECIFICATION

Notes

- This form should be attached to the front of the ICA specification and include all details.
- All work (including CDs etc) needs to be secured and clearly marked with the student name, number and module title.
- An Assignment Front Sheet should be completed before the work is submitted to OASIS.

Module Title: Artificial Intelligence Programming	**Module Leader**: Simon Lynch **Module Code:** AIP
Assignment Title: General Problem-Solving using Operators	**Deadline Date:** 17th May 2010 **Deadline Time:** 12-noon

The information relating to Common Skills is for Higher National Courses only:

Competencies being formally assessed: ____________________________________

You must submit a completed **Common Skills Record Sheet** (obtainable from OASIS) with your assignment.

FULL DETAILS OF THE ASSIGNMENT ARE ATTACHED INCLUDING MARKING & GRADING CRITERIA

Artificial Intelligence Programming (AIP) Assignment

BSc Year 2 - 2009/2010

Module Leader:	Simon Lynch
Other Module Tutor:	Fred Charles
Hand-in:	17th May 2010, OASIS by 12-noon.

Assignment Aim

The aim of this assignment is to test the students' ability to design and develop solutions to problem based learning exercises. The students will also be required to provide a report (1000-1500 words), written and presented to a professional standard, to discuss and critically evaluate the development process of their solutions.

The assignment is to be undertaken by group, where the groups are to be the same as for the ones set for the presentations carried out during the course of the year in this same module.

Learning Outcomes

On successful completion of this module, the student will be able to:

1. Demonstrate how to program a simple agent (robotic agent or game non-player character) to act upon its environment.
2. Evaluate different approaches to search and their relative benefits in different situations.
3. Create small scale AI systems to solve problems, plan sequences of actions or play games.
4. Construct simple knowledge representational schemes and the inference mechanisms that support them.
5. Use Common Lisp to build symbolic representations (rules, knowledge, planning operators, etc) for use with a selection of inference mechanisms.
6. Research appropriate resources.
7. Produce documentation for software design.

Marking Scheme

This assignment accounts for **75%** of the overall mark for the assessment of the module, where the remaining **25%** are allocated to the assessment of the presentations which were undertaken during the course of the year during computer lab sessions.

For this assignment, the Lisp implementation of your solution will be assessed on **45%** (i.e. 60% of 75%) and the technical report **30%** (i.e. 40% of 75%). There is also a peer-assessment element to this assesment in order to account for individual contributions to the overall work undertaken.

Hand in

You are expected to submit both the report (1000-1500 words) and the Lisp code in electronic format on disk (CD or DVD) with the report in Microsoft Word or Adobe Acrobat format. Please, also provide a single printed copy of the report.

Brief

General Problem Solving using STRIPS-like operators and search mechanisms.

The main objectives of the assignment are:

1. use sets of tuples to specify domain state descriptions
2. design and implement STRIPS-like operators
3. investigate the limitations of simple-search strategies

In this assignment, you will be solving a standard planning-like problem for which you will need to define the context for a virtual world (its characteristics and properties) within which a single agent (robot or non-player character) is evolving. You will be developing the solution by describing the domain using sets of tuples and also STRIPS-like operators to be applied on the described domain.

These domain descriptions and operators are based on the techniques introduced in both lectures and practicals. You may start with your first definition of operators as not using pattern-matching, though you must use matching operators for the final version of operators. Similarly the virtual world you define should begin as a small scale problem and may acquire extra features at a later stage.

You are required to set several problems to be solved based on a series of tasks the agent will be able to perform within the virtual world. These tasks should be specified as a set of tuples in order to provide both an initial state and a goal.

The context and scale of the domain problem you are setting should be agreed with the module tutors prior to any further development.

You are not required to implement your own search mechanisms but you must use the following Lisp tools: *matcher*, *utils* and *ops-search* which are available from the module's webpage.

Requirements

- Agent (robot or non-player character):
  - one and only one

- Zones:
  - between 7 and no more than 15

- Positions (inside zones):
  - between 3 and no more than 5 per zone

- Different object types:
  - between 3 and no more than 6

- STRIPS-like operators:
  - between 10 and no more than 20

- Number of objects in the overall domain:
  - between 10 and no more than 20

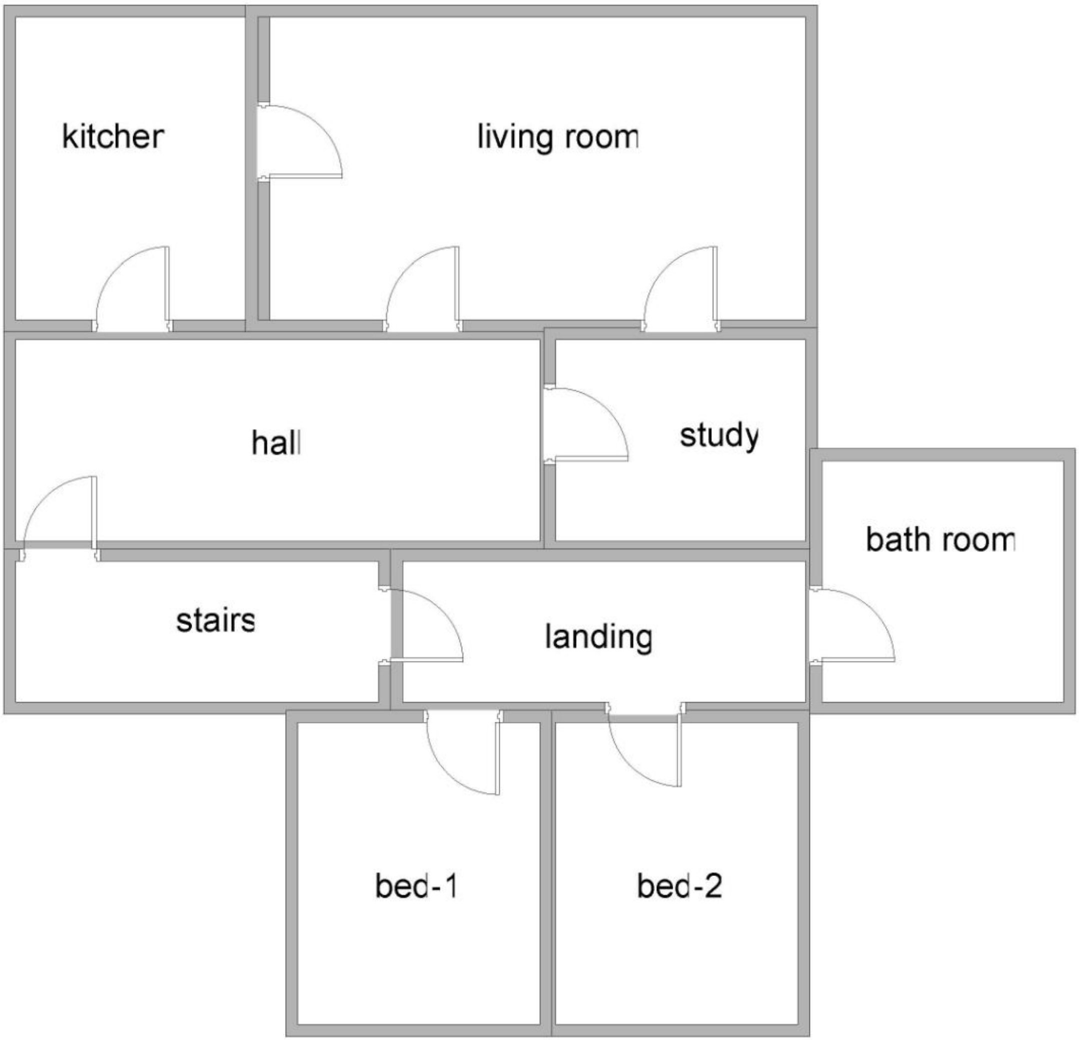
- Connections between zones (including possible guards):
  - between 10 and no more than 20

Example

A virtual world environment contains 9 rooms with doors between them. There is a cupboard and a table in the kitchen and a bed in the bedrooms. There is a robot in the world. The robot has some kind of arm which allows it to hold (at most) one item, it also has some device which allows it to climb on furniture like tables and chairs.

A first task may deal with a situation where the robot needs oiling but the oil is locked in the cupboard in the kitchen and the cupboard key is on the bed in the bedroom.

You would need to provide the overall world description as a set of tuples, the set of operators, the set of tuples describing the initial state and the set of tuples describing the goal state.



Report (30%)

You are required to provide a single report per group of a maximum of 1500 words, written and presented to a professional standard.

The report will include:

- introduction to the context of the problem chosen
- analysis and design of the virtual world to be used
    1. diagram (digital sketch) of the actual virtual environment
    2. diagram of the abstracted representation of the virtual environment
    3. domain description using sets of tuples
- presentation of the setting and basic evaluation of the several small problems to be solved, meaning the several different tasks described for the agent to undertake within the virtual environment

Software (45%)

You are required to provide a single CD/DVD per group which includes:

- the electronic copy of the report.
- the Lisp files.