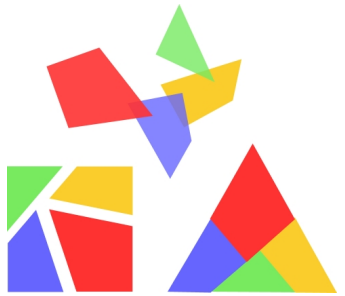
COMP5450M

Knowledge Representation



Lecture KRR-1

Introduction to the Knowledge Represenation and Reasoning Masters Course

Course Elements

- The course will cover the field of knowledge representation by giving a high-level overview of key aims and issues.
- Motivation and philosophical issues will be considered.
- Fundamental principles of logical analysis will be presented (concisely).
- Several important representational formalisms will be examined. Their motivation and capabilities will be explored.
- The potential practicality of KR methods will be illustrated by examining some examples of implemented systems.

Information and Learning

Course materials will be available from the module pages on Minerva and also at `teaching.bb-ai.net/KRR.html`.

There is no set text book for this course, but certain parts of the following provide very useful supporting material:

Russell S. and Norvig P. *Artificial Intelligence, A Modern Approach*, 3rd Edition (especially chapters 7–12).

Brachman RJ and Levesque HJ, *Knowledge Representation and Reasoning*, Morgan Kaufmann 2004

Poole D and Mackworth A, *Artificial intelligence: foundations of computational agents*,

There is an html version of this last title at

`http://artint.info/html/ArtInt.html`

Major Course Topics

- Classical Logic and Proof Systems.
- Automated Reasoning.
- Programming in *Prolog*.
- Representing and reasoning about time and change.
- Space and physical objects.
- Specialised AI representations: situation calculus, non-monotonic logic, description logic, fuzzy logic.
- Ontology and AI Knowledge Bases.

Coursework

The module will have four assessed pieces of work:

1. solution of problems by representing in logic and using an *automated theorem prover* (Prover9)

2. implementation of knowledge-based inference capabilities using *Prolog* (pairs work)

3. a short essay about a major challenge for KR&R (similar to the *Winograd Schema Challenge* (pairs work)

4. an *online test* consisting of short problems based on all the different reasoning systems covered in the module.

Relation to Basic Logical Background

A large amount of material is available in the form of slides and exercises.

We shall recap this but not revisit every detail.

We shall look at the application of KRR techniques in more general problem settings; and will often see that several representational formalisms and reasoning mechanisms need to be combined.