CSE 591
Knowledge Representation and Reasoning
(Spring 2012)

Joohyung Lee

Instructor

- Dr. Joohyung Lee.
  - Close pronunciation: /Jew-Young Lee/
- Assistant Professor of Computer Science and Engineering, SCIDSE
- Research areas: AI (knowledge representation) computational logic (logic programming, formal methods)
- Office: BYENG 472
- Office hours: TTh 4:30-5:30 PM

Course Webpage

- Homepage: http://krr-f12.wikispaces.asu.edu/
  - This is a wiki page
  - Check it regularly, at least once a week
  - Discussion board

Course Description

- Knowledge representation and reasoning (KRR) is one of the fundamental areas in Artificial Intelligence; Any intelligent agent needs to have adequate knowledge in order to behave intelligently.
- The KRR research is concerned with how knowledge can be represented in formal languages and manipulated in an automated way so that computers can make accurate decisions derived from the knowledge base.
- Various methods have been developed in the past 50 years, and it's often discovered that they are in fact closely related to each other.
- This is a graduate level course which will introduce basic and recent developments in the research in knowledge representation and reasoning.

Objectives

- Understand the foundations of KRR and the tradeoff between representation and reasoning
- Understand which knowledge-based technique is appropriate for which tasks
- Can use KRR systems and apply them to real world problems
- Can write a research paper related to knowledge representation.

Prerequisites

- No prerequisites other than graduate students.
- Undergraduates can enroll with my approval.
- Background in mathematical logic is recommended.
  - There will be a quick review
  - You need to catch up quickly
  - CSE 459/598 Logic for Computer Scientists (TTh 10:30-11:45 AM, BYENG M1-09)

Topics

- Foundation of KRR
  - Classical logic
  - Logic programming
- Reasoning about actions
  - Cognitive robotics
- Ontology reasoning
  - Description logics and Semantic Web KR
- Application of KRR in CS
  - Security

Readings

- No designated textbook
- We will read research articles and some chapters from the Handbook of Knowledge Representation (Elsevier). The materials will be distributed in class or posted on the Wiki.
- Brachman & Levesque's textbook is also good.

Grading

- class participation 20%
- two midterms 15% + 15%
- homework 25%
- project 25%

- Grading is separate for 459 and 598

Participation

- Present solutions to the problems in handouts. Should be your own work.
- Each one counts for 10%. Two presentations are required.
- Bonus points for additional presentations. Priority is given to those who has less credits.
- Solutions you found by yourself. Can consult the materials handed out in class, but no other books, Internet, help from others.
- Moore Method

Homework

- Almost weekly
- By emails only. Use plain text in the body of the message. NO ATTACHMENTS
- Append your name to the title; no other change
- Use plain text in the body of the message. NO ATTACHMENTS (see “notation.pdf” on the class Webpage)
- There will be penalty if the instruction is not followed
- I may ask to clarify. Be prompt to reply

Re: CSE 591 KRR Fall 2010 Homework 8 : Aaron Gottesman

Aaron Gottesman aarong@asu.edu
to Joohyung

Here is my file for a 'sudokuSolver' that is included in all three instances:

```
% File 'sudokuSolver'

% This file has the program to solve any instance
% of a sudoku problem.

% A set to hold the numbers that the rows,
% columns and values can take.
:- sorts
  nums.

:- objects
  1..9                :: nums.

% The constant val(R,C)=V stands for the
% value of the number in row R and column C
% is V.
:- constants
  val(nums,nums)      :: nums.

% The variables used where the Rs are for rows,
% the Cs are for columns and the V is for value.
```

Project

- Up to X people in one team.
- You may choose your own topic, or I may assist you in finding one.
- Distribution
  - proposal (half page abstract + 5 min presentation): 10%
  - progress report : 30%
  - final report (6 page two columns): 60%
- In past class, some of successful projects were published in IJCAI, KR, COMPSAC and NMR
- Suitable for MS portfolio (talk to me beforehand)

KR Formalisms to Study

- Classical logic
- Nonmonotonic causal theories
- Answer set programming
- Description logics and OWL
- Situation Calculus, Event Calculus, GOLOG

First Paper to Read

- Some parts of Ch1 of Handbook of Knowledge Representation http://www.cs.utexas.edu/~vl/papers/Ch1.pdf
  - pp. 1 - 4 (before “Natural Deduction in Propositional Logic”)
  - pp. 6 - 12 (before “Natural Deduction with Quantifiers and Equality”)
  - pp. 63 - 70
- This is a review of classical logic. It will be quick.