

Computational Logic

Introduction

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Presentation

Goal

- get in touch with the *theoretical foundations* of computational logic
- systematic *proof techniques*: know and apply
- study the *resolution* with unification
- take a look to implemented *systems* actually doing this work
- towards *logic programming* (LP)

Formal Logic vs. Computational Logic

- in theory: FL before CL
- in practice: you are studying both at the same time, so we try to take this into account

Presentation

How to pass the exam...

- written *test*
- read, understand, explain a *paper* (to be chosen from interesting research work in this area)

Talking to me...

- any time (Mon→Fri), contact by mail
 - damiano@fi.upm.es
 - (or damiano.zanardini@gmail.com)
- my office: now 3301 (CLIP lab), I'll let you know when I move

Contents

- first-order logic: syntax and semantics (recall, see FL course)
- standardization of formulæ
- Herbrand universe, Herbrand base, Herbrand interpretations
- automatic proof techniques: theory
 - Herbrand's theorem
 - method of Gilmore
 - method of Davis-Putnam
 - Robinson's resolution
- resolution with unification
- resolution strategies
- extra (1): automatic theorem provers
 - implementations
 - applications
- extra (2): towards logic programming
 - Horn clauses and SLD resolution
 - applications

Books and Papers

- J.H. Gallier. *Logic for Computer Science: Foundations of Automatic Theorem Proving*. 2003. (quite complete) [FI,PDF]
- L. Paulson. *Logic and Proof*. 2007. (shorter) [PDF]
- M. Huth and M. Ryan. *Logic in Computer Science: Modelling and Reasoning about Systems*. 2004. (mostly formal logic + program analysis) [FI,PDF]
- T. Tymoczko and J. Henle. *Sweet Reason*. 1995. (a broader view on logic; definitely good for a read) [FI]
- A. Leitsch. *The Resolution Calculus*. 1997. [E.U. Informatica]
- A. Ramsay. *Formal Methods in Artificial Intelligence*. 1989 [FI]
- R.M. Smullyan. *First-order logic*. 1995 (orig. 1968) [FI]
- C-L. Chang and R.C-T. Lee. *Symbolic Logic and Mechanical Theorem Proving*. 1973. (a bit old) [FI]
- J.A. Robinson. *Computational Logic - Memories of the Past and Challenges for the Future*. 2000. (interesting paper)

Links and Resources

On the WWW

Still empty

- http://www.clip.dia.fi.upm.es/~damiano/teaching/emcl/cl_08_09/

I will put here useful stuff about the course