COL703 - Assignment3
First Order Resolution

Suyash Agrawal
2015CS10262

November 28, 2017

Introduction

The objective of this assigment was to check satisfiability of first order logic statements using Resolution Refutation method.

Procedure

The following procedure was used for resolution:

- First standardize the variables of the formula apart to prevent free variable capture during various steps.
- Then convert the standardized formula to Prenex Normal form.
- Convert the quantifier free part to Conjunctive Normal Form.
- Skolemize the formula to get rid of EXISTS quantifier.
- Convert the formula to set notation, i.e. formula is a set of clauses and each clause is a set of predicate.
- Resolution Step:
  - Select two clauses from set such that there is a predicate p in one of them and NOT(predicate p) in other and they are unifiable.
  - Compute the most general unifier for these two predicate.
  - Apply the m.g.u. computed on the rest of the predicates in the selected clauses.
  - Remove these two clauses from the original set of clauses and add the union of the predicates in these clauses after removing the selected predicates and applying the m.g.u.
- Do resolution step repeatedly till it is possible to find two unifiable perdicates.
- The result is:
  - If Empty clause is derived then False (as contradiction is shown)
  - Else True.

NOTE

Since the resolution step is itself indeterministic (as it does not specify the procedure for choosing which terms to unify), this program can give false positives i.e. it can output true for unsatisfiable formula ,as for some order of resolution we may not be able to derive contradiction.
Though, the program will never give false negative, i.e. if it outputs false for a formula then that formula is definitely false as we are able to derive contradiction from it.

Running

Please see "test.sml" attached to see how to use the program. It also contains sample testcases.