IN112: FOL formal systems

Author : Christophe Garion <garion@isae.fr>
Audience : SUPAERO 1A
Date :

1. **Factors and binary resolvents**
   (a) find a factor for the following clauses:
      - $R(x, a) \vee Q(y) \vee R(f(b), a)$
      - $P(f(x), x) \vee Q(x) \vee P(y, a)$
   (b) find a binary resolvent for the following clauses:
      - $P(x, a) \vee Q(y)$ and $\neg P(z, z)$
      - $\neg P(x, f(x)) \vee Q(g(x))$ and $P(a, y) \vee R(y)$
   (c) is it possible to find a binary resolvent of $P(a, x)$ and $\neg P(x, b)$?
2. **Is Socrates mortal or not?**
   Using a FOL language and the Resolution formal system, prove that the following argument is correct:
   - all humans are mortal
   - Socrates is human
   - therefore Socrates is mortal
3. **Students or not**
   Prove using the Resolution formal system that the following argument is correct:
   - every student has a student card
   - PhD students are students
   - the only persons who benefit from ONERA work council are ONERA employees
   - PhD students at ONERA benefit from ONERA work council
   - therefore PhD students at ONERA are ONERA employees who have a student card
4. **To ski or not to ski**
   (a) represent the following facts and question in first-order logic

   > Tony, Mike, and John belong to the Alpine Club. Every member of the Alpine Club is either a skier or a mountain climber (or both). No mountain climber likes rain, and all skiers like snow. Mike dislikes whatever Tony likes and likes whatever Tony dislikes. Tony likes rain and snow. Is there a member of the Alpine Club who is a mountain climber but not a skier?

   (b) using Resolution, find the answer.