MSc Module COMP6012

Automated Reasoning II
Using SPASS

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Getting started

1. Log in under Linux.
2. Suggestion: Create a subdirectory in your COMP60121 directory called `spass` (say).

   ```
   mkdir spass
   cd spass
   ```

3. Copy the file `barber_ex.dfg` from `/opt/info/courses/COMP60121` into your `spass` subdirectory.

   ```
   cp /opt/info/courses/COMP60121/*.dfg .
   ```

   (Note the dot at the end of the line; it's important.)

4. Create a link from the executable `/opt/spass/bin/SPASS` to your `spass` directory.

   ```
   ln -s /opt/spass/bin/SPASS SPASS
   ```

5. Run SPASS on the file.

   ```
   SPASS barber_ex.dfg
   ```

Lots of output is produced. Look for the the line starting with `SPASS beiseite` which is produced when SPASS terminates normally. It should say one of the following.

```
SPASS beiseite: Completion found.
SPASS beiseite: Proof found.
```

The meaning of this and the other output is explained in the tutorial, see below.

Exercise

1. (a) Work through the tutorial at `http://spass.mpi-sb.mpg.de/tutorial.html` (a hard copy is included in this handout).
   (b) Copy the Socrates example from it into a file and run it with SPASS. See tips below for additional options to use when running SPASS.

2. Consider the following formulae saying that R is a binary relation which is symmetric, transitive and serial.

$$F_1 = \forall x \forall y (R(x,y) \to R(y,x))$$
$$F_2 = \forall x \forall y \forall z ((R(x,y) \land R(y,z)) \to R(x,z))$$
$$F_3 = \forall x \exists y R(x,y)$$

   Using SPASS prove that

$$(F_1 \land F_2 \land F_3) \to \forall x R(x,x).$$

   That is, if R is symmetric, transitive and serial then it is reflexive.

3. Consult the manual pages of SPASS by typing

```
man -M /opt/spass/man SPASS
```

   and work out how to run the prover so that it uses the following. (See ‘Resources’ below for other formats of the manual pages.)

   (a) Ordered resolution without selection.
   (b) Resolution with maximal selection of all negative literals.
   (c) Ordered hyperresolution.
   Hint: You may need to switch off the Auto mode by using `-Auto=0`, and then explicitly specifying the inference rules and reduction rules the prover should use.

Tips

By default SPASS uses specialised rules and techniques that we have not covered in the course. In order to help you make sense of the output it is a good idea to switch some of the default options off. Specifically, I suggest you always use at least these options when running SPASS.

```
SPASS -CNFStrSkolem=0 -CNFOptSkolem=0 -Sorts=0 -CNFRenaming=0 <extra
options> <SPASS input file>
```

Resources

- Lecture notes.
- SPASS tutorial: `http://spass.mpi-sb.mpg.de/tutorial.html` (these notes include a copy).
- Specification of the input syntax for SPASS (included in these notes).
- Local directory: `/opt/spass`.

  The directory contains linux binaries, the manual pages in various formats, the SPASS tutorial, a specification of the SPASS input language and the SPASS Handbook.

  To consult the manual pages use one of the following

  ```
  man -M /opt/spass/man SPASS
  info -f /opt/spass/info/script.info
  lynx /opt/spass/share/spass/html/script.html
  ```

- SPASS website: `http://spass.mpi-sb.mpg.de`.

  Includes lots of documentation, tutorial, web interface, problem libraries, and a download area with sources and binaries for various platforms (Linux, Unix, Windows, XP, Mac, Nokia N800).

- MSPASS website: `http://www.cs.man.ac.uk/~schmidt/mspass`.

  MSPASS is an extension of an older version of SPASS that is now integrated into the latest release of SPASS.