Grundlagen der Künstlichen Intelligenz

Programming Exercise 2: Constraint Satisfaction Problem — 23th November 2018

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Problem 2: Playing board games

During Christmas Holidays, your friends and relatives suddenly leave you alone babysitting their children: your younger sister Andrea and her schoolmate Beatrix, the sister of your best friend Celeste, your twin cousins David and Emanuel, the new-born son of your brother Frank, your brother-in-law George and the neighbor's niece Hilary. You want to avoid the evening ending up in a crying and screaming catastrophe. In order to survive you have to keep the children busy and happy, but you just have the following games at home:

- Risk
- Scrabble
- Card game UNO
- Lego

Consider the following constraints:

1. Everyone plays a game
2. No one plays alone
3. No game is not played (i.e. each game must be played at least by one child)
4. Scrabble is a game for 2 to 4 players
5. Lego is a game for 1 to 3 players
6. Risk is a game for 3 to 6 players
7. UNO is a game for 2 to 6 players
8. Andrea plays together with Celeste
9. David, Emanuel, and George don't play together because they don't get along
10. David and Beatrix don't play Risk because they hate this game
11. Hilary plays Lego with Frank because he is just a baby
12. Hilary plays with at least another girl beside herself
13. No one plays Scrabble
14. Beatrix plays together with Andrea

Model the constraint satisfaction problem in Savile Row. For each of the following subsets of constraints, find the solution, if it exists:

Problem 2.1: { 1 – 2, 4 – 12 }

Problem 2.2: { 1, 3 – 10, 12 }

Problem 2.3: { 1, 3 – 7, 10 – 12 }

Problem 2.4: { 1 – 2, 4 – 7, 10 – 13}

Problem 2.5: { 1 – 2, 4 – 11, 13 }

Problem 2.6: { 1 – 2, 4 – 7, 10 – 14}

Note that problem `2.1` and `2.3` are not satisfiable.

Please upload your solution files according to one of the following two options. Depending on the option of your choice you will be uploading between 7 and 8 files.

Option 1: Six `.eprime` files

- `csp1.eprime` – your `.eprime` file for problem 2.1
- `csp2.eprime` – your `.eprime` file for problem 2.2
- `csp3.eprime` – your `.eprime` file for problem 2.3
- `csp4.eprime` – your `.eprime` file for problem 2.4
- `csp5.eprime` – your `.eprime` file for problem 2.5
- `csp6.eprime` – your `.eprime` file for problem 2.6
- `readme.txt` – a text file (example in the next page) explaining:
  - Your choice of variables,
  - Your solutions to each problem (if a solution exists) i.e. who gets what. If multiple solutions exist for some problem, you need only give one solution here (note that you can run MINION with the flag `-all-solutions`).

Option 2: One `.eprime` file and six `.param` files

- `csp.eprime` – your `.eprime` file for the whole problem
- `csp1.param` – your `.param` file for problem 2.1
- `csp2.param` – your `.param` file for problem 2.2
- `csp3.param` – your `.param` file for problem 2.3
- `csp4.param` – your `.param` file for problem 2.4
- `csp5.param` – your `.param` file for problem 2.5
- `csp6.param` – your `.param` file for problem 2.6
- `readme.txt` – a text file (example in the next page) explaining:
  - Your choice of variables,
  - Your solutions to each problem (if a solution exists) i.e. who gets what. If multiple solutions exist for some problem, you need only give one solution here (note that you can run MINION with the flag `-all-solutions`).

A pass will be awarded only if:

1. the solutions to the problems in `readme.txt` are correct,
2. your `.eprime` files (and `.param` files, if used) work and generate a `solution` file if a solution exists, and the problem has been modeled correctly using your choice of variables,
3. your submission is submitted in the correct format, as shown above.
4. like the rest of the programming exercises, this is an individual project and work **must** be your own. (We will use a plagiarism detection tool and any copied code will annul all bonus exercises from both the copier and the copied person!)

Submission will close on **Sunday, 23.12.2018 at 23:59**. Your solution will be marked using a shell script. You can either pass (if all requirements listed above are met) or fail (unfortunately, we cannot manually check for minor errors). Thus, it is very important to follow the instructions exactly!

Example `readme.txt`:

```
Cecilia Curreli
Matrikelnr. 0XXXXXXX

Choice of variables: I chose to assign blah...

Solution 2.1:
Andrea: Risk
Beatrix: Lego
Celeste: Scrabble
David: UNO
Emanuel: UNO
Frank: Scrabble
George: Risk
Hilary: Scrabble

Solution 2.2:
No solution found

Solution 2.3:
Andrea: Scrabble
Beatrix: Lego
Celeste: Scrabble
David: UNO
Emanuel: UNO
Frank: Scrabble
George: Lego
Hilary: Lego

Solution 2.4:
No solution found

Solution 2.5:
Andrea: Risk
Beatrix: Lego
Celeste: UNO
David: UNO
Emanuel: Scrabble
Frank: Scrabble
George: Risk
Hilary: Risk

Solution 2.6:
No solution found
```