ProjectB

Group: Fed a sheep
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Question 1
Indicate the title of your project and give a small paragraph description of the project

School dormitory allocation system.

Create an allocation system to assign each student who applies for a hostel to a hostel that has a suitable environment and good roommates. Each unit has three bedrooms and can accommodate up to two people per bedroom, with each unit sharing a kitchen. Students will be allocated to the same bedroom/unit by the system, taking into account their living experience and gender. In summary, the goal of this project is to create an allocation system for hostel providers that will attract students to move in while also providing convenience for them.

Question 2 Overview
2.1 List the predicates and what they mean
Student/2:Store student names and their IDs.
Gender/2:Store student IDs and their gender.
Pet/2:Record student IDs and whether they have pets.
Bedtime/2:Record student IDs with their approximate bedtime.
Waketime/2:Record student IDs with their approximate waketime.
Hobby/2:Record student IDs and their hobbies (including sports, fitness, computer games, etc.).
Room/2:Record the room number and the unit number to which it belongs.
Registration/2:Record the room number and the assigned student ID.
Cook/2:Record the student IDs and whether they want to cook. Extension
Matching_degree/3:Record the match between two students' hobbies. Extension

2.2 For each predicate listed in Question 2.1, indicate in a table the following information:
Arity How many arguments does the predicate take?
Function What is the function of the predicate: is it an input predicate, an internal predicate, or an output predicate?
Nature Is it a domain predicate or a search predicate?

Name	Arity	Function	Nature
Student	2	Input	Search
Gender	2	Input	Search
Pet	2	Input	Search
Bedtime	2	Input	Domain
Waketime	2	Input	Domain
Hobby	2	Input	Search
Room	2	Internal	Search
Registration	2	Output	Search
Cook	2	Input	Search
Matching_degree	3	Internal	Search

Question 3 Constraints and Optimization
3.1 List the constraints / optimization criteria that you have identified for the problem, even if you haven't implemented them. Describe each of them in English. If any of your constraints or criteria cannot be effectively captured with Answer-Set Programming, state so and justify why not briefly.

1. Gender constraint: Students of different genders cannot be allocated to the same room.

2. Room capacity constraint: If two students are allocated to the room, no other student can be allocated to the room until at least one student has checked out.

3. Pet ownership constraints: Students who do not like pets will not be allocated to the same unit as students who have pets.

4. Sleeping time constraint: Only students whose bedtime and wake-up time are all within 1 hour of each other will be grouped together.

5. Room assignment: The one with the highest matching degree will be assigned to a room, then the one with the lower matching degree.

6. Cook constraints: One unit can have at most 3 students who want to cook in their dormitory.

7. Matching degree calculation: Matching degree will plus one if two students have the same hobby.

3.2 For each constraint or optimization criterion listed in Question 3.1, indicate in a table the following information:

Name	Type	Coded	Lines	Works	MVP
Gender constraint	Constraint	✅	22 - 25	✅	✅
Room capacity constraint	Constraint	✅	27 - 29	✅	✅
Matching degree calculation	Criterion	✅	31 - 34	✅	✅
Pet ownership constraints	Constraint	✅	36 - 39	✅	✅
Cook constraints	Constraint	✅	41 - 42	✅	✅
Sleeping time constraint	Constraint	✅	44 - 60	✅	✅

Question 4
In practice / completion / implementation
does solve.lp work on the sampledata.lp?
Yes, it totally does.

4.1 [Self Evaluation] Self-evaluate from the following list
    4

4.2 Explains or justifies your self evaluation.
As we described in Project A 1.2, our system limits each unit to three bedrooms that can accommodate up to two people each. On the assumption that everyone can live in the flat, students of different genders must not be assigned to the same bedroom, and students who have less than an hour difference in living time may become roommates (this differs from the two hours in Project A because in subsequent discussions it was found that two hours was a bit much), and students who have pets will not live in the same unit as students who are allergic to pets. We added a few extensions after the basic conditions were met: 1. One unit can have at most 3 students who want to cook in their dormitory, because then there would not be enough kitchen space. 2. A matching_degree was added so that as many of the assigned roommates had the same hobbies as possible.

```
clingo version 5.4.1
Reading from sampledata1.lp ...
Solving...
Answer: 1
registration(101,z06) registration(102,z08) registration(102,z09) registration(1
03,z04) registration(103,z05) registration(201,z07) registration(201,z10) regist
ration(202,z01) registration(202,z02) registration(203,z03) total_degree(12)
Optimization: -12
OPTIMUM FOUND

Models       : 1
  Optimum    : yes
Optimization : -12
Calls        : 1
Time         : 0.032s (Solving: 0.02s 1st Model: 0.00s Unsat: 0.02s)
CPU Time     : 0.032s
```
```
clingo version 5.4.1
Reading from sampledata2.lp ...
Solving...
Answer: 1
registration(101,z06) registration(101,z11) registration(102,z08) registration(1
02,z09) registration(103,z07) registration(103,z10) registration(201,z01) regist
ration(201,z02) registration(202,z03) registration(202,z12) registration(203,z04
) registration(203,z05) total_degree(14)
Optimization: -14
OPTIMUM FOUND
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