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Introduction

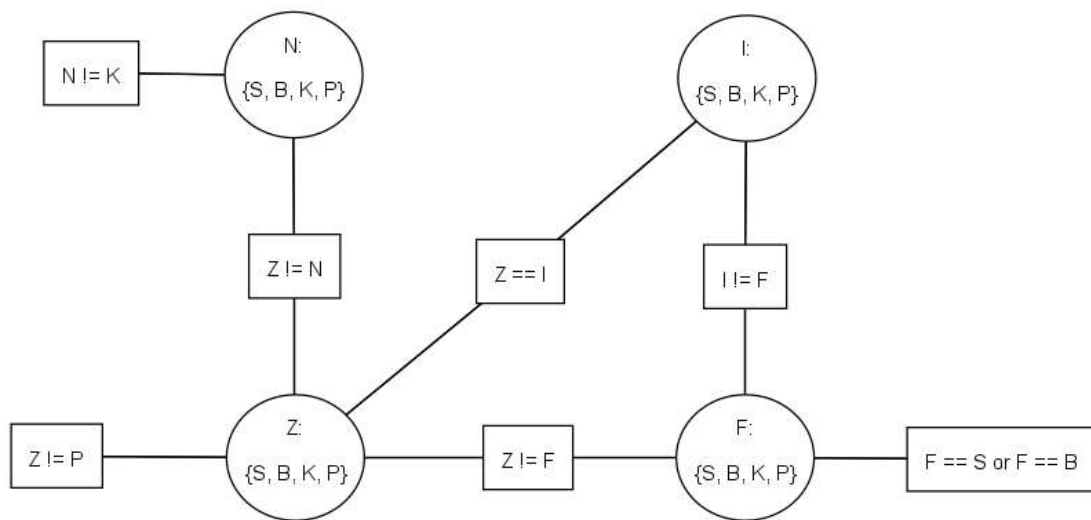
This lab required us to formulate four scenarios as CSPs and solve them using the java applet, such that the solution satisfies all the given constraints for each of the scenarios.

Task 1

Analysis

The given scenario is about four friends who have various preferences regarding the food they want to order. We need to form a CSP and find a solution that meets their preferences.

Solution



Variables: Zahid (Z), Ishrak (I), Farabi (F), Nafisa (N)

Domains: Special Rice (S), Biriyani Rice (B), Kashmiri Naan (K), Paratha (P)

Constraints:

- **(I != F):** This ensures that Ishrak and Farabi have different dishes. We set the values (S, S), (B, B), (K, K) and (P, P) not true since they will mean they take the same dish.
- **(F == S or F == B):** Farabi wants only rice items, so either Special Rice or Biryani Rice. Only S and B are set to true.
- **(N != K):** Nafisa will order anything other than Kashmiri Naan. Everything other than K is set to true.
- **(Z != P):** This ensures that Zahid will order anything but Paratha. Everything other than P is set to true.
- **(Z != N):** Since Zahid wants a unique dish, his dish cannot be the same as Nafisa's. We set the values (S, S), (B, B), (K, K) and (P, P) not true for Z and N.
- **(Z != F):** Since Zahid wants a unique dish, his dish cannot be the same as Farabi's either. We set the values (S, S), (B, B), (K, K) and (P, P) not true for Z and F.
- **(Z == I):** However, Zahid will get the same dish as Ishrak so they are equal. We set the values (S, S), (B, B), (K, K) and (P, P) true for Z and I since this means that they get the same dish.

Possible Solution

One possible solution that satisfies all the constraints is:

- Zahid: Biryani Rice
- Ishrak: Biryani Rice
- Farabi: Special Rice
- Nafisa: Special Rice

Findings

The solution found by the applet satisfies all the given constraints. So, it is safe to say that our CSP formulation is correct and so is the solution.

Challenges

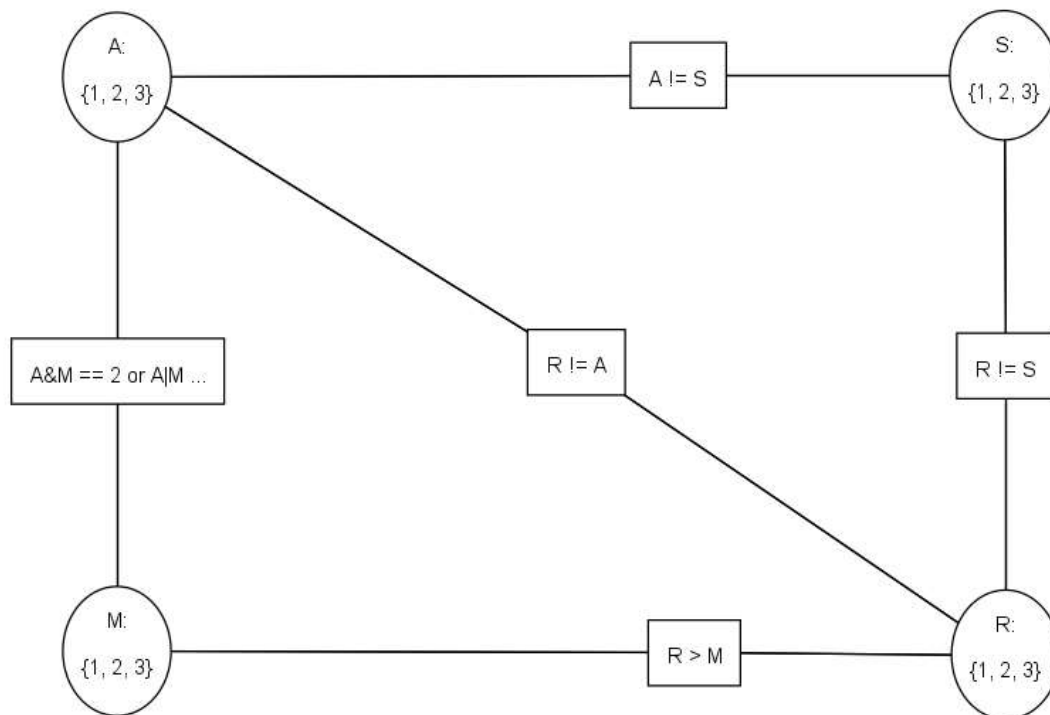
I did not face any challenges while solving this problem.

Task 2

Analysis

This scenario revolves around four people looking to rent places following some given constraints. The target is the same as the first task: formulate the CSP and solve it.

Solution



Variables: ³ Ali (A), Sristy (S), Maliha (M), and Rafid (R)

Domains: 1, 2, 3

Constraints:

- ¹ **(A != S):** This ensures that Ali and Sristy live on different floors. We set the values (1, 1), (2, 2) and (3, 3) not true since they will mean they are on the same floor.
- ⁸ **(A & M == 2 or A | M == 3):** We set the value (2, 2) and the values having 3 true. This ensures that Ali and Maliha will be on floor 2 if they are on the same floor or one of them will be on floor 3 if they are on different floors.

- **(R != S):** We set the values (1, 1), (2, 2) and (3, 3) not true to ensure that Rafid cannot live on the same floor as anyone, including Sristy.
- **(R != A):** Similar to the previous constraint, this ensures that Rafid is not on the same floor as Ali either.
- **(R > M):** This ensures that Rafid lives on a higher floor than Maliha. We ensure this by setting only (2, 1), (3, 1) and (3, 2) true for Rafid and Maliha since they are the only pairs where Rafid > M.

Possible Solution

- Sristy: 1
- Ali: 2
- Maliha: 2
- Rafid: 3

Findings

The solution found by the applet meets our constraints. So the CSP and the solution are correct.

Challenges

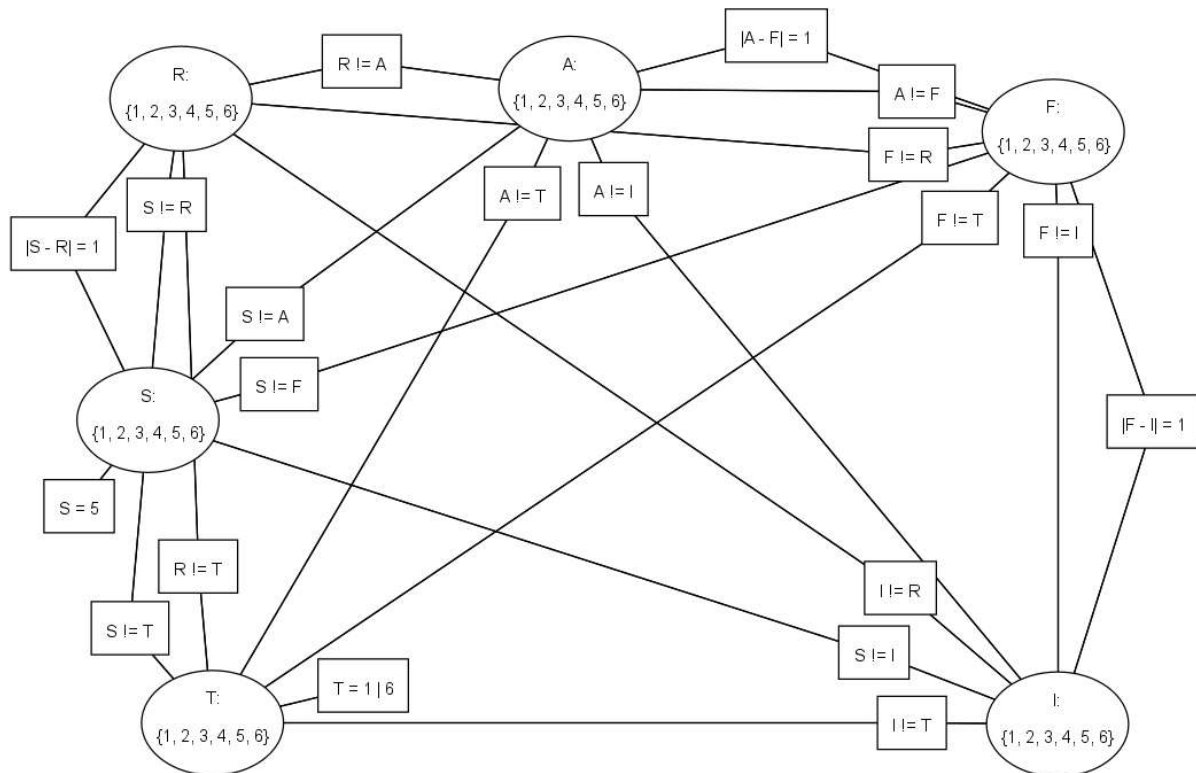
I did not face any challenges while trying to solve this problem.

Task 3

Analysis

This problem is about six friends occupying a unique spot in a queue but following some given constraints.

Solution



Variables: Rifat (R), Atiq (A), Farhan (F), Ishmam (I), Tabassum (T), Sabrina (S)

Domains: 1, 2, 3, 4, 5, 6

Constraints:

- **(S = 5):** Since Sabrina has only one person behind, her position is 5.
- **(T = 1 | 6):** We set the values 1 and 6 true since Tabassum can only occupy the first or the last position.
- **(|S - R| = 1):** We set only those pairs of values true where the difference is 1. This ensures that Sabrina and Rifat stand beside each other, regardless of their position in the queue.

- ($|A - F| = 1$): We set the pairs of values with difference 1 true. This constraint along with the next one ensures that Farhan is standing between Atiq and Ishmam.
- ($|F - I| = 1$): Similar to the previous constraint, we set those values true where the absolute difference is 1. This constraint along with the previous one ensures either of the two sequences: A-F-I or I-F-A.
- **AllDiff**: To ensure that everyone occupies a unique spot, we set these constraints: $(F \neq T)$, $(F \neq S)$, $(I \neq T)$, $(I \neq S)$, $(T \neq S)$, $(R \neq A)$, $(R \neq F)$, $(R \neq I)$, $(R \neq T)$, $(R \neq S)$, $(A \neq F)$, $(A \neq I)$, $(A \neq T)$, $(A \neq S)$, $(F \neq I)$ like every other inequality constraint.

Possible Solution

- Atiq: 1
- Farhan: 2
- Ishmam: 3
- Rifat: 4
- Sabrina: 5
- Tabassum: 6

Findings

Our obtained solution is correct since it satisfies all the constraints.

Challenges

Initially, I did not notice that everyone would have a unique position. So, I forgot to add the AllDiff constraint. While setting it, I tried to use a ternary constraint but things got messy really quickly and I got confused with three variables. Then I decided to handle it with every inequality separate.

6

The problem is about creating a schedule for two faculty members who will complete the given tasks following some constraints.

[illegible]

6

1

Constraints:

- Each faculty member can do one task at a time, meaning they cannot work on multiple tasks simultaneously. This is enforced by the constraints $G \neq Q$, $G \neq C$, $G \neq D$, $G \neq L$, $Q \neq C$, $Q \neq D$, $Q \neq L$, $C \neq D$, $C \neq L$, $D \neq L$.
- The AI class (C) must be completed before the AI lab (L) can be conducted, represented as $C < L$.
- Gathering contents (G) for DBMS must be finished before the DBMS Lab (D) starts, denoted by $G < D$.
- The DBMS Lab (D) must be completed by 10 am, signified by $D < 10$.
- Checking quiz scripts (Q) and conducting the AI Lab (L) each require 2 consecutive hours and must start by 10 am, with constraints $Q < 11$ and $L < 11$.
- Faculty member X specializes in gathering contents (G) for DBMS, indicated by $G = X$.
- The faculty member conducting the DBMS Lab (D) cannot handle the AI Lab (L), represented by $D_{lab} \neq L_{lab}$.
- The faculty member conducting the AI Lab (L) must also handle the AI class (C), expressed as $L_{lab} = C_{lab}$.
- While one faculty member is conducting the DBMS Lab (D), the other faculty member cannot perform any tasks and must attend the lab, denoted as $D = X, Y$ for $[D, Q]$, $[D, G]$, $[D, C]$, $[D, L]$.

Possible Solution

- D: x9
- C: y8
- Q: x10
- G: x8
- L: y10

Findings

The obtained solution meets all the constraints. So, safe to say that it is correct.

Challenges

I found it difficult to visualize the scheduling task as a CSP, especially the domains and some of the constraints.

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