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AI-Hw-3

Choice of Representation:
I have used a common class which stores the information of all variables including problem 1 and problem 2. While creating objects for different problems, different constructors are called resulting in different objects for the two problems. A backtrack search method is written which takes variable and its domain as an input to it. Consistency functions are written for two different problems.

Problem: 1(Job's Puzzle)

Variables:
I have chosen 8 variables in the problem. Each variable will correspond to one job. Hence 8 variables are listed below.
Roberta_Job1 , Roberta_Job2, Thelma_Job1, Thelma_Job2, Steve_Job1, Steve_Job2, Pete_Job1, Pete_Job2

Domains:
Since each variable can take any of the 8 jobs listed below. So the domain of the problem is Chef, Guard, Nurse, Clerk, Police officer , Teacher, Actor and Boxer.

Constraint:
I have included 8 constraints as mentioned in the problem. It also includes the one in which a variable cannot be assigned more than one job.

Solution:

Name	Sex	Job
Roberta	FEMALE	GUARD
Roberta	FEMALE	TEACHER
Thelma	FEMALE	CHEF
Thelma	FEMALE	BOXER
Steve	MALE	NURSE
Steve	MALE	POLICE OFFICER
Pete	MALE	CLERK
Pete	MALE	ACTOR

MRV Heuristic function:

The heuristic function used is minimum remaining value(MRV).
Implementation:
Before assigning unassigned variable to any domain, MRV function is called to pick the only variable that has minimum remaining value left. This is done by sequentially picking all the unassigned variables and assign values to them and count how many values can be assigned to each variable. This is done for all unassigned variables. After the process is completed, the variable which has least number of values which can be assigned is picked by MRV function.
Example:
        Let's say Roberta_Job1 is assigned any job like guard. Now the above process is repeated for the rest of 7 unassigned variable. Assume values comes out be [3,2,1,4,2,4,7]. This means Roberta_Job2 can be assigned only 3 value, Thelma_Job1 can be assigned 2 values, Thelma_Job2 -> 1 values and so on. So according to MRV, variable Thelma_Job2 is picked as it has least MRV value.

No MRV used
States Searched: 52

With MRV Heuristic
States Searched: 36

Problem 2 (House Puzzle)

Variable:
I have chosen 25 variables in the problem:
House: Red, Green , Yellow, Blue, Ivory
Man: Englishman, Spaniard, Norwegian, Japanese, Ukranian
Animal: Dog, Fox, Snails, Horse, Zebra
Eat: Hershey, Kit Kat, Smarties, Snickers, Milky Way
Drinks: Orange, Tea, Coffee, Milk, Water

Domain: [1,2,3,4, 5] -> House Numbers
Since each variable can take 1,2,3,4 or 5 as house number. So the domain is the house numbers.

Constraint:

I have used 15 constraints, 14 given in the problem section and last one is used like if house number is assigned to a category, then same house number can not be used for that particular category.

Solution:

House No	Category	Specification
3	house	Red
5	house	Green
1	house	Yellow
2	house	Blue
4	house	Ivory
3	man	Englishman
4	man	Spaniard
1	man	Norwgian
5	man	Japanese
2	man	Ukranian
4	animal	Dog
1	animal	Fox
3	animal	Snails
2	animal	Horse
5	animal	Zebra
2	eat	Hershey
1	eat	KitKat
3	eat	Smarties
4	eat	Snicker
5	eat	Milky Way
4	drink	Orange
2	drink	Tea
5	drink	Coffee
3	drink	Milk
1	drink	Water

MRV Heuristic function:

The heuristic function used is minimum remaining value(MRV).

Implementation:

It is exactly the same as described above. Just loop over all unassigned variables and check which one has the minimum remaining value left. Pick that variable instead of sequentially pulling unassigned variable.

No MRV used:

States Searched: 2730

MRV Used:

States Searched: 110