Department of Computer Science
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Introduction to Artificial Intelligence
Laboratory activity

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Logics

Electronic Festival

The five biggest DJs in the world are going to play in an electronic music festival, each one in a specific stage. They are side by side waiting to play. Find out their nationalities, hobbies and which genre they play.

Shirt: black, blue, green, red, white
Stage: Arcadia, Asgard, Shangrila, Valhalla, Xibalba
Nationality: American, Canadian, Dutch, French,
Scottish Age: 25 years, 30 years, 35 years, 40 years, 45 years
Hobby: camping, juggling, painting, singing, surfing
Genre: drum and bass, dubstep, EDM, house, trance

We know that:
The Scottish is somewhere to the left of the DJ wearing the White shirt.
At the fourth position is the DJ who is going to play on the Arcadia stage.
The 30 years old DJ is at the first position.
The DJ that plays EDM is exactly to the right of the Canadian.
The one who likes Painting is next to the DJ who plays Dubstep.
The DJ wearing the Black shirt is somewhere between the Scottish and the Dubstep player, in that order.
The French DJ is next to the one wearing the Blue shirt.
At one of the ends is the DJ that likes Camping.
The DJ who is going to play on the Asgard stage is wearing the Blue shirt.
The one that likes Painting is somewhere between the DJ wearing Green and the DJ wearing Blue, in that order.
At the fifth position is the DJ who plays Drum and bass.
At the middle is the DJ who is going to play on the Asgard stage.
The one who plays Trance is next to the one who plays Dubstep.
The Canadian is exactly to the left of the DJ who likes Juggling.
The DJ whose hobby is Singing is exactly to the right of the DJ wearing the Black shirt.
The DJ in his Mid thirties is next to the DJ who is into Juggling.
The 40 years old DJ is at the fourth position.
The 40 years old DJ is somewhere between the Dutch and the youngest DJ, in that order.
The DJ wearing Blue is somewhere to the left of the DJ who is going to play on the Xibalba stage.
The one who enjoys Surfing is going to play on the Valhalla stage.
The DJ wearing the Red shirt is somewhere to the right of the French.

Implementation

As we need to write a huge amount of propositions to encode the available knowledge. First Order Logic (FOL in short) offers us some more operators, which allow a more compact way of writting the same knowledge.
We want to model this problem in FOL, then to ask Mace4 to find a model.We are going to use several predicates of arity one,like:

right-dj(x,y) : this is a predicate that tell us that y is the left neighbor of x
We know that the DJs are side by side, so we give to each one a position(0,1,2,3,4). I implemented the right neighbor assuming that the neighbor from the right has the position of his neighbor from left plus one.

neighbors(x,y) : means that x and y are neighbors
Two DJs are neighbors if their position is equal with the other position plus one.

one-end(x) : means that x is placed in one of the and(position 0 or 4)

somewhere-right(x,y) : means that y is placed somewhere in the right of y
Y being somewhere in the right of y means that y's position is x's position plus 1,or plus 2, or plus 3

between(x,y,z) : means that y is somewhere between x and z
Y being somewhere in the middle of x and z means that x is somewhere in the left of y and z is somewhere in the right of y. For this i used the somewhere-right predicate.

Solution

I found this puzzle on brainzilla.com/zebrapuzzles. The advantage of this site was that I was able to check if the model that mace4 is giving is correct.

Appendix A

Your original code

```
set(arithmetic).            % For the "right dj" relation.
assign(domain_size, 5).  % The five dj are {1,2,3,4,5}.

list(distinct).             % Objects in each list are distinct.
[Scottish,Canadian,French,Dutch,American].          %nationalities
        [blue,black,green,red,pink].                  % shirts
[drum,dubstep,EDM,house,trance].                    %genre
[Xibalba,Shangri,Asgard,Arcadia,Valhalla].          %stage
[age1,age2,age3,age4,age5].                         %age 25,30,35,40,45
[camping,juggling,painting,singing,surfing].        %hobby
end_of_list.


formulas(assumptions).
   % Definitions of "right_dj".

   %y se afla in dreapta lui x
   right_dj(x,y) <-> x+1 = y.
   %y left/ right neighbor of x
   neighbors(x,y) <-> right_dj(x,y) | right_dj(y,x).
   %x se afla la unul dintre capete
   one_end(x) <-> (x = 4) | (x = 0).
   %y se afla undeva in partea dreapta a lui x
   somewhere_right(x,y) <-> (x+1=y) | (x+2=y) | (x+3=y).
   %y se afla undeva intre x si z
   between(x,y,z)<->somewhere_right(x,y) & somewhere_right(y,z).


   % The clues.
somewhere_right(Scottish,pink).
Arcadia = 3.
age2 = 0.
right_dj(Canadian,EDM).
neighbors(painting,dubstep).
between(Scottish,black,dubstep).
neighbors(French,blue).
```

```
one_end(camping).
Asgard = blue.
between(green,painting,blue).
drum = 4.
Asgard = 2.
neighbors(trance,dubstep).
right_dj(Canadian,jugglin). % left canadian & right juggling
right_dj(black,singing).    %left black & right singing
neighbors(age3,juggling).
age4 = 3.
between(Dutch,age4,age1).
somewhere_right(blue,Xibalba).
Valhalla=surfing.
somewhere_right(French,red).
end_of_list.
```