YANAMANDRA SHARATH CHANDRA (585953)

University of Pisa

TURN 1:

PROBLEMS : SOLVING ZEBRA PUZZLE

CLUES GIVEN TO SOLVE THE PROBLEM:

1. There are five houses.
2. The Englishman lives in the red house.
3. The Spaniard owns the dog.
4. Coffee is drunk in the green house.
5. The Ukrainian drinks tea.
6. The green house is immediately to the right of the ivory house.
7. The Old Gold smoker owns snails.
8. Kools are smoked in the yellow house.
9. Milk is drunk in the middle house.
10. The Norwegian lives in the first house.
11. The man who smokes Chesterfields lives in the house next to the man with the fox.
12. Kools are smoked in the house next to the house where the horse is kept.
13. The Lucky Strike smoker drinks orange juice.
14. The Japanese smokes Parliaments.
15. The Norwegian lives next to the blue house.

Before jumping straight into solving we need to know some concepts like constraint problem and understand it.

Definition of constraint problem:

Defined by a set of variables x1, x2, x3…..xn and set of conditions c1, c2, c3,…cn , such that each of the variable Xi has a non empty domain Di of possible values. (minimum value is 1)

A state is defined as an assignment of values to some or all variables.

A consistent assignment is an assignment that does not violate the constraints.

A complete assignment is an assignment that includes all variables.

Benefits:

We are able to represent in Standard pattern of a problem.

Generic goal and successor functions (is does not effect the next function with respect to first function)

Generic heuristics (no domain specific expertise)

Constraint Programming In Python Possible?

Constraint satisfaction problems are mathematical problems defined as a set of objects whose state must satisfy a number of constraints or limitations.

We only need to specify the problem, even better if we could do it in Python and make use of its powerful features.

We can! With the python-contraint1 module.

Library:

Python module python-constraint offers solvers for Constraint Satisfaction Problems over finite domains in simple and pure Python.

Download and install python-constraint from here: https://pypi.org/project/python-constraint/

After you setup, you should be able to run the following command on a python shell:

from constraint import *

features:

Backtracking solver

Recursive backtracking solver

Minimum conflicts solver

Predefined constraint types (e.g., AllDifferentConstraint, FunctionConstraint)

Example:

Solve the a + b = 5, a $*$ b = 6 algebraic relation.

```
from constraint import *

problem = Problem()

problem.addVariable('a', range(5))

problem.addVariable('b', range(5))

problem.addConstraint(lambda a, b: a + b == 5)

problem.addConstraint(lambda a, b: a * b == 6)

solutions = problem.getSolutions()

print solutions
```

[{'a': 3, 'b': 2}, {'a': 2, 'b': 3}]

References:

1) https://rosettacode.org/wiki/Zebra_puzzle#Alternative_Version_3

In the above link I referred some code of python and made-up my code.

2) James Little; Cormac Gebruers; Derek Bridge & Eugene Freuder. "Capturing Constraint Programming Experience: A Case-Based Approach" (PDF).

In this I referred on constraint programming and logic puzzles.