CSGA 6525 Artificial Intelligence

Fall 2017

Assignment #1

Q1. Define the following

a) An agent

An agent is anything that can be viewed as perceiving its environment through sensors and acting upon that environment through actuators.

b) A rational agent

For each possible percept sequence, a rational agent should select an action that is expected to maximize its performance measure, given the evidence provided by the percept sequence and whatever built-in knowledge the agent has.

c) Task environment

Task environments are essentially the 'problems' to which rational agents are the 'solutions'.We can specify it as PEAS:Performance, Environment, Actuators, Sensors.

d) Partially observable environment

Partially observable environment is the environment in which the sensors can not capture parts of data because of noisy and inaccurate sensors or because parts of the state are simply missing from the sensor data

e) Nondeterministic environment

A nondeterministic environment is one in which actions are characterized by agents' possible outcomes, but no probabilities are attached to the agents.

f) Dynamic environment

If the environment can change while an agent is deliberating, then the environment is dynamic for that agent.

g) Discrete environment

An environment which contains limited number of distinct, clearly defined percepts and actions.

h) Simple reflex agent

Agents that select actions on the basis of the current percept, ignoring the rest of the percept history.

i) Goal-based agent

Agents that can combine goal information with the model to choose actions that achieve the goal.

Q2

(a)

1) what a state is

A **state** is a tuple which has three numbers of how much gallons of water a jug contains currently.For example, (1,2,3) represents that jug1 has 1 gallon of water, jug 2 has 2 gallons of water and jug3 has 3 gallons of water.

2) what the initial state and goal state are

Initial state: (0,0,0) #all jugs are empty

Goal state: If a state has a jug which contains exactly 1 gallon of water, the state is our goal state. For example, (1,x,y) or (x,1,y) or (x,y,1).

3) what actions are there

Suppose our jugs are:a,b,c

12 Actions:Fill a,Fill b,Fill c,Empty a,Empty b,Empty c,Pour a to b,Pour a to c,Pour b to a,Pour b to c,Pour c to a,Pour c to b.

4) formal state transition model for each action

Fill a:(12,b,c)

Fill b:(a,8,c)

Fill c:(a,b,3)

Empty a:(0,b,c)

Empty b:(a,0,c)

Empty c:(a,b,0)

Pour a to b:if a>8-b:(0,8,c)else(0,a+b,c)

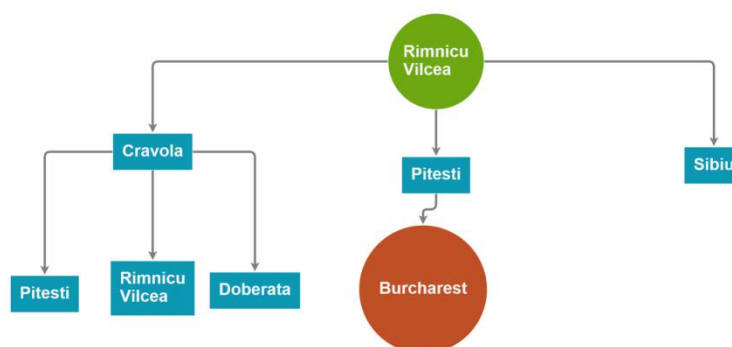Pour a to c:if a>3-c:(0,b,3)else(0,b,a+c)

Pour b to a:if b>12-a:(12,0,c)else(a+b,0,c)

Pour b to c:if b>3-c:(a,0,3)else(a,0,b+c)
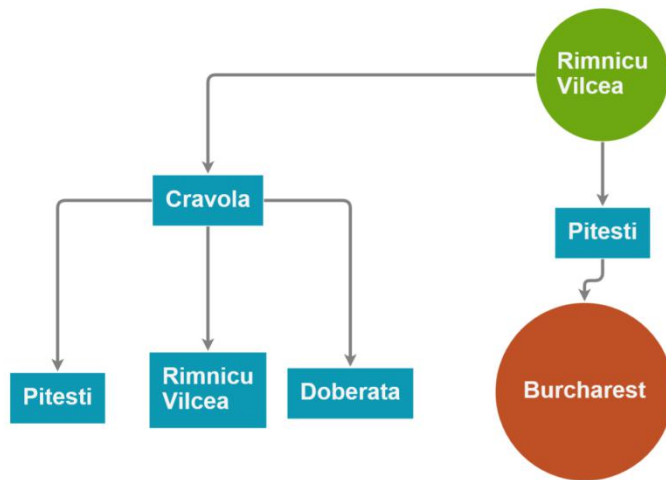
Pour c to a:if c>12-a:(12,b,0)else(a+c,b,0)
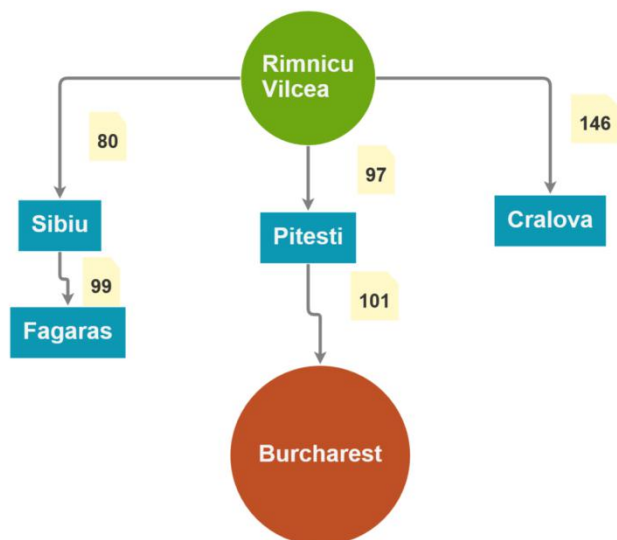
Pour c to b:if c>8-b:(a,8,0)else(a,b+c,0)

Q3

(a)Breath-first search

(b)Depth_first Search
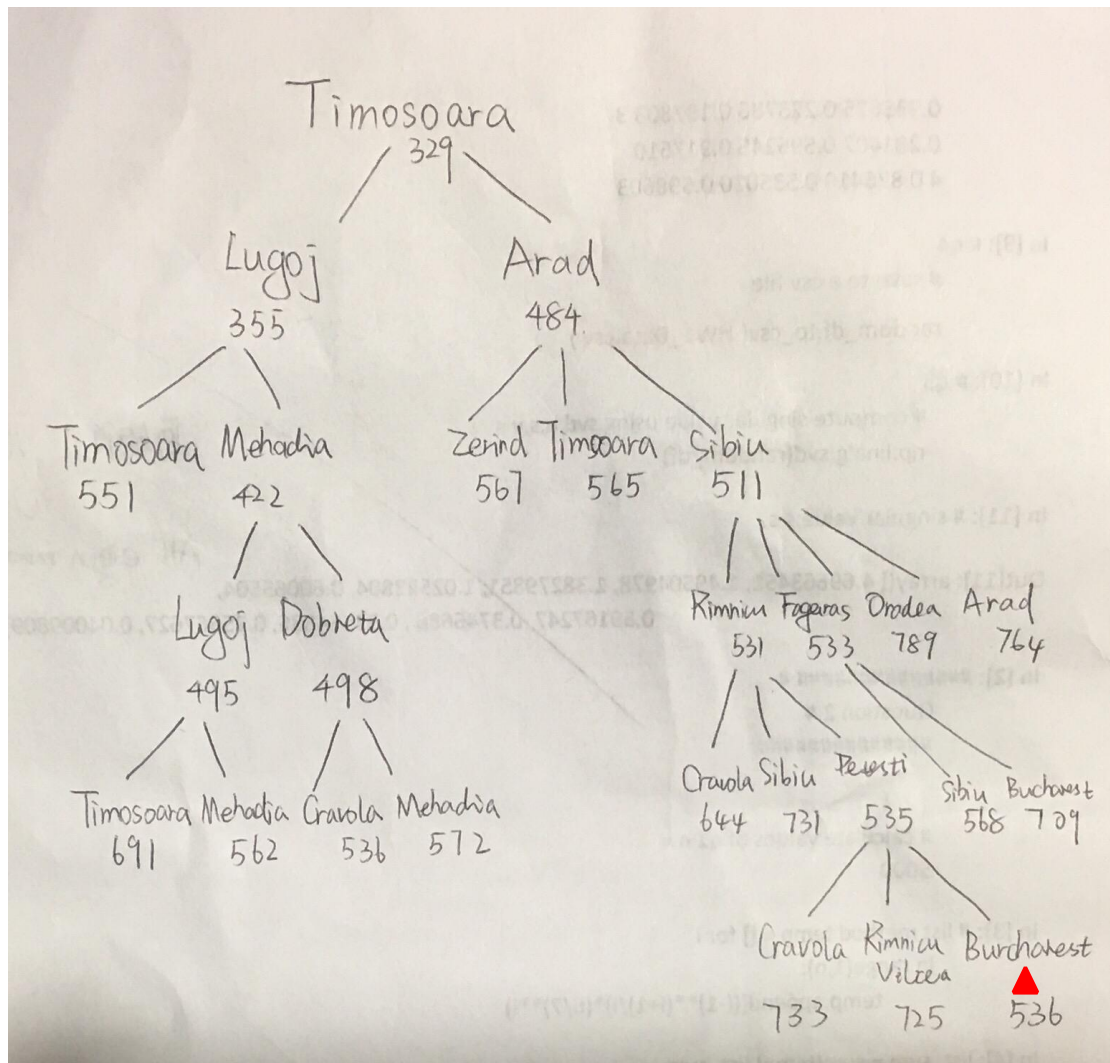

(C)Uniform cost Search

Q4

Timosoara 329
Lugoj 355   Arad 484
Timosoara 551   Mehadia 422   Zerind 567   Timosoara 565   Sibiu 511
Lugoj 495   Dobreta 498
Timosoara 691   Mehadia 562   Cravola 536   Mehadia 572
Rimnicu 531   Fagaras 533   Oradea 789   Arad 764
Cravola 644   Sibiu 731   Pitesti 535   Sibiu 568   Bucharest 709
Cravola 733   Rimnicu Vilcea 725   Burcharest 536

Path return: Timisoara->Arad->Sibiu->Rimnicu Vilcea->Pitesti->Bucharest