Water-Jug Problem

Water Jug Problem:

Problem: You are given two jugs, a 4-gallon one and a 3-gallon one.Neither has any measuring mark on it.There is a pump that can be used to fill the jugs with water.How can you get exactly 2 gallons of water into the 4-gallon jug.

Solution:
The state space for this problem can be described as the set of ordered pairs of integers **(x,y)**
Where,
X represents the quantity of water in the 4-gallon jug **X= 0,1,2,3,4**
Y represents the quantity of water in 3-gallon jug **Y=0,1,2,3**
Start State: (0,0)
Goal State: (2,0)
Generate production rules for the water jug problem
Production Rules:

Rule	State	Process
1	(X,Y | X<4)	(4,Y) {Fill 4-gallon jug}
2	(X,Y |Y<3)	(X,3) {Fill 3-gallon jug}
3	(X,Y |X>0)	(0,Y) {Empty 4-gallon jug}
4	(X,Y | Y>0)	(X,0) {Empty 3-gallon jug}
5	(X,Y | X+Y>=4 ^ Y>0)	(4,Y-(4-X)) {Pour water from 3-gallon jug into 4-gallon jug until 4-gallon jug is full}
6	(X,Y | X+Y>=3 ^X>0)	(X-(3-Y),3) {Pour water from 4-gallon jug into 3-gallon jug until 3-gallon jug is full}
7	(X,Y | X+Y<=4 ^Y>0)	(X+Y,0) {Pour all water from 3-gallon jug into 4-gallon jug}
8	(X,Y | X+Y <=3^ X>0)	(0,X+Y) {Pour all water from 4-gallon jug into 3-gallon jug}

9	(0,2)	(2,0) {Pour 2 gallon water from 3 gallon jug into 4 gallon jug}

Initialization:
Start State: (0,0)
Apply Rule 2:
(X,Y | Y<3) -> (X,3)
{Fill 3-gallon jug}
Now the state is **(X,3)**

Iteration 1:
Current State: **(X,3)**
Apply Rule 7:
(X,Y | X+Y<=4 ^Y>0) (X+Y,0)
{Pour all water from 3-gallon jug into 4-gallon jug}
Now the state is **(3,0)**

Iteration 2:
Current State : **(3,0)**
Apply Rule 2:
(X,Y | Y<3) -> (3,3)
{Fill 3-gallon jug}
Now the state is **(3,3)**

Iteration 3:
Current State:**(3,3)**
Apply Rule 5:
(X,Y | X+Y>=4 ^ Y>0) (4,Y-(4-X))
{Pour water from 3-gallon jug into 4-gallon jug until 4-gallon jug is full}
Now the state is **(4,2)**

Iteration 4:
Current State : (4,2)
Apply Rule 3:
(X,Y | X>0) (0,Y)
{Empty 4-gallon jug}
Now state is (0,2)

Iteration 5:
Current State : (0,2)
Apply Rule 9:
(0,2) (2,0)
{Pour 2 gallon water from 3 gallon jug into 4 gallon jug}
Now the state is **(2,0)**

Goal Achieved.

State Space Tree:

6 comments:

Hitesh Verma 26 September 2016 at 10:23

nice

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dineshtak 8 April 2017 at 10:24

nice sir
thanx

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SimpleMaryam 28 June 2017 at 01:09

Tank you

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SimpleMaryam 28 June 2017 at 01:12

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Lalita Chaple 30 October 2017 at 07:02

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