HW10, Artificial Intelligence

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05/07/2015

#1) Find derivation and decimal value of the string 10100.00101

First, the derivation:

SV

(2)

L.L

(4)

LB.L

(4)

LBB.L

(4)

LBBB.L

(4)

LBBBB.L

(3)

BBBBB.L

(4)

BBBBB.LB

(4)

BBBBB.LBB

(4)

BBBBB.LBBB

(4)

BBBBB.LBBBB

(3)

BBBBB.BBBBB

(6)

1BBBB.BBBBB

(5)

10BBB.BBBBB

(6)

101BB.BBBBB

(5)

1010B.BBBBB

(5)

10100.BBBBB

(5)

10100.0BBBB

(5)

10100.00BBB

(6)

10100.001BB

(5)

10100.0010B

(6)

10100.00101

Whew! Finally done. Now, the value of the decimal, going the opposite direction.

First, all the 1’s turn into B1 ­And all the 0’s turn into B0  With that in mind, I’m going to skip the first 10 steps for brevity’s sake:

(10 steps)B1B0 B1 B0 B0. B0 B0 B1 B0 B1

(3) B1B0 B1 B0 B0.L0,1 B0 B1 B0 B1

(4) B1B0 B1 B0 B0.L0,2 B1 B0 B1

(4) B1B0 B1 B0 B0.L1,3 B0 B1

(4) B1B0 B1 B0 B0.L2,4 B1

(4) B1B0 B1 B0 B0.L5,5

(3)L1, 1 B0 B1 B0 B0.L5,5

(4)L2,2 B1 B0 B0.L5,5

(4)L5,3 B0 B0.L5,5

(4)L10,4 B0.L5,5

(4)L20,5.L5,5

(2) S20 + 5/2­5 = 20.15625

#2)

#3) (extra credit) The controlled grammar for the cannibals and missionaries is as follows:

C is the number of cannibals on side B of the river, M is the number of missionaries.

Q\_1 S(c, m) 🡪 A(c+1, m+1) F\_t =2 F\_f = {empty set}

Q\_2 A(c,m) 🡪 p(c, m)A(F\_1(c, m) , f\_2(m)) F\_t = 2 F\_f = 3

Q\_3 A(c,m) 🡪 p(c,m)

Conditions for true/false in the different states: Q\_1 = T, Q\_2 = T if c > 0 or m > 0; Q\_2(c, m) = F if ((c = 3) AND(m=3)) or (c > m) or ((3 – c) > (3 – m)) Q\_3(c, m) = T if ((c = 3) AND (m = 3))

The function f\_1(c, m) will be defined as: if (c = 1) AND (m = 1), then f\_1(c, m) = c+2 otherwise if (c != 1) AND (m != 3) f\_1(c, m) = c – 1 else f\_1(c, m) = c+1

The function f\_2(m) is defined as: if (m = 1) then f\_2(m) = m-1 otherwise if (m = 0) then f\_2(m) = m+2 else if m = 3 f\_2(m) = m else f\_2(m) = m+1.

Now, this sort of cheats since it has the solution more or less ‘programmed’ into it, but it does work! Yay!