HW10, Artificial Intelligence

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

First, the derivation:

S_V

(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 B_1 And all the 0's turn into B_0 With that in mind, I'm going to skip the first 10 steps for brevity's sake:

(10 steps)$B_1B_0\ B_1\ B_0\ B_0.\ B_0\ B_0\ B_1\ B_0\ B_1$

(3) $B_1B_0\ B_1\ B_0\ B_0.L_{0,1}\ B_0\ B_1\ B_0\ B_1$

(4) $B_1B_0\ B_1\ B_0\ B_0.L_{0,2}\ B_1\ B_0\ B_1$

(4) $B_1B_0\ B_1\ B_0\ B_0.L_{1,3}\ B_0\ B_1$

(4) $B_1B_0\ B_1\ B_0\ B_0.L_{2,4}\ B_1$

(4) $B_1B_0\ B_1\ B_0\ B_0.L_{5,5}$

(3)$L_{1,\ 1}\ B_0\ B_1\ B_0\ B_0.L_{5,5}$

(4)$L_{2,2}\ B_1\ B_0\ B_0.L_{5,5}$

(4)$L_{5,3}\ B_0\ B_0.L_{5,5}$

(4)$L_{10,4}\ B_0.L_{5,5}$

(4)$L_{20,5}.L_{5,5}$

(2) $S_{20\ +\ 5/2}{}^{5}$ = 20.1510100.00101625

#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!