

IITJ (2013-14), 3rd Year, II Sem.
32002-Artificial Intelligence, Quiz#3

April 30, 2014

Duration: 20 Minutes

Roll No.....
(Max Marks: 10)

- Use best-first search to find the minimum distance as well as the path from start node a to goal node g in the graph shown in figure 1. (5)

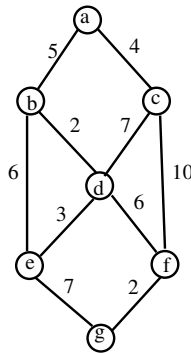


Figure 1: Graph.

Ans. The search tree for best-first is given in figure 2:

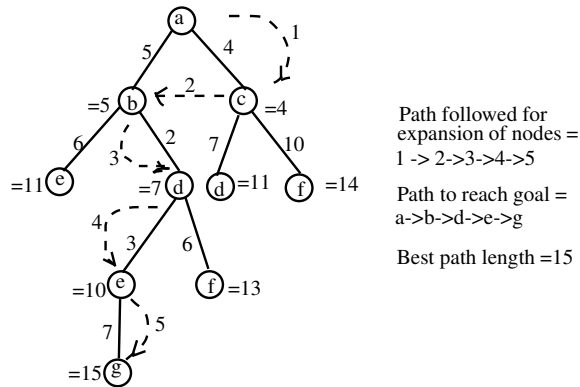


Figure 2: Best-first Traverse.

- Making use of backtracking, solve the following crypto-arithmetic Constraint satisfaction problem. Try to find out more than one solution, if they exist. (5)

$$\begin{array}{r}
 T W O \\
 + T W O \\
 \hline
 F O U R
 \end{array}$$

Ans. $T, W, O, F, U, R \in \{x \mid 0 \leq x \leq 9\}$. Three carries are $v_1, v_2, v_3 \in \{0, 1\}$, and for unique values $O, W, T \neq 0$. Constraints are

$$c_1 = 2O = R + v_1 \times 10 \tag{1}$$

$$c_2 = 2W + v_1 = U + v_2 \times 10 \tag{2}$$

$$c_3 = 2T + v_2 = O + v_3 \times 10 \tag{3}$$

$$c_4 = F \tag{4}$$

Let $v_3 = F = 1$, thus $c_3 = 2T + v_2 = O + 10$.

Let $v_2 = 1$.

$$\therefore c_3 : 2T + v_2 = O + 10$$

Let $v_2 = 1$

$$\therefore c_2 : 2W + v_1 = U + 10$$

Let $v_1 = 1$.

$$\therefore c_1 : 2O = R + 10$$

$$\therefore O \geq 5$$

Let $O = 5$.

$$\therefore R = 0$$

$$c_2 : 2W + 1 = U + 10$$

$$\text{or } 2W = U + 9$$

Let $U = 1$

$\therefore W = 5$, which is a contradiction.

$U = 2$ cannot be assigned, otherwise W will be a fraction.

Let $U = 3$, $\therefore W = 6$

$$c_3 : 2T + 1 = O + 10$$

or $2T = O + 9$, so $T = 7$. This gives us,

$$\begin{array}{r} \text{T W O} \quad \text{7 6 5} \\ + \text{T W O} \quad + \text{7 6 5} \\ \hline \text{F O U R} \quad \text{1 4 3 0} \end{array}$$

Similarly, by assuming different values of $v_1 \dots v_3$, many potential solution exists. But, all 8 may not.