

Answer 4)

Constraint satisfaction problems are those problems which satisfy a given constraint on set of constraints to solve a given problem.

The components of the CSP are:-

- A finite set of variables which states the solution ($V = \{V_1, V_2, V_3, \dots, V_n\}$)
- A set of discrete values known as domain from which the solution is picked ($D = \{D_1, D_2, D_3, \dots, D_n\}$)
- A finite set of constraints ($C = \{C_1, C_2, C_3, \dots, C_n\}$)

Many types of constraints involve:-

Unary, Binary, Higher order, Preferences (soft), constraints.

Sudoku puzzle as a CSP

↳ Variable are cells.

↳ domain = $\{1, 2, 3, 4, 5, 6, 7, 8, 9\}$

↳ Constraints → rows, column, b
all contain all diff numbers

Through following these constraints
Sudoku can be expressed as a CSP.

Now, for the given ~~Cryptarithmetic~~ Cryptarithm problem we have

$$\begin{array}{r} \text{E A T} \\ + \text{T H A T} \\ \hline \text{A P P L E} \end{array}$$

So, Here, 'A' \rightarrow 1
'T' \rightarrow 9

Now, we have

$$\begin{array}{r} \text{E } \textcircled{1} \text{ 9} \\ + \text{9 H } \textcircled{1} \text{ 9} \\ \hline \text{1 P P } 3 \text{ 8} \\ \quad \quad \quad \hookrightarrow \text{'L'} \end{array}$$

$$E = 8$$

$$T = 9$$

$$A = 1$$

$$L = 3$$

$$H = 2$$

$$P = 0$$

We have the solution as

$$\begin{array}{r} 819 \\ + 9219 \\ \hline 10038 \end{array} //$$

Logical agents can form representations of a complex world, use a process of inference to derive new representation about the world & use these new representation to ~~deduce~~ deduce what to do.

↳ The central component of knowledge based agent is its knowledge base.

↳ A SK, TELL → operations to add new sentences to the knowledge base & to query what is known which,
↳ may involve inference

for the wumpus world problem:-

{ performance measure:-

+1000 → climbing out with gold.

-1000 → falling into pit or getting eaten by Wumpus

-1 → each action

-10 → using up the arrow
game ends → agent dies

{ Environment

4x4 grid :

initial → [1, 1] facing right

gold \rightarrow location random. with uniform distribution other than start

other than start \rightarrow prob = 0.2,

{ Actuators :-

\rightarrow can move, forward

Turn left by 90°

Turn Right by 90°

\rightarrow dies horribly if enters a bit line wumpus sq.

\rightarrow if bumps in wall can't move.

\rightarrow Grab \rightarrow to pick up gold.

\rightarrow climb \rightarrow to climb out of the car [only floor 1,1]

{ Sensors,

\hookrightarrow S touch \rightarrow when wumpus present in directly adjacent,

\hookrightarrow Breeze \rightarrow when directly adjacent to a bit

\hookrightarrow Litter \rightarrow when gold is present in the sq.

↳ Bump → When walks into a wall.

↳ Scorer → when the vump is killed

1, 4	2, 4	3, 4	4, 4
1, 3	2, 3	3, 3	4, 3
1, 2 OK	2, 2	3, 2	4, 2
1, 1 [A] OK	2, 1 OK	3, 1	4, 1

here, [A] = Agent
 B = Breeze
 G = Gitter, Gold
 OK = Safe Sq
 P = Pit
 S = Stench
 ✓ = Visited
 W = Wind

It represent the first step taken by the agent in the wumpus

~~The following~~ Stages in the program
 agent
 world.