

## EXPERIMENT NO. 6

Aim :- Knowledge representation and knowledge base for Wumpus World.

Theory :-

Q.1] (a) "Some students took French in Spring 2001".

Sol<sup>n</sup>  $\exists x : \text{student}(x) \wedge \text{takes}(x, \text{French}, \text{Spring 2001})$

(b) "Every student who takes French passes it".

$\forall x : \text{student}(x) \wedge \text{takes}(x, \text{French}) \rightarrow \text{Passes}(x, \text{French})$

(c) "Only one student took Greek in Spring 2001".

$\exists x : \text{student}(x) \wedge \text{takes}(x, \text{Greek}, \text{Spring 2001})$   
 $\wedge [\forall y : \neg (y = x)] \rightarrow \neg \text{takes}(y, \text{Greek}, \text{Spring 2001})$

(d) "The best score in Greek is always higher than the best score in French".

$\exists x \forall y \text{ score}(x, \text{Greek}) \wedge \text{score}(y, \text{French})$   
 $\rightarrow \text{higher}(x, y)$

(e) "Every person who buys a policy is smart".

$\forall x \exists y : \text{person}(x) \wedge \text{policy}(y) \wedge \text{buys}(x, y)$   
 $\rightarrow \text{smart}(x)$

(f) "No person buys an expensive policy."

$\forall x \forall y : \text{person}(x) \wedge \text{policy}(y) \wedge \text{expensive}(y)$   
 $\longrightarrow \neg \text{buys}(x, y)$

(g) "There is an agent who sells policies only to people who are not insured."

•  $\exists x \exists y \exists z \text{ agent}(x) \wedge \text{policy}(y) \wedge \text{people}(z)$   
 $\wedge \text{sells}(x, y, z) \wedge \neg \text{insured}(z)$

(h) "There is a barber who shaves all men who do not shave themselves"

$\exists x \forall y \text{ barber}(x) \wedge \text{men}(y) \wedge \neg \text{shave}(y, y)$   
 $\longrightarrow \text{shave}(x, y)$

• (i) "A person born in UK; Each of whose parents is a UK citizen or a UK resident; is a UK citizen by birth."

$\left[ \left[ \forall x : \text{Person}(x) \wedge \text{Born}(x, \text{UK}) \right] \wedge \left[ \forall y \text{ Parent}(y, x) \right] \right.$   
 $\longrightarrow \text{citizen}(y, \text{UK}) \vee \text{citizen}(y, \text{resident}(y, \text{UK})) \left. \right]$   
 $\longrightarrow \text{Birth citizen}(x, \text{UK})$

(j) "A person born outside UK, one of whose parents is a UK citizen by birth, is a UK citizen by descent."

$$\forall x \left[ \left[ \text{Person}(x) \wedge \neg \text{Born}(x, \text{UK}) \right] \wedge \left[ \exists y : \text{Parent}(y, x) \wedge \text{Birth Citizen}(y, \text{UK}) \right] \right] \rightarrow [\text{Citizen Descent}(x, \text{UK})]$$

Q.2 Describe the Wumpus World Problem.


Sol<sup>n</sup> Wumpus world is a cave which has 4/4 rooms connected with passage ways. So there are a total 16 rooms which are connected with each other. We have knowledge-based agent who will go forward in this world. The cave has a room with a beast called Wumpus. It can be shot by an arrow, but the agent has a single arrow. There is one room with gold.

Its knowledge base comprises of collection of proposition variables and rules, and the logical relationship between them.



## Wumpus World

### [A] Initial State

4			$\approx$ Breeze	
3		"Stench" $\approx$ Breeze Gold	Pit	Breeze $\approx$
2	"Stench"	(W)	"Stench" $\approx$ Breeze	Breeze $\approx$
1	 Agent	"Stench"	Breeze $\approx$	Pit
	1	2	3	4

Wumpus =  $\{ [2, 2] \}$

Gold =  $\{ [2, 3] \}$

Agent =  $[1, 1]$

State =  $\{ \text{None}, \text{None}, \text{None}, \text{None} \}$

KB

$[1, 1] = \text{ok}$

$[2, 1] = \text{ok}$

$[1, 2] = \text{ok}$

$[1, 3] = \text{ok}$

Step 1 • Agent moves to  $[2, 1]$

State :  $\{ \text{Stench}, \text{None}, \text{None}, \text{None} \}$

$B_{1,1}$	$B_{2,1}$	$B_{1,1}$	$P_{1,2}$	$P_{2,1}$	$P_{2,2}$	$P_{3,1}$	$R_1$	$R_2$	$R_3$	$R_4$	$R_5$	KB
false	false	false	false	false	false	false	true	true	true	true	false	false
false	false	false	false	false	false	true	true	true	false	true	false	false
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
false	true	false	false	false	false	true	true	true	false	true	true	false
false	true	false	false	false	false	true	true	true	true	true	true	<u>true</u>
false	true	false	false	false	true	false	true	true	true	true	true	<u>true</u>
false	true	false	false	false	true	true	true	true	true	true	true	<u>true</u>
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
true	true	true	true	true	true	true	false	true	true	false	true	false

Step 2] Agent moves to [1,2]

State : { Stench, None, None, None }

Step 3] Agent decides to move to [1,3]

State : { None, None, None, None }

● Step 4] Agent moves to [1,4]

State : { None, None, Bump, None }

Step 5] Agent is in [2,3]

State : { Stench, Breeze, None, Glitter }

Since it perceives glitter, agent gets gold and backtracks from all 'ok' states to reach start.

②  $\frac{1}{27/3/24}$