

CS 344

Artificial Intelligence

By Prof: Pushpak Bhattacharya

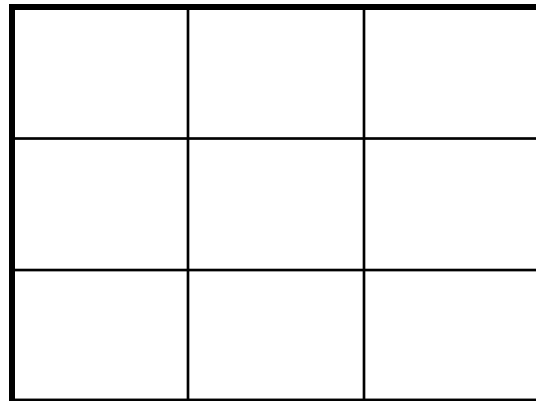
Class on 04/Apr/2007

Knowledge representation (contd.)

1. Knowledge representation : primitives and levels
2. Knowledge representation and problem solving

Correct representation facilitates problem solving

Example: Tic-Tac-Toe

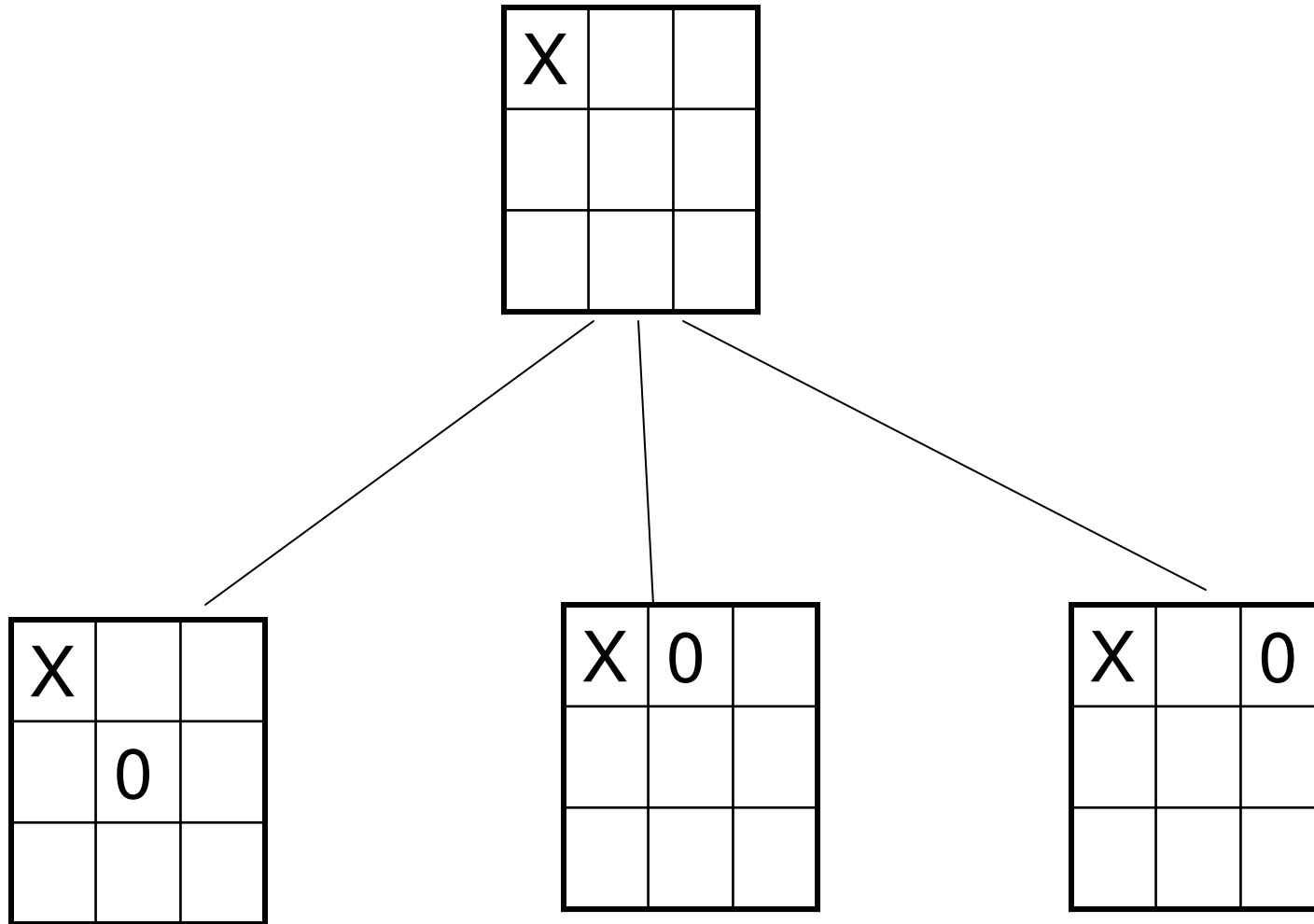


Human – ‘X’

Computer = ‘0’

Turn 1: Human

At every stage the computer explores a state-space



Now, if the tic-tac-toe board is looked upon as a magic square, then the computation is greatly facilitated

8	3	4
1	5	9
6	7	2

Magic square with every row/col/diag summing to 15

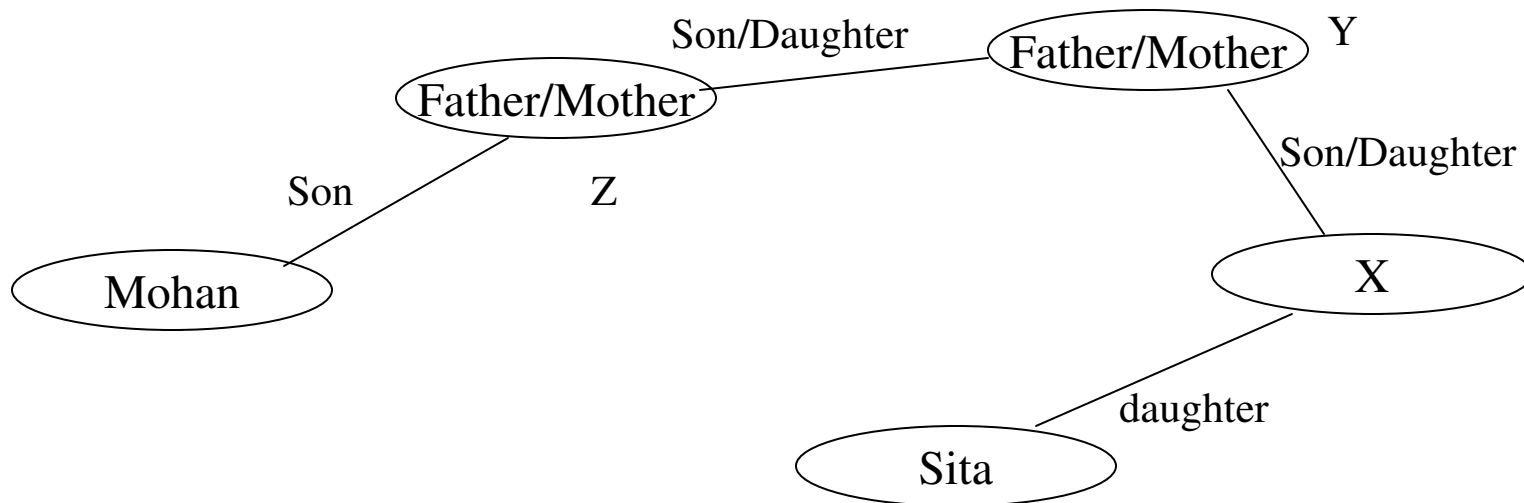
- The placement of symbol '0' is dependant on opponent's and own winning possibility. The magic square makes this easier.
- α - β pruning [read up]

Example 2 (contd.)

- If dominoes with two cells coloured with black and white can cover the mutilated chess board completely?
- Each domino covers two adjacent cells: one black and one white cell.
- # of black cells = 32
- # of white cells = 30
- Thus the chess board cannot be covered with this kind of dominoes

Primitives of KR

- Deciding on this set is an exercise involving long experience, astute judgment and constraints of application domain.
- Example:
 - Sita is Mohan's cousin
 - Primitives: Father, Mother, Daughter, Son



Primitives (contd.)

Sita = daughter(X)

X = daughter(Y)

Y = mother(Z)

Z = mother(Mohan)

If cousin itself was a primitive, things would have been easier

The more the primitives, the better the capability of Inferencing

- But the storage and processing expenses increase with the complexity of the primitive set.

- Also one has to grapple with the **FRAME PROBLEM**

Representation of “Many” (Contd. from last lecture)

- Given E: predicate calculus expression
- I: Interpretation
- D: Domain

If D contains many kinds of elements like natural numbers, set, entities, then we have what is called the **MANY SORTED PREDICATE CALCULUS**

Representation of “Many” (Contd.)

- Many students passed

$$\begin{aligned} & \exists L \forall x [\{ (student(x) \wedge passed(x)) \\ & \Leftrightarrow belongs(x, L) \} \\ & \wedge greater(length(L), threshold)] \end{aligned}$$

D: {Students and other humans} U {Lists} U
{natural nos}