

Assignment no - 3

Q.1 Demonstrate status prolog functionality using two real time instance.

→ Prolog is logic programming language associated with artificial intelligence and computational linguistics.

IBM Watson -

Prolog is used for pattern matching in the IBM Watson question answering system.

In a first step, sentences from many different corpora are converted into a structured form by a parser.

Their prolog system then tries to match those structured facts with the asked question in order to resolve the unknown elements and give an answer.

Natural language processing (NLP)

(1) NASA (Speech Applications) -

A fully voice-operated procedure browser has been developed by the NASA intelligent systems divisions.

On the International Space Station (ISS) astronauts execute thousands of complex procedures to maintain life support systems, check out space suits and conduct science experiments, among their many tasks. Today when carrying out these procedures, an astronaut usually reads from a PDF viewer on a laptop computer, which requires them to

shift attention from the task to scroll pages.

Q.2] Outline the features of constraint satisfaction problem.

→ Constraint satisfaction problems (CSPs) are problems in which states are defined by the values taken by a set of variables and goal test specifies a set of constraints the values must satisfy. Problems that can be expressed as CSPs: N-queens, VLSI layout, scheduling, cryptarithmic. can use search to look for an assignment of values to variables such that the constraints are satisfied. CSP has become a powerful and commonly used technique in AI with its own algorithms for determining variable assignments (ex - arc consistency, hill climbing, simulated annealing etc).

S E N D
+
M O R E

M O N E Y

Search is a common technique in problem solving especially when our knowledge of the problem or domain is limited.

Q. 3] Explain Adversarial Techniques in detail



There are two Adversarial techniques such as Minimax and Alpha-Beta pruning.

1. Minimax -

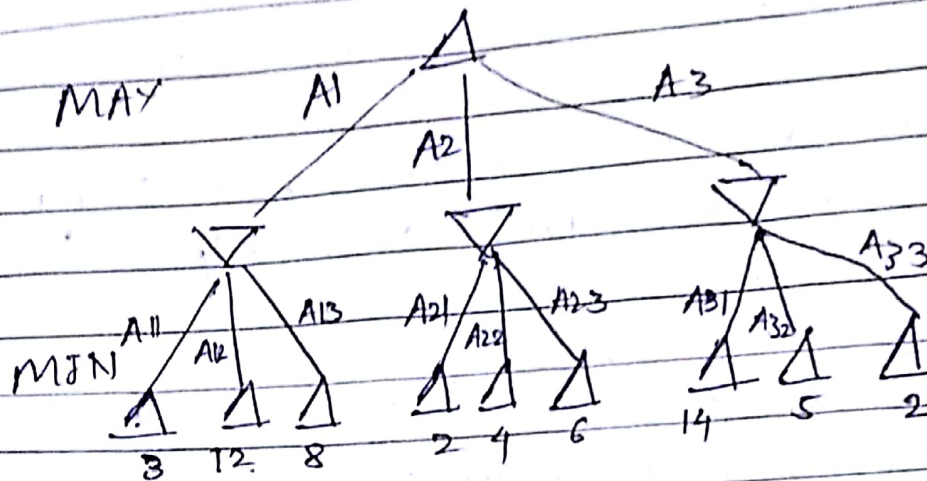
Minimax procedure:-

Search down several levels, at the bottom level apply the utility function, back-up values all the way up to the root node, and that node selects the move.

Assume. game tree of uniform depth (to simplify matters).

- Generate entire game tree
- Apply utility function to each terminal state.
- To determine utility of nodes at any level, If min's turn to play it will choose child with \min^m utility, otherwise max will choose child with \max^m utility.
- Continue backing up values from leaf to root, on level at a time.

A more Abstract game tree.



Terminal utilities (for MAX)

A two-ply game.

The Δ nodes are 'MAX' nodes in which it is max's turn to move, and the ∇ nodes are "MIN" nodes. The terminal nodes show utility values for MAX. The other nodes are labelled with their minimax values.

2. Alpha-Beta pruning -

Consider node n in search tree such that certain player has a choice of moving to that node.

If the player has a better choice m either at the parent node of n , or at any choice point further up, then n will never be reached in actual play.

Once we have ascertained enough information about n , or at any choice point further up the n with actual play.

In most games it will be impossible to try and calculate minimax as described - the game tree will be just too big.

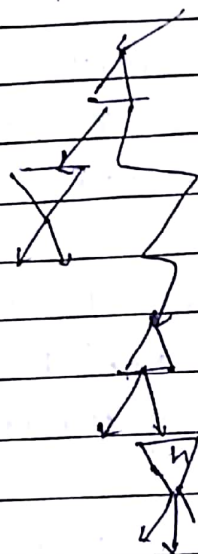
pruning - eliminⁿ of branches from the search without examinⁿ - Alpha-beta pruning returns a pruned minimax tree.

MAX

MIN

MAX

MIN



- suppose α is the value of the best choice for max on the path and β the value of the best choice for min on the path
- Alpha-beta updates the values of α and β and prunes any subtree as soon as it can determine whether it is worse than the current α or β .
- start with α as large -ve no, β as large positive number.

Q.4) Interpret Importance of game theory in AI.

Games have been one of the most visible areas of progress in the AI space in the last few years. Chess, Jeopardy, Go and Poker are some of the games that have been mastered by AI systems using breakthrough technologies.

AI systems that would be improved using game theory require more than one participant which narrows the field quite a bit.

For instance, a sole 'forcast' optimization AI systems such as Salesforce Einstein is not an ideal candidate for applying game theory principles.

However, in a multi-participant environment, game theory can be incredibly efficient. In those settings game theory can serve:

- participant design - game theory can be used to optimize the decision of a participant in order to obtain the maximum utility.
- Mechanism Design: Inverse game theory focus on designing a game for a group of intelligent participant. Auctions are a classic example of mechanism design.

Game theory covers a large spectrum of the most relevant & well-known include.

- Single-move Games:

This type of the game is based on each player taking a single action without knowing the action of any ~~data~~ other participant. stock purchasing is a classic example of single move games.

- Repeated Games - This type of the game faces players with the same choice multiple times but, each time, each player has knowledge about the previous decision of the other players. Many repeated games are validations of single move games with repetitions.