INT404 ARTIFICIAL INTELLIGENCE

Lecture 2

Artificial Intelligence – an Overview

Artificial intelligence techniques can be divided into **two** types:

1) Symbolic computation
2) Non- symbolic computation

Artificial Intelligence – an Overview

Symbolic Computation:

- Symbol: represents a concept, rather than a value. e.g. ax+y=0
- A symbol represents a relationship among two or more classes. ('class' as in Object Oriented Programming Systems.) e.g. father
- Symbolic computation represents an extreme in a continuum(undistinguishable): Variable (representing numbers), Data Structure (variables of a particular type), Class (representing a collection of related variables and their functions), Symbol (representing collection of Objects and the relationships between them)

Artificial Intelligence – an Overview

Symbolic Computation has two branches

1. Heuristic search – Adjoining, Segment 1 of the World view.

   Heuristic – A guide, an approximation, a thumb rule. Basically helps in pruning(Weed out **unwanted** or unnecessary things) the search tree.

2. Knowledge-based systems – In the world view, **between** heuristic search and sub-symbolic computation (neural networks).

   Knowledge – "Data is an understood, recognized format",
   "Information is Useful data" and
   "Knowledge is Generalized Information." => Concepts, Patterns.

Heuristic search

1	2	3
4		5
6	7	8

4	2	5
1	7	3
6		8

Artificial Intelligence – an Overview

Heuristic Search – Two types

1. Proceeds from Start state to Goal state – A* - Data driven.
2. Proceeds from Goal state to Start state – AO* - Goal driven.

A* - generates a solution path. Uses heuristics to prune the possible set of operators.

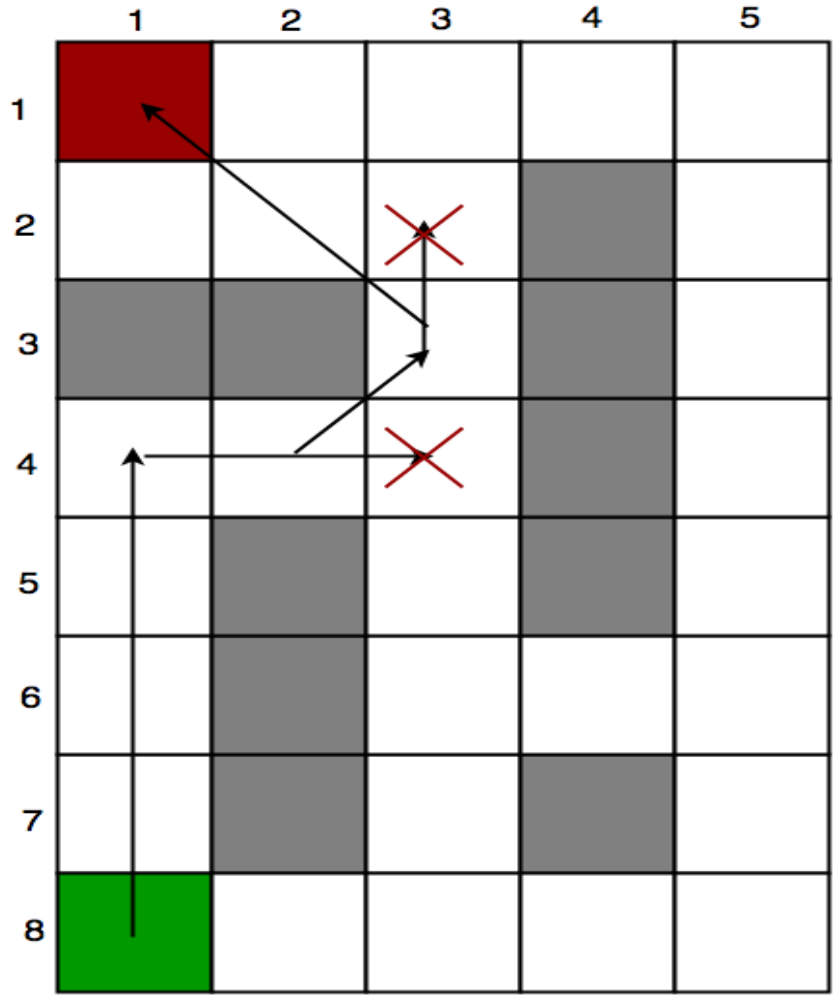
AO* - generates a solution tree. Creates sub-goals for a particular goal, until the sub-goal is directly achievable.

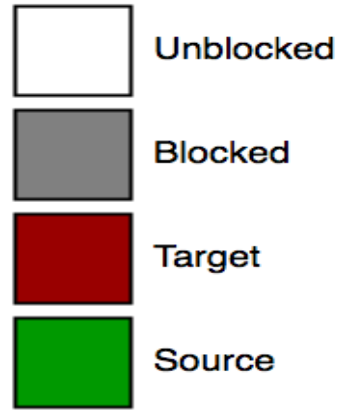
Artificial Intelligence – an Overview

Heuristic Search(A*)

- A* Search algorithm is one of the best and popular technique used in path-finding and graph traversals.
- unlike other traversal techniques, it has “brains”. What it means is that it is really a smart algorithm which separates it from the other conventional algorithms.

Heuristic Search(A*)





A* Search Algorithm makes the most intelligent choice at each step. Hence you can see that algorithm goes from (4,2) to (3,3) and not (4,3) (shown by cross).

Similarly the algorithm goes from (3,3) to (2,2) and not (2,3) (shown by cross).

Artificial Intelligence – an Overview

Heuristic Search

Core areas of Heuristic search:

a) Problem representation - by a State space. Each node in the State space represents a complete state of the problem.

b) Operators – Change one state to another.

c) Heuristic Evaluation function – Evaluates the goodness of each of the possible next states. (Not a definite evaluation, only an approximation.)

Artificial Intelligence – an Overview

Heuristic Search

The Heuristic evaluation function is basically a form of hill climbing: Take the steepest gradient – which will be the shortest path to the peak (goal).

Problems in Heuristic Search:

Local Maxima – A particular point in the search space may be better than all neighboring points, but still, may not be the ultimate goal. This is called a Local Maxima. Solved by making Random Jumps.