

## U-6 (Planning)

### \* Planning -

- process of deciding sequence of actions in that will achieve goal
- consider various planning techniques for AI agent who is having working environments that are fully observable, deterministic, finite, static, discrete, etc.
- decision making actions
- execution of plan is about choosing sequence of tasks w.h. high probability of accomplishing a specific task.

### \* Difficulties -

- 1) irrelevant actions impact (infinite loop → agent → incorrect actions)
- 2) choosing better actions we need good heuristic function. (new problem → new heuristic)
- 3) directly associate with characteristics of a problem.  
[problem decomposable → various subproblems  
↳ easy to achieve goal]

P

## The planning problem -

- represent planning process as a problem.
- 1) states   2) actions   3) goals.
- planning problem → language to expressive of variety of problems.  
(proper syntax).
- language → classical planner platform → Ada, etc are representing planning problem.

P

## classical planning -

- processing constructing complicated plans of action using issue structure as a guide.
- Invariants → optimum planning (graph theory, complexity theory).
- domain specific solvers → improve efficiency.
- ml approach are being used in planning & extraction of structural data (← ml, deep learning & neural networks).

### Traditional planning

→ planning → determine problem, agent → plan  
acting → choose course of action to adapt  
learning → action cause him to learn new things.

Advantages ↗ precise domain-independent heuristic  
    ↘ simple to use & operate efficiently

Hierarchical  
~~Planning~~

- hierarchical information on actions, or description of how complex actions are broken down.

eg → serving coffee

making coffee      bringing coffee.

- ~~Planning~~ → Hierarchical Task Network

- combines Partial Order Planning & HTN planning concepts.

- single top level action turned Act, purpose of finding Act execution meets goals.

- decomposition actions are used to refine this strategy.

- each action decomposition breaks → high level strategy

Travel (source, dest.)

Take - Plane

Take - bus

Take - Car

Board (Bus, source)

Buy - Ticket

Get on (bus)

Leave (bus, dest.)

Grab (center)

Request (ticket)

Pay (Ticket)

### \* Advantages of Hierarchical Planning -

- reduce plan at each level of hierarchy  $\rightarrow$  small no. of activities.
- real-world appn  $\rightarrow$  very big plans,  $\rightarrow$  HIN algo.
- hierarchical structure makes it simply rectify problem.
- more efficient & than single-level planning for complexities.

### \* Disadvantages -

- deterministic environment  $\rightarrow$  HIN planners.
- HIN planners  $\rightarrow$  unable to deal with unpredictable result of actions.

Here, description of how complex actions are broken down.

### \* Planning & Acting in Nondeterministic

- Domain
- Time, schedule & Resources  $\rightarrow$  temporal ordering constraint
- constraints, resource constants of available resources.

## \* Limitations of Artificial Intelligence =

### 1) Requires Monitoring

- algorithm → ~~key~~ engine, someone → turn on key.
- marketer → crucial to planning creation & execution.
- supplier of fresh data → AI → learning needed.
- human-like AI → user research → hard -

### 2) Limited to Pre-fed task.

- limited tasks
- can't make split-second decisions
- can't express emotions

### 3) Maintenance & Cost.

- hefty up-front cost → ongoing maintenance & repair
- regular updates → keep up with dynamic business environment
- business → carefully analyze return on investment

### 4) Lack Creativity

### 5) Absence of Fairacy, Safety & Ethics -

### 6) Adversarial Attacks

## Ethical challenges of AI -

- 1) potential for employment loss as result of automation technology.
- 2) employees must be redeployed or retrained in order to keep positions.
- 3) Machine-created wealth should be distributed fairly.
- 4) impact of human-machine interaction on human attention & behaviour.
- 5) necessity to address algorithm bias in data resulting from human bias.
- 6) safety of AI → capacity to cause harm.
- 7) smart machines are considered to learn & deploy independently.  
there is a need to guard against unforeseen outcomes.

## Future of AI. (in diff sectors)

- healthcare
- security & defense { explain }
- education
- Banking & finance
- Autonomous Vehicle
- Manufacturing
- Entertainment
- workplace



## Components of AI

Explor

- Learning
- Perception
- Reasoning
- Language - understanding
- Problem solving