

1. Partial order planning:

Partial order planning technique where actions are partially ordered, meaning that not all actions need to be executed in a strict sequence. The planner defines order of actions only where necessary (based on constraints), leaving other actions unordered until they become dependent.

ex: robot that needs to set table.

A: place plate on table

B: place fork on table

C: Place knife on table

D: Pour water into glass.

order of placing plate, fork and knife is not dependent on each other.

However, the action of pouring water into glass can only happen after glass is placed. So, actions are only partially ordered.

Glass placed (E) \rightarrow pour water (D)

other actions like placing plate, fork and knife are dependent of each other and can occur in any order.

2. Non-Linear Planning:

It allows the execution of actions that are not strictly sequential. It means that multiple steps can be executed concurrently as long as their dependencies are satisfied. This type planning is useful in scenarios where tasks do not depend on each other and can be done in parallel.

ex: project where different developers are working on different modules.

A: Develop module A

B: Develop module B

C: Integrate module A and B

D: Test the integrated system.

In non-linear planning, Task A and Task B can happen concurrently since they are independent of each other. However, Task C can only happen once both Task A and Task B are complete. Similarly, Task D testing can only be executed after Task C is finished.

3. Hierarchical planning

Hierarchical planning breaks down complex tasks into smaller, more manageable sub-task. It structures a plan into different levels of abstraction, where a high-level task is decomposed into detailed steps at lower levels.

ex: robot is tasked with preparing breakfast, which involves multiple subtask.

* prepare breakfast

Subtask 1 : Make coffee.

1.1 Boil water

1.2 Add coffee to the filter.

1.3 pour boiling water over coffee.

Subtask 2 : Toast bread.

2.1 place bread in toaster

2.2 press start button

2.3 Take out the toast.

Subtask 3 : cook eggs.

3.1 crack eggs onto pan

3.2 fry the eggs.