**Name: Kulsoom Khurshid**

**Reg #: SP20-BCS**

**Planning and Acting in Non-Deterministic Domains:**

Classical planning is conducted in fully observable, static, and deterministic environments. It is considered unrealistic in many real-world applications because the environment is not always fully observable, static, and deterministic.

**Bounded Indeterminacy:**

In bounded indeterminacy, the possible effects of the actions are listed down in the action description axioms, but actions have unpredictable effects.

**Unbounded Indeterminacy:**

In unbounded indeterminacy, the possible effects of the actions are not listed prior or it is large to be enumerated completely.

**Planning Methods:**

Following are the four planning strategies used for handling indeterminacy.

**Sensor less Planning:**

Sequential plans to be executed are constructed without perception. Sensor less planning also known conformant planning, handles domains where the state of the world is not fully known. And makes the plan that work in all possible cases.

**Conditional planning (contingency planning):**

Constructs a conditional plan with different branches for various contingencies that could happen. It handles domains where the effects of an action are not deterministic. It plans ahead for different possible results of each action.

**Execution monitoring and replanning:**

Existing strategies are utilized to make an arrangement, yet it keeps a check during execution and rethink in the event that it's vital. The rethinking calculation begins from the present status in the arrangement execution, when the startling occasion has been input. The goal is to ﬁnd out which state ought to be arrived at next in the issue in order to hold as a significant part of the first arrangement as is sensible without compromising the ideal arrangement. At the end of the day, we need to figure that state from which whatever number activities as could reasonably be expected of the old arrangement are as yet relevant.

**Continuous planning:**

A planner designed to persist over a lifetime. Continuous planning is an approach to planning where static annual or bi-annual plans are replaced with a continually updated plan, which is revised every time an internal or external event (such as a shift in priorities, an unexpected delay in a given program or a change in the business environment) occurs.

**Example:**

Suppose given an initial state with a chair, a table, and some cans of paint, with everything of unknown color, achieve the state where the chair and table have the same color.

**Initial State:**

Object(Table) ^ Object(Chair) ^ Can(C1) ^ Can(C2) ^ InView(Table)

**Goal State:**

Color(Chair, c) ^ Color (Table, c)

**Actions:**

* Remove Lid
* Paint
* LookAt

**Sensor less Planning:**

RemoveLid(Can1), Paint(Chair, Can1), Paint(Table, Can1)

**Contingent planning:**

1. Look at the table and chair to sense their colors.
2. If they’re the same color, you’re done.
3. If not, look at the paint cans.
4. If one of the cans is the same color as one of the pieces of furniture, then apply that paint to the other piece of furniture.
5. Otherwise, paint both pieces with one of the cans.

LookAt(Table), LookAt(Chair)

If Color(Table, c) ^ Color(Chair, c) then NoOp

Else RemoveLid(Can1), LookAt(Can1), RemoveLid(Can2), LookAt(Can2)

If Color(Table, c) ^ (Color(can, c), then Paint (Chair, can)

If Color(Chair, c) ^ (Color(can, c), then Paint(Table, can)

Else Paint(Chair, Can1), Paint(Table, Can1)

**Replanning:**

LookAt(Table), LookAt(Chair)

If Color(Table, c) ^ Color(Chair, c) then NoOp

else RemoveLid(Can1), LookAt(Can1)

if Color(Table, c) ^ Color(Can1, c) then Paint (Chair, Can1)

else replan