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AI - Assignment 1

Q. 1) Write a short note :

b) Sensorless Planning :

→ 1) It is a kind of planning that is based on any perception. The algorithm ensures that plan should reach its goal at any cost.

2) Sensorless planning is also known as conformant planning. For the environment with no observations.

3) In these the problem of finding a sequence of actions for achieving a goal in presence of uncertainity in the initial state or action effects.

4) It works in no observations environment so it search the belief-state space to find the solution for sensorless problem rather than physical state.

5) This agent not reliable on sensor data and then it comes up with the plan that works in all possible case.

example : 1) You have a wall made from bricks.
(2) You have a can of white paints.

- Action : paint (brick), effect : colour (brick)
- Goal : Every brick should be painted white
- Suppose world isn't fully observable, we actually cannot observe the brick colour.

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(c) Multiagent planning:

→ 1) In multiple agent environment each agent faces a multiagent planning problem in which it tries to achieve its goal.

2) It involves co-ordinating resources and activities of multiple agents.

3) It can involve agent for planning for a common goal or agent co-ordinating the plans for planning of others or on agent refining their own plans while negotiating over tasks or resources.

4) If new agent are introduced to a single agent environment, but single agent does not change its basic algorithm then it may perform poorly.

5) Agents are not in different to another agents intentions (like nature is). So agents can co-operate, complete or co-ordinate.

6) Sometimes distribution computations are easier to understand and develop.

7) Joint plans can be constructed, but must be aggregated with some form of co-ordination. if two agents are to agree on which joint plan to execute.

8) Example: In double tennis problem if each agent uses different plan then neither will return the ball.

9) Having a correct joint plan doesn't guarantee success the agent needs to arrive at some joint plan.

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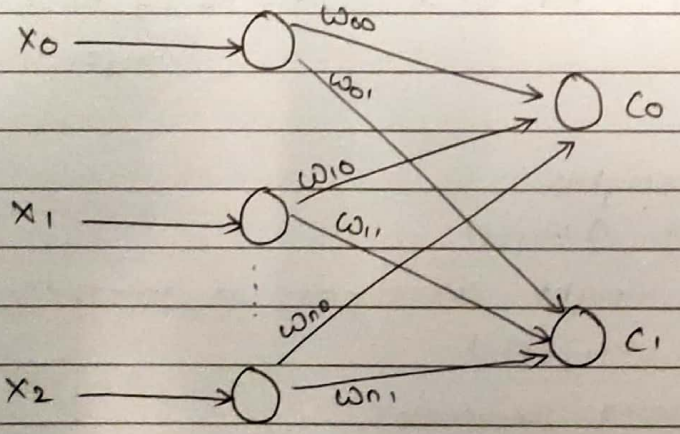
Q. 2) Write a short note on Self Organizing Map.

→

1) Self Organizing Map (SOM) is type of neural network inspired by bilogical neural networks in 1920.
2) It follows unsupervised learning approach and trained it network through a competitive learning algorithm.
3) SOM is used for clustering and mapping technique to map multidimensional data onto the lower-dimensional which allows people to reduce complex problem for easy interpretation.
4) SOM consists of two layers Input and output layers:



5) Each neuron in an SOM is assigned weight vector with the same dimensionality N as the input space.
6) Any given input pattern is compared to the weight vector of each neuron and closest to output weight, neuron is declared as winner.
7) The euclidean norm is commonly used to measure distance.

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B) Algorithm:

Step 1: Initialization

Set initial synaptic weight to small random value between [0,1] and assigned small positive value to the learning parameters α.

Step 2: Activation and Similarity matching:

Activate network by applying input vector x. Find winner takes all (best neuron) neuron J_x at iteration p,

using euclidean distance.

$$J_x(p) = \min_{j=1}^{n} [x - w_p(x)]$$

nx no. of neuron in input layer.

Step 3: Learning

Update synaptic weights.

$$w_{ij}(p+1) = w_{ij}(p) + \Delta w_{ij}(p)$$

where $\Delta w_{ij}(p)$ = weight correction at interaction p

$$\Delta w_{ij}(p) = \eta [x_i - w_{ij}(p)]$$

↳ learning parameter.

Step 4: Iteration:

Increase iteration p by 1, go back to step 2 and continue until the minimum-distance Euclidean criteria is satisfied, or no noticable changes occurs in the feature map.

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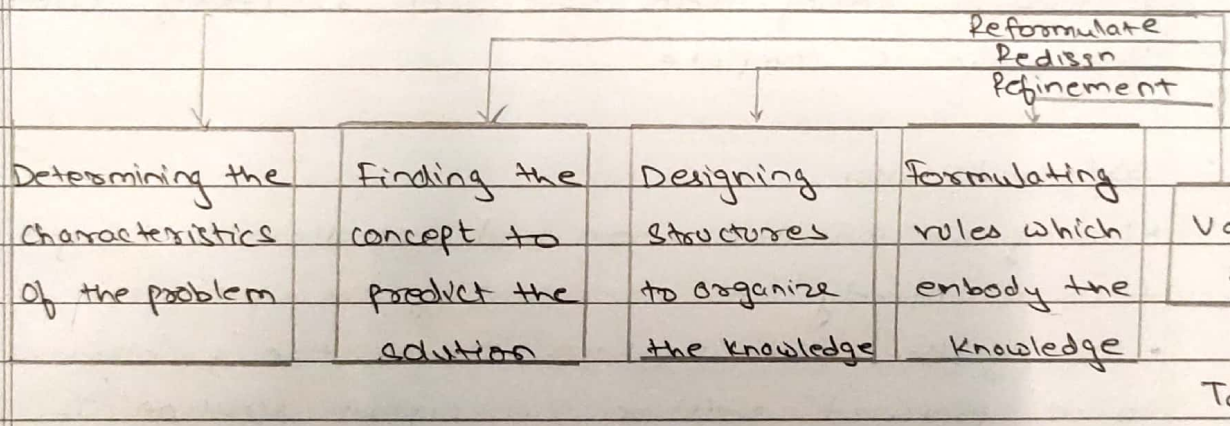
Q. 3) Explain phases in building Expert Systems with ES Architecture in detail.

→ The following are stages for developing expert system:

1) Identification.
2) Conceptualisation.
3) Formalisation
4) Implementation
5) Testing (Validation, verification, maintenance)



Five stages of Expert System Development

(1) Identification:

- Before we can begin to develop on expert system, it is important to describe, with as much precision as possible, the problem which the system is intended to solve.
- It is also important to identify our resources domain experts and information such as reference books and manuals are usually located.

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(2) Conceptualization:

- Once it has been identified for the problem an expert system is to solve the next stages involves analysing the problem further to ensure that it specifies as well as generalities are understood.
- This stage involves a circular procedure of iteration and re-iteration between the knowledge engineers and the domain expert.
- When both agree that the key concepts and the relationships among them have been adequetly conceptualised, this stage is complete.

(3) Formulaisation:

- During the indentification and formalisation stages, the focus is entirely on understanding the problem.
- During the formalisation stage, the problem is connected to its proposed solution, an expert solution is supplied by analyzing the relationships depicted in the conceptualization stage.

(4) Implementation

- In these stages the formalization concepts are programmed into the computers which has been chosen for system development, using the predetermined techniques and tools to implement 'first-pass' (prototype) of the system.
- If the prototype works at all, the knowledge engineer may be able to determine if the technique is chosen to implement the expert system were the appropriate.

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- Once the prototype system has refined sufficiently to allow it to be executed, the expert system is ready to be tested thoroughly to ensure that it expertise's correctly.

5) Testing :

- Testing provides an opportunity to identify the weakness in the structure and implementation of the system and to make the appropriate correction.
- Results from the test are used to 'feedback' to return to a previous stage and adjust the performance of the system.
- The testing process is not complete until it indicates that the solutions suggested by the expert system are consistently as valid as those provided by human domain expert.

Q. 4) Atari Games :

→ 1) The truth of atari video games are a great way to test AI. They provide variety of challenges that forces an AI to dense number of strategies yet they have a clear measure of success, a score to test against.
2) The AI agent called agent 57 has learned to play all 57 atari video game in arcade learning environment- a collection of classic games, that researcher use to test the limit of their deep learning agent.
3) Developed by deep mind agent 57 uses the same deep

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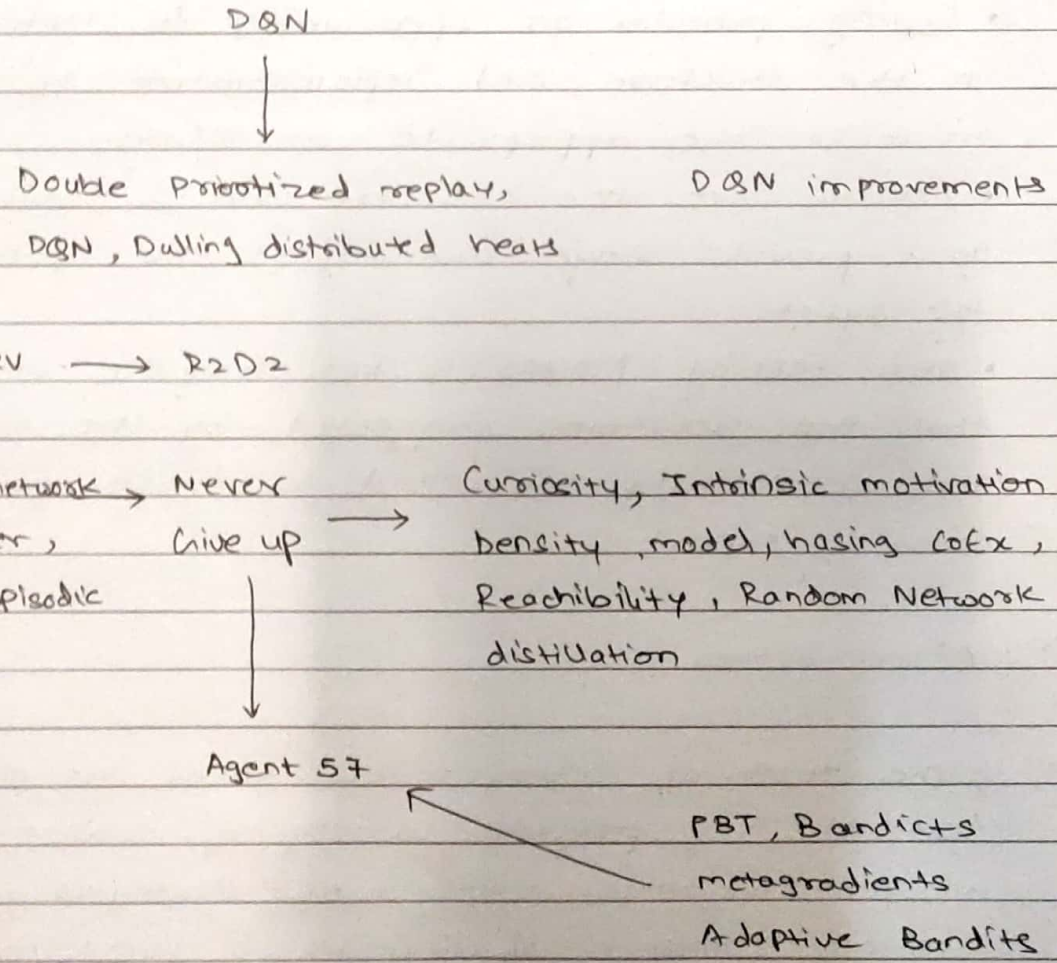
reinforcement learning algorithm to achieve superhuman game play levels even in the game that previous one's struggle with.

- Games such as Montezyma's revenge and pitFall require extensive exploration to obtain ~~guard~~ good performance.



- Training an AI to excel AI more than one taste of biggest open challenge in deep learning. The ability to learn 57 different tasks make agent 57 more versatile than previous AI game but it is still can't learn to play more than one game at a time.

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