Title: Assignments on State space formulation and PEAS representation for various AI applications

Objectives:

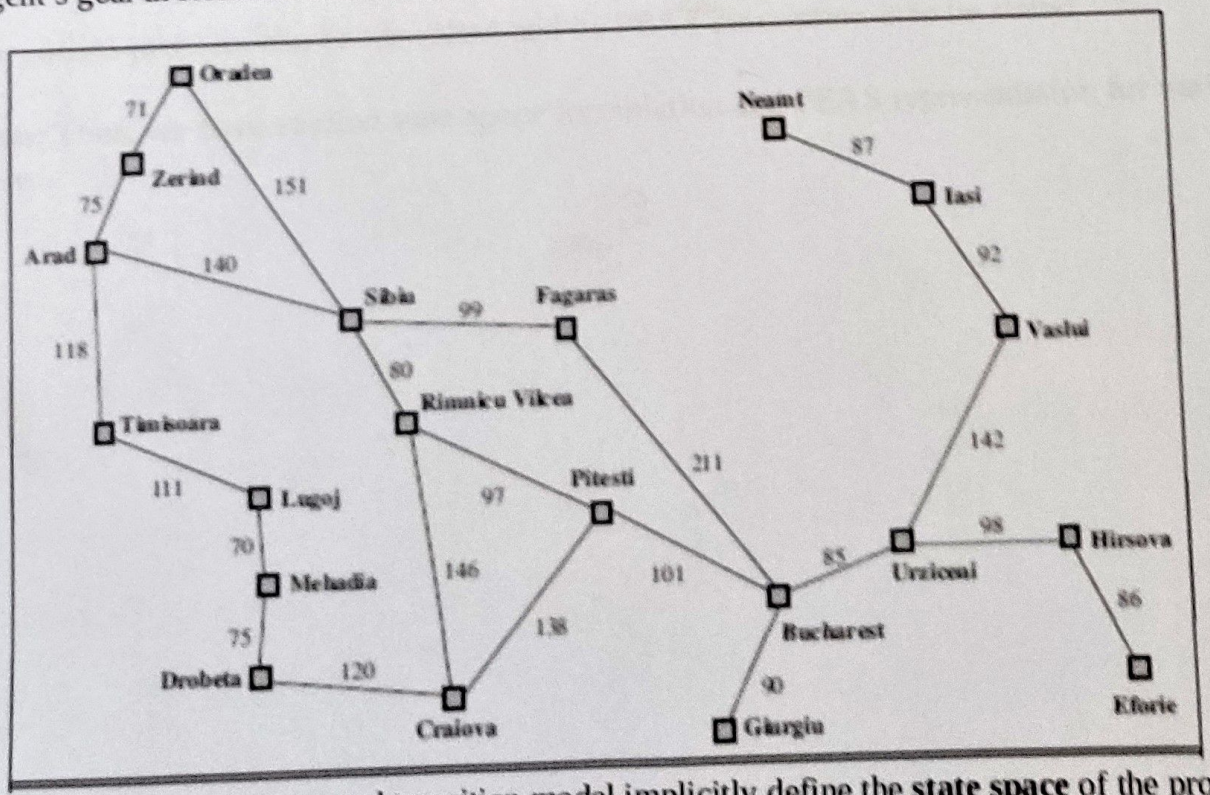
- To formulate a problem and demonstrate state space formulation.
- To analyze PEAS representation of AI applications.

Theory:

State Space Formulation:

A **problem** can be defined formally by five components:

- The **initial state** that the agent starts in. For example, the initial state for our agent in Romania might be described as In(Arad).
- A description of the possible **actions** available to the agent. Given a particular state s, ACTIONS(s) returns the set of actions that can be executed in s. We say that each of these actions is **applicable** in s. For example, from the state In(Arad), the applicable actions are {Go(Sibiu), Go(Timisoara), Go(Zerind)}.
- A description of what each action does; the formal name for this is the **transition model**, specified by a function RESULT(s, a) that returns the state that results from doing action a in state s. We also use the term **successor** to refer to any state reachable from a given state by a single action.2 For example, we have RESULT(In(Arad),Go(Zerind)) = In(Zerind) .
- The **goal test**, which determines whether a given state is a goal state. Sometimes there is an explicit set of possible goal states, and the test simply checks whether the given state is one of them. The agent's goal in Romania is the singleton set {In(Bucharest)}.



Together, the initial state, actions, and transition model implicitly define the **state space** of the problem—the set of all states reachable from the initial state by any sequence of actions. The state space forms a directed

network or **graph** in which the nodes are states and the links between nodes are actions. (The map of Romania shown in Figure can be interpreted as a state-space graph if we view each road as standing for two driving actions, one in each direction.) A **path** in the state space is a sequence of states connected by a sequence of actions.

PEAS Representation:

PEAS stand for Performance Measures, Environment, Actuators, and Sensors.

Performance Measure: If the objectives function to judge the performance of the agent. For example, in case of pick and place robot, no of correct parts in a bin can be the performance measure.

Environment: It the real environment where the agent need to deliberate actions.

Actuators: These are the tools, equipment or organs using which agent perform actions in the environment. This works as output of the agent.

Sensors: These are tools, organs using which agent captures the state of the environment. This works as input to the agent.

PEAS descriptor for Automated Car Driver:

Performance Measure: Safety: Automated system should be able to drive the car safely without dashing anywhere. Optimum speed: Automated system should be able to maintain the optimal speed depending upon the surroundings. Comfortable journey: Automated system should be able to give a comfortable journey to the end user.

Environment: Roads: Automated car driver should be able to drive on any kind of a road ranging from city roads to highway. Traffic conditions: You will find different sort of traffic conditions for different type of roads.

Actuators: Steering wheel: used to direct car in desired directions. Accelerator, gear: To increase or decrease speed of the car.

Sensors: To take i/p from environment in car driving example cameras, sonar system etc.

In this way, an AI problem can be identified and its PEAS description is to be stated.

Conclusion: Thus, we have studied state space formulation and PEAS representation for various AI applications.