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Artificial Intelligence 001

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Assignment 2

1) Select 4 from each of the following activities, give a PEAS description of the task environment and characterize it in terms of the 6 properties listed in Section 2.3.2. Support your answer by explaining each category choice in 2-4 sentences. See examples in attached Figure 2.6.

• Playing soccer.

• Exploring the subsurface oceans of Titan.

• Shopping for used AI books on the Internet.

• Playing a tennis match.

• Practicing tennis against a wall.

• Performing a high jump.

• Knitting a sweater.

• Bidding on an item at an auction.

i) Shopping for used AI books on the Internet

Performance Measures – Price of the books can be the most determinant factor for the task environment in this case. Quality and reviews of the book are also have significant effect in conditioning the task environment. Similarly, the number of times it has been bought and the author of the book can also be considered as performance measures for this particular case.

Environment – Websites and Vendors are some of the environment that the agent can perceive to understand about the books on the internet. Online shopping websites can be the most effective examples.

Actuators – The agent can use URLs, keywords, survey forms and screened information to derive necessary data and act on its environment. Through these actuators, the agent can extract a set of information through learning.

Sensors – The agent can adjust the codes in the HTML through search engines or other input boxes to give out what it has understood. These sensors directly contribute in the learning process of the agent.

Partially Observable – While the keywords and other information that are typed in can be seen, the majority of the environment are not observable. The interactions between the agents on the network are not discernible.

Multi-Agents – The environment may require multiple agents to interact and perform various tasks in order to process data and produce relevant results. A single agent cannot perform all the tasks.

Stochastic – The environment cannot be completely determined by the agent. Furthermore, the same sets of inputs can result in numerous outcomes. So, it is partly both.

Sequential – The process is sequential because the past decisions and actions factor into making a logical decision regarding current inputs. Memory from past actions are taken into account in the future as a reference.

Static/Dynamic – It is partly static and partly dynamic because some of the environmental factors remain unchanged while the agent acts while some do change. The keywords searched will remain same however, the webpages might change.

Continuous – The data sources for this case is ever-changing resulting in numerous possibilities. Since there is dependency on various unknown data sources, it is a continuous environment.

ii) Performing a high jump

Performance Measures – The height of the jump made, the safety level of the jump are two major factors to measure the agent’s performance. The agent must consider these factors while making a leap for the high jump.

Environment – A high jump cross bar and landing platform are the environment for the agent. It has to jump over the cross bar and then land safely on the platform placed just behind the crossbar.

Actuators – Jumping Spring, Legs and Safety-Pad could be the actuators for the agent. Springs and Legs are necessary so that the agent can make a jump and the safety-pad is essential to have a safe landing.

Sensors – Cameras and height sensors are essential sensors for the agent. The agent need these sensors to detect its environment and make necessary calculations based on them.

Observable – The environment is observable because the sensors can detect the height of the high-jump cross and its height on the air through its height sensors. The agent can make the observations through cameras and other sensors.

Single Agent – A single agent is enough for this case. The only objective to be completed is to make a jump and a single agent is sufficient to conduct this event.

Stochastic – As we run the model, new results come out almost every time. The agent’s actions determine what the result is going to be and hence cannot be fully determined by just a set of parameters and an initial condition.

Sequential – The agent learns from its past actions to derive the next best action in this case and memory from past experiments are used for the next iteration. So, it is a sequential environment.

Static – The environment remains unchanged when the agent takes any action. The data-knowledge sources do not change frequently hence it is a static environment.

Discrete – There are finite sets actions that can be performed for this case. With the limitations of actions there are limited set of possibilities. Hence, it can be considered as a discrete environment.

iii) Practicing tennis against a wall

Performance Measures – The speed of ball, precision of the shot and the reflexes to the rebound ball are the performance measures for this case. These aspects help us to recognize the level of execution of an agent.

Environment – Playground, wall, ball, and racquet are the parts of environment. The ball and racquet can however, act as actuators also.

Actuators – Arms, ball and racquets are the actuators for playing tennis against a wall. Agent can apply its learned information into actions through these actuators.

Sensors – The sensors could be a camera, location sensors in the ball, and the sensors in the racquet to determine the areas in contact between the ball and racquet. The sensors are required to be high-end type because they might have to detect a very high speed and the rapid changing ball location.

Observable – Yes, the process of ball being hit and rebound on the wall can be observed and studied. With the help of the sensors, the environment can be analyzed.

Single Agent – Only a single agent is required for this case because basically, it is a single player. If there was an opponent, (like in squash) then there would be multi-agents involved.

Stochastic – The results of the agent’s actions are random and is almost impossible to be calculated using a formula. Hence, the environment is stochastic.

Sequential – The events occurring are taken as learning scenes by the agent and it uses the information to make the best next step. Since the environment is dependent on the past results, it is a sequential environment.

Dynamic – The environment changes when the agent acts. When the racquet hits the ball, the ball moves forward and bounces on the wall. This happens is a dynamic environment.

Continuous – The speed of ball and its location have a large range of continuous values. The set of possible actions is also large and hence the environment can be stated as a continuous environment.

iv) Knitting a sweater

Performance Measures – Size of the sweater, Quality of the sweater and the speed of knitting could be some areas that can be measured to recognize the agent’s ability. The agent should ensure that the sweater is comfortable to be worn.

Environment – The environment for knitting a sweater could consist the yarn, needles, wool, craft and patterns. The agent has to take these aspects into account to make any actions.

Actuators – Arms, needles and yarn are the actuators for this case. The agent can act through the arms and needles to knit using the yarn.

Sensors – Camera could be necessary sensor for this case however, it will not suffice. A pattern sensor is required to detect that the knitting is going the right way.

Observable – The whole process of knitting can be directly observed. Starting from the tying the first knot in needle to creating patterns as the knitting continues, all of these can be seen and agent can undergo learning based on the observations.

Single Agent – This is a single agent environment. A single agent can conduct all the necessary processes to complete the learning and then perform a successful knitting.

Stochastic – Making a pattern while knitting a sweater comes across with various changes in the process and hence a single formula cannot determine the whole process. So, it is stochastic.

Sequential – The previous loop in the needle is useful to determine the next loop and hence the agent can make actions based on it. There are interrelated sequels of events that occur to complete the knitting.

Dynamic – As the knitting continues, the position of the needles change and so does the lengths and shapes of the wool. Hence it is a dynamic environment.

Continuous – The knitting of sweater does not consist of values that agent needs to take into account. The location of wool in the needle also changes through a wide range.