

Assignment - 1B

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Subject: A.I

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Q1. Explain PEAS descriptions for wumpus world

→ PEAS represents Performance Measures, Environment, Actuators and Sensors. The PEAS description helps in grouping the agents. PEAS description for the wumpus world problem.

1) Performance measures:

- Agent gets the gold and return back safe = +1000 points.
- Agent dies = -1000 points
- Each move of the agent = -1 point
- Agent uses the arrow = -10 point.

2) Environment:

- A cave with 16 (4×4) rooms.
- Rooms adjacent to the WUMPUS are stinking.
- Rooms adjacent to the pit are breezy.
- The room with the gold glitters.
- Agent's initial position - Room [1,1] and facing right side.
- Location of WUMPUS, gold and 3 pits can be anywhere, except in Room [1,1].

3) Actuators:

Devices that allow the agent to perform the following actions in the environment.

- Move forward
- Turn right
- Turn left
- Shoot
- Grab
- Release.

4) Sensors:

Devices which help the agent in sensing the following from the environment.

- Breeze
- Stench
- Glitter
- Scream
- Bump.

WUMPUS world characterization

- Partially observable: knows only the local perceptions.
- Deterministic: outcome is precisely specified.
- Sequential: subsequent level of actions performed.
- Static: wumpus, pits are immobile.
- Discrete: discrete environment.
- Single-agent: the knowledge-based agent is the only agent whereas the wumpus is considered as the environment's feature.

Q2. Explain various elements of cognitive system

→ cognitive computing represent self-learning systems that utilize machine learning models to mimic the way brain works. Eventually, this technology will facilitate the creation of automated IT models which are capable of solving problems without human assistance.

The purpose of cognitive computing is the creation of computing frameworks that can solve complicated problems without constant human intervention. In order to implement cognitive

function computing in commercial and widespread applications, cognitive computing consortium has recommended the following features for the computing system:-

1) Adaptive:

This is the first step in making a machine learning based cognitive system. The solutions should mimic the ability of human brain to learn and adapt from the surroundings. The systems can't be programmed for an isolated task. It needs to be dynamic in data gathering, understanding goals, and requirements.

2) Interactive:

Similar to brain the cognitive solution must interact with all elements in the system, - processor, devices, cloud services and user. Cognitive systems should interact bi-directionally. It should understand human input and provide relevant results using natural language processing and deep learning. Some skilled intelligent chatbots such as Mitsuku have already achieved this feature.

3) Interactive and stateful:

The system should 'remember' previous interactions in a process and return information that is suitable for the specific application at that point in time. It should be able to define the problem by asking questions or finding an additional source. This feature needs a careful application of the data quality and validation methodologies in order to ensure that the system is always provided with enough information and that the data sources it operates on to deliver reliable and up-to-date input.

4) Contextual :

They must understand, identify and extract contextual elements such as meaning, syntax, time, location, appropriate domain, regulations, user's profile, process, task, and goal. They may draw on multiple sources of information, including both structured and unstructured digital information, as well as sensory inputs.

Q3.

Write note on Language Model.



Language Model (LM) is the use of various statistical and probabilistic techniques to determine the probability of a given sequence of words occurring in a sentence. Language models analyze body of text data to provide a basis for their word predictions. They are used in natural language processing applications, particularly ones that generate text as an output, some of these applications include, machine translation and question answering.

There are various language model available a few are:

a) Methods using markov assumption:

A process which is stochastic in nature, is said to have the markov property, if the conditional probability of future states depends upon present state:

b) N-gram models:

- from the markov assumptions, we can formally define models where $k=n=1$ as following -

$$P(w_1 | w_1, w_2 \dots w_{i-1})$$

c) Unigram model ($k=1$)

$$P(w_1 | w_1, w_2 \dots w_{i-1})$$

$$= \prod_i p(w_i)$$

d) Bigram model ($k=2$):

$$P(w_1|w_2, w_3, \dots, w_{i-1}) = P(w_i|w_{i-1})$$

$$P(w_i|w_{i-1}) = \frac{\text{count}(w_{i-1} \dots w_i)}{\text{count}(w_{i-1})}$$

Q4.

Write a note on machine translation.



Machine translation is a classic test of language understanding. It consists of both language and you & generation many machine translation system having huge commercial use following are a few:

- google translate goes through 100 billion words per day.
- ebay uses machine translation techniques to enable cross border trade & connect buyers / sellers around globe.
- facebook uses machine translation techniques to enable user to translate text in posts & comments automatically in order to break language barrier.
- syst Translation was only one of the first applications of computing power, starting in the 1950's. Unfortunately, the complexity of the task was far higher than early computer scientists' estimates, requiring enormous data processing power and storage far beyond the capabilities of early machines. Neural machine translation proved so effective that google changed course and adopted it as their primary development

model. Other major providers including Microsoft and Amazon soon followed suit, and modern machine translation became a viable tradition to translation technology.

Q5. Explain following terms:

a) Phonology :

It is the study of organizing sounds systematically in an NIP system.

b) Morphology :

- It is a study of construction of words from primitive meaningful units.

c) Lexical analysis :

lexicon is the words and phrases in language. lexical analysis deals with the recognition & identification of structure of sentences, phrases & words.

d) Syntactic analysis :

In syntactic analysis the sequences are pointed as noun, verbs, adjective and other parts of sentences. In this phase the grammar of the sentence is analyzed in order to get relationship among different words in sentences. for example, "manage eats me" will be rejected by analyze.

e) word sense disambiguation :

- while using words that have more than one meaning we have to select the meaning which makes the most sense in context. for eg. use one typically given a list of words associated word tends