

Assignment No :- 1 B

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Sem / Branch :- VII / IT

Batch :- I2

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Q.1 Explain PEAS descriptions for Wumpus world.

→ i) Performance Measure:-

- +100 for grabbing goal and coming back to start.
- -200 for if player is killed
- -1 per action
- -10 for using arrow

ii) Environment:-

- Empty Rooms
- Room with Wumpus
- Rooms neighbouring to Wumpus which are smelly
- Rooms with bottomless pits
- Rooms neighbouring with bottomless pits which are breezy.
- Rooms with gold which is glittery.
- Arrow to shoot Wumpus.

iii) Sensors (Assuming Robotic Agent)

- Camera to get the view.
- Odour sensor to smell the stench.
- Audio sensor to listen to the screen and bump.

iv) Effectors (Assuming robotic agent)

- Motor to Move left Right
- Robot arm to grab
- Robot Mechanism to shoot arrow.

Wumpus World agent has following Characters.

- |                     |                  |
|---------------------|------------------|
| a) fully observable | b) Deterministic |
| c) static           | d) Discrete      |
| e) Simple Agent     |                  |



Q.2 Explain various elements of Cognitive system

→

1) Cognitive Computing is a new type of Computing with the goal of more accurate Models of how the human brain/mind Senses / reasons and responds to stimulus.

2) Generally the term Cognitive Computing is used to refer to new hardware and/or software that Mimic the Functioning of the human brain thereby improving human decision-making. Cognitive Computing applications link data analysis and adaptive page displays.

Following are some of the elements of Cognitive Systems.

1) Interactive :-

- 1) They may interact easily with users so that those users can define their needs comfortably.
- 2) They may also interact with other processors, devices, and Cloud services as well as with people.

2) Adaptive :-

- 1) They may be engineered to feed on dynamic data in real time.
- 2) They may learn as information changes and as goals and requirements evolve.
- 3) They may resolve ambiguity and tolerate unpredictability.



### 3] Contextual :-

- 1) They may understand, identify and extract Contextual elements such as meaning, Syntax, location, appropriate domain, regulations user's profile, process, task and goal.
- 2) They may draw on Multiple Sources of information, including both Structured and Unstructured digital information, as well as sensor inputs like visual, gestural, auditory or sensor-provided

### 4] Iterative and Stateful :-

- 1) They may aid in defining a problem by asking questions or finding additional source of input if a problem statement is ambiguous or incomplete
- 2) "remember" previous interactions in a process and return information that is suitable for the specific application at that point in time.



Q.3. Write note on language Model.

- 1) The goal of a language Model is to Compute a Probability of a token (eg a source Sentence or Sequence of words) & are useful in Many different NLP Applications.
- 2) Language Model actually a grammar of a language as it gives the probability of word that will follow.
- 3) InCase of (LM) probability of a Sentence as sequence of words is  $P(w) = P(w_1, w_2, w_3, \dots, w_n)$
- 4) It can also be used to find the probability of the next word in sentence  $P(w_4 | w_1, w_2, w_3, w_4)$
- 5) A Model that Computes either of these is language Model.
- 6) 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.

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

c) Unigram Model ( $k=1$ ):-

$$P(w_1, w_2, \dots, w_n) = \prod P(w_i)$$

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d) Bigram Model ( $k=2$ ): -

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

$$p(w_i | w_{i-1}) = \frac{\text{Count}(w_{i-1} \dots w)}{\text{Count}(w_{i-1})}$$

Q.4. Write a note on Machine Translation.

→

i) Machine Translation is Classic test of language understand. It Consists of both language analysis and generation. Many Machine translation System have huge Commercial use following are few of the examples.

i) Google Translate goes through 100 billion words per day.

ii) eBay uses machine translation techniques to enable crossborder trade and connect buyers / sellers around globe.

iii) Facebook uses (MT) to translate text in post and comments automatically in order to break language barriers.

iv) Systran became the first software provider to launch a Neural Machine Translation Engine in more than 30 languages in 2018.

v) Microsoft brings AI-powered translation to end users and developers on Android, iOS, and Amazon Fire, whenever or not they have



access to the Internet.

2) In a traditional Machine Translation System, parallel corpus a collection of trees is used to each of which, is translated into one or more other languages than original. For eg. given source language eg. French and target language eg. English. Multiple statistical models need to be built including a probabilistic formulation using translation model  $p(f|e)$  trained on parallel corpus and language model  $p(e)$  trained on English corpus.

3) It is obvious that this approach skips hundreds of important details, requires a lot of human feature engineering and is overall a complex system.



Q.5. Explain following terms:-

a] Phonology:-

It is study of organizing sounds systematically in an NLP (Natural Language Processing) system.

b] Morphology:-

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

c] Lexical Analysis:-

Lexical is words and phrases in language. Lexical Analysis deals with recognition and identification of structure of sentences. It divides paragraphs in sentences, phrases and words.

d] Syntactic Analysis:-

In this, sentences are parsed as noun, verbs, adjective and other parts of sentences. In this phase grammar of sentence is analyzed in order to get relationship among different words in sentence.  
e.g. "Mango eats me" will be rejected by an analyzer.



e) Word sense disambiguation:-

While using words that have more than one meaning we have to select meaning which makes most sense in context. For eg. we are typically given list of words associated word senses eg. from dictionary or from an online Resource such as word net