

Department of Information Technology

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Assignment No. 1B

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Class :- B.E.

Subject :- IS LAB

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Q.1 Explain PEAs descriptions for WUMPUS World

→ ① Performance measure

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

② Environment

- Empty rooms
- Rooms neighbouring to Wumpus which are smelly.
- Rooms with bottomless pits
- Rooms neighbouring with bottomless pits which are breezy.
- Rooms with gold which is glitery.
- Arrow to shoot the Wumpus.

③ Sensors (assuming a robotic agent)

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

④ Effectors (assuming a robotic agent)

- motor to move left, right.
- Robot arm to grab the gold
- Robot mechanism to shoot the arrow

The WUMPUS world agent has following characteristics:-

- ① Fully observable.
- ② Deterministics
- ③ Episodic
- ④ Static
- ⑤ Discrete.
- ⑥ Single agent.

Q.2 Explain various elements of cognitive system

- Cognitive computing is a new type of computing with the goal of more accurate models of how the human brain/mind sense, reasons, and responds to stimulus. Generally, the term cognitive computing is used to refer to new hardware and/or software that mimic the following functioning the human brain. These by improving human decision making. Cognitive computing applications links data analysis & adaptive page display i.e. adaptive users interface, to adjust content for a particular type of audience.

- Following are elements of cognitive system:

① Interactive :-

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

② Adaptive :-

- They may be engineered to feed on dynamic data in real time. They may learn as information changes & as goal as requirements evolve. They may resolve ambiguity & tolerate unpredictability behaviour.

③ Contextual :-

- They may understand, identify & exact contextual elements such as meaning syntax, location, appropriate domain etc.

④ Interactive & stateful:-

- They may aid in defining a problem by asking questions or finding additional source input if a problem statement is incomplete.

Q.3 Write note on language Model.

→ ① The goal of language model is to compute a probability of a token (e.g. - a sentence or sequence of word) & are useful in many different NLP applications.

② Language model (LM) actually a grammar of language, as it gives the probability of word that will follow.

③ In case of (LM) probability of a sentence as sequence of word 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: $P(w_{n+1}/w_1, w_2, w_n)$

⑤ A model that computes either of these is language Model.

⑥ There are various languages models are available, a few are:

① Methods using markov assumptions

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

② N-gram Model

- 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 ($k=1$)

$$p(w_1 w_2 \dots w_n) = \prod_{i=1}^n p(w_i)$$

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

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

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

Q.4 Write a note on machine Translation

Machine Translation is classic test of language understanding. It consists of both language analysis & generation. Many machine translation systems have huge commercial use. Following are few of the examples:

- 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 (MT) to translate text in posts & comments automatically in order to break language barriers.
- System became the first software provider to launch a neural machine translation engine in more than 30 languages in 2016.
- Microsoft brings AI-powered translation to end users & developers on Android, iOS and Amazon Fire, whether or not they have access to the internet.

In a traditional machine translation system, parallel corpus a collection of trees is used. each of which is translated into one or more other languages than the original.

eg. given the source language eg. English, multiple statistical models need to build, including a probabilistic formulation using the fusion rule, a translate model $P(f|e)$ trained on parallel corpus and a languages model $P(e)$ trained on the english corpus.

It is obvious that, this approach skip, hundreds of important details requires alot of human feature engineering & is overall a complex system.

Q.5 Explain the following terms.

1] Phonology :-

It is the study of organizing sound systematically in an NLP (natural language processing) system.

2] Morphology :-

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

3] Lexical analysis :-

Lexicon is the word phrase in language. Lexical analysis deals with the recognition & identification of structure of sentences.

It divides the paragraphs in sentences, phrases & words.

4] Syntactic Analysis :-

In syntactic analysis the sentences are parsed as noun, verbs, adjective & 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 eg :- "Mango eats me" will be rejected by analyzer

5] 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 example, we are typically given a list of words associated word senses from a dictionary or from an online resources such as word net.