Modelling Cognition

The discussion progressed around the different proposed models of human cognition.

Nature of Linguistic Sign

Saussure emphasises on the unity of the components of Linguistic Sign

- concept (signified)– the abstract idea in reference to, the topic of communication
- sound-image (signifier)– the sensory imprint that the communication mode makes on us.

Each of the components is meaningless without the other. The existence of a simple sound or sign without a corresponding concept to refer can be seen useless. Also, the formation of concepts is not possible unless there is a psychological imprint on senses in correspondence. Psychological nature can be noticed when we mutter things out while reading or thinking. In which cases we tend to use the sound-image of words in our mind to understand them.

"The bond between signifier and signified is arbitrary":

We discussed it in two different ways. First we argued that notion of concepts can have different - different sound image for different persons depending on various factors like social and linguistic background , exposure to that concept (idea of man being able to recognise difference between dog and calf) , experience , physical structure (gender , persons with deficiencies) etc. So this relation of having a different sound image is not completely arbitrary.

Almost all of persons will recognise the dog to be a dog. When I show you picture of my pet dog, I might have different kind of feelings (sound-image), you will have different kind of emotions and understanding but both will agree on dog being dog.

We thought the arbitrary part as if a different name would have been decided for tree in our language then we would not have any problem in relating with concept of tree with that idea.

However, we concluded on the following interpretation. The semantic space can be divided into concepts, mapped to the sound-images and this split is dependent on the surroundings of the linguistic development. Example, the linguistic signs for eat and drink are not differentiated in *Bengali,* unlike in *English*.

The Sign: Icon, Index and Symbol

Icon**:** The sign that is the result of perception by the human mind. The existence of its real world analogue – the 'object' is unnecessary for the icon to exist.

Symbol: A sign used based on the common understanding in reference to an Icon (generally perceived similarly among various people, but need not be exactly the same).

Index: A sign that brings about a spatial or temporal continuity of context to the existing object, the real world analogue of Icon. Hence, the existence of the object is necessary for the Index to exist.
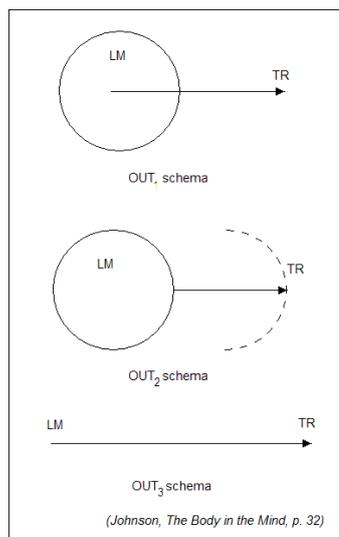
Symbol Grounding Problem and Symbolic Theft

The introduction of the notion of symbols in the previous section implicitly provides their grounding in non-symbolic icons or concepts. The necessity of the same has been established by the Chinese-Chinese dictionary example. Modelling human cognition as symbol systems helps capture higher level logic and reasoning, done consciously by us. However, it trivialises the symbol grounding problem which, in reality undergoes a rigorous training stage where the Iconic properties are captured to recognise and differentiate between linguistic signs and also, the invariant properties among signs of the same category. This is modelled using connectionist systems (neural networks).

Image Schema

Image Schemas give a deeper insight about how semantics of the reasoning can be modelled by spatial structures mapped to a condensed description of perceptual experience. Image schemas act as a bridge between the lower levels of perception to a higher level cognition.

The schema for the same word tends to be different depending on the context. Example, in the diagram shown, the word 'out' can be represented by containment image schema.

(Johnson, The Body in the Mind, p. 32)

1. He went out of the room.
2. Spill out the beans.
3. I set out for London.

Cohen's distinguishes the schemas further to capture the dynamics of an intentional agent (An Image Schema Language)

- Static – instantaneous descriptions of relationships. Example, a near-far relation.
- Dynamic – description over time. Example, an approaching schema.
- Action – captures agents' intentions as a sequence of dynamic states. Example, kicking can be described as A approaching B, A coming in contact with B and B moving away from A.

Mind – A computer program?

Intelligence in machines is normally associated with it passing Turing test. Searle argues that we cannot rely on this definition as it takes only the input and output into account (questions and answers). It really does not take the factors of human understanding and thinking into account. With regards to Searle's Chinese room argument, the idea of formal symbol manipulation is not thinking because this does not have any recreational ability and it does not have any semantic association with the symbols (Symbols not being grounded to concepts).

We discussed that idea of thinking is related to having perceptual ability, semantic understanding. Idea of formal symbol manipulation system being platform independent was also discussed. As formal manipulation system is independent of the hardware on which it is running (These are sequential steps which can be carried out by any kind of device). However, understanding and thinking as of now is not thought or associated with other than living beings (that's why Turing Test takes humans being intelligent). Searle feels that a machine has to have some special kind of hardware, in duplication of the human brain to be considered to be thinking. Perhaps what he wanted to say was a system like the human brain would compose of individual neurons acting independent of each other, resulting in the total thinking process. Our view on whether this can happen in future was of varied perspective. We think that the idea being conscious is what that would make a difference in human understanding. However, we cannot explain it in terms of hardware as on date.

From behaviourism to cognitivism:

We discussed that modelling mind by merely through behaviourism lacks some fundamental problems. It does not take into account when we are unconsciously thinking. It does not take into account the hardware structure of brain. Merely analyzing input and output is not possible, because we really do not all of the inputs and outputs which mind is taking. This can just be predicted. Behaviourist think that thinking is merely a behaviour of mind, But cognitivism says that behaviour is the result of thinking, not the other way round.

Behaviourism only predicts the human behaviour on different situations, solely depending on input stimuli and corresponding output. So this does not take into account the complex structure of brain and various environmental factors. As we have argued that most of the time brain acts unconsciously due to which we are unable to understand the behaviour of mind.

Is it necessary to have language for thinking?
Though Language acts as one of the medium between human and social interactions, (there exists a lot more method of communications like Sign Language, Face movement , different images, visual understanding , there all are different than linguistic abilities). Every human being exchanges piece of information through a language. There are a lot of words in languages which do not have their individual meanings but they create a meaning when associated with other ones. Ex. Pani - Vani , Chay - Vay in Hindi . So every word in the language need not to have a meaning. Example, we use a

lot of words like Uh, hmm, etc. to convince others not having any literal meaning attached with them. With respect to Saussure's analysis We can conclude that we think more in terms of words / symbols to sound image mapping but not in terms of word to word mapping.

References

[Angelo Cangelosi, Alberto Greco and Stevan Harnad , 2002] "Symbol Grounding and the Symbolic Theft Hypothesis"; In Cangelosi A & Parisi D. Simulating the Evolution of Language. London: Springer

[Harnad S., 1990]; "The Symbol Grounding Problem"; Physica D 42: 335-346.

[Saussure, Ferdinand de , 1916]; "Nature of the Linguistics Sign" ; In Charles Bally & Albert Sechehaye, Cours de linguistique generale, McGraw Hill Education.

[Pierce C. S., 1932] ; "The icon, index, and symbol" ; Collected papers of Charles Sanders Pierce, 2, 156-173.

[John R. Searle , 1990]; "Is the Brain's Mind a Computer Program?" ; In Scientific American, pp. 26--31.

[Robert St. Amant,Clayton T. Morrison,Yu-han Chang,Paul R. Cohen,Carole Beal , 2006]; "An image schema language" ; "The Proceedings of The 7th International Conference on Cognitive Modelling (ICCM)"