International Journal For Advanced Research In Science & Technology
A peer reviewed international journal www.ijarst.in
ISSN: 2457-0362

A STUDY OF COMPUTATIONAL MODEL ON INTERACTION SYSTEM FOR MIMIC HUMAN BEHAVIOUR

CANDIDATE NAME= SANTOSH KUMAR
DESIGNATION- RESEARCH SCHOLAR MONAD UNIVERSITY HAPUR
GUIDE NAME = DR.AMIT SINGAL
DESIGNATION- ASSOCIATE PROFESSOR MONAD UNIVERSITY HAPUR

ABSTRACT

Several novel, difficult activities have emerged in modern civilization, testing the limits of human capability. Some examples include guarding a building with multiple cameras at all times, exploring alien worlds, repairing satellites, caring for elderly relatives, serving in the military in hostile environments, rescuing people trapped in burning buildings, etc. Some of the aforementioned activities are very time-consuming and taxing, others pose serious health risks, and yet others are just impossible to do in the allotted amount of time. Robots have more strength and speed than humans, but they lack the intelligence to replace us. Robotic robots will need to replace humans in the aforementioned activities after the memory process has been computationally imitated so that they can do tasks that need intelligent human behavior. Human memory is the primary driver of our behavior; therefore scientists have spent a lot of time studying different parts of the brain to better understand it. According to studies of the human brain, there are three main types of human memory: episodic, semantic, and procedural. Semantic memory enables people to construct knowledge from information across all sensory domains and aids in decision making based on acquired generalizations, while episodic memory aids in intelligent choice making by storing specifics about previous events. Procedural memory is responsible for translating high-level goals and environmental activities into lower-level motor tasks. This article presents a computational model for the human memory process since previous work in this area has failed to adequately account for the interconnected nature of the many components of episodic and semantic memory. Two types of memory, episodic and procedural, have been taken into account in this study's modeling. Computational Long Term Memory Architecture is the suggested model's module name. Each of the three modules in the Architecture represents one of the three main categories of human long-term memory: computational semantics, episodic memory, and procedural memory.

KEYWORDS: Computational Model, Interaction System, Mimic Human Behaviour, Semantic memory enables, human long-term memory

INTRODUCTION

Exploring new worlds, fixing satellites in space, working in nuclear power plants, rescuing victims of natural disasters, etc. are only some of the new, demanding jobs that modern civilization faces. Long periods of focused effort are needed for certain jobs, such as airport or border patrol, when a moment's distraction might have catastrophic consequences. Robots are necessary to replace people in the aforementioned occupations in order to give convenience and lower the danger to human life. A robot requires the ability to predict and account for a wide variety of outcomes in each of these situations.

Given that people base their judgments on information stored in their memories, it is necessary to simulate the human memory process on computers. Several Mars rovers have been deployed there in the past. Because of their lack of intelligence, constant orders from the command center were needed even for the smallest of maneuvers. Heavy storms, for example, might cause input signals to be disrupted, leaving the system inactive for extended periods of time [1,2]. Even yet, it takes a lot of energy just to get the signals needed to perform any given activity. In a similar vein, security cameras record footage that is only seen when an unusual event is detected from the outside world. These two examples highlight the need for intelligent devices that can mimic human cognitive abilities including understanding, inference, and knowledge construction by experience, planning, and reporting to the user.

Computer scientists today are making strides in this direction; they have achieved remarkable success in the area of sensory memories, in particular in the detection of stimuli; for instance, in computer vision, the detection of objects [3–4], gestures [5–7], texts [6–9], and faces [7–9] is done; in the auditory domain, the detection of spoken words [8–9] and emotions in speech signals [10–11] is done; and so on. When this sort of multimodal information is combined, it may reflect far more significant information than would be represented by the detections of each separate domain acting alone. If a person (let's call him john) is seen eating a cake with great enthusiasm, it cannot be inferred from the mere detection of his face, gesture, facial expression, and items in the scene that john enjoys eating cake. Planning, inference, talking while recalling previous events, recalling the place of any event and performing navigation towards the location even in the dark, forming a general opinion about anything by judging someone's behavior, constructing hierarchies, etc. are just some of the complex tasks that a human brain is capable of.

AN OVERVIEW OF HUMAN MEMORY

Different parts of the brain work together in a simultaneous fashion to develop complex behavior and functions throughout the human memory process. According to a review of the relevant research, the human memory process includes the following fundamental capabilities: encoding, remembering, consolidating, cognitively processing, and inferentially processing information. Human intellect rests on these fundamental capabilities.

Ultra short-term memory (shown in Figure1), short-term memory, and long-term memory are the three main types of human memory, each with their own set of fundamental capabilities.

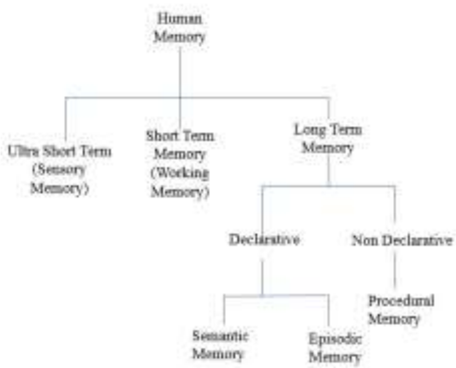

Figure 1: Human memory classification

1. Ultra-Short-Term Memory

When it comes to memory, sensory recollection is the most fleeting. It's the capacity to keep sensory impressions in mind long after the source of those feelings has gone away. The five senses—sight, sound; smell, taste, and touch—receive accurate, short-term storage in this region of the brain. One example of sensory memory is the capacity to recall the appearance of an object after just a brief glance.

2. Short-Term Memory (Working Memory)

As "the brain's Post-it note", short-term memory serves as a type of "scratch-pad" for temporary recollection of the information which is being processed at any one moment. One way to define it is as the capacity to retain and analyze data simultaneously. For a brief time (usually between 10 and 15 seconds, occasionally up to a minute), it keeps a limited quantity of information (often about 7 items or fewer) in memory in an active, easily accessible state.

Baddeley et al present a model for working memory in which it is broken down into several sections, such as the phonological loop store, the visual-spatial sketchpad, the episodic buer, and the central executive component. Here, the phonological loop is used to keep track of sounds, the visuospatial sketchpad is used to keep track of visual information including pictures, mental maps, and places, and the episodic bu er is used to keep track of the combined acoustic and geographical data for the time being. The system's coordination relies on the central executive component.

3. Long-Term Memory

Human cognition is mostly the work of the long-term memory. The memory processes the wide variety of sensory input that enables humans to perceive, think, and act in the world, as well as to remember specifics from prior experiences. Depending on how crucial the knowledge is, its retention in long-term memory might last anywhere from a few hours to forever. Long-term memory may be broken down into semantic memory, episodic memory, and procedural memory.

Type descriptions and further information are provided below.

3.1 Semantic Memory

The semantic memory stores and acquires multimodal information by experience. The Taj Mahal in Agra is an example of knowledge that is a general relationship of multi-modal input. Shooting someone may result in death (a generalized event), and then (a general sequence of learning) the birthday boy slices his cake (a specific event). The birthday boy, cake, gun, and bullet are all concepts here that are filed away in the brain's semantic memory. The knowledge of many ideas, such as the notion of "give," are also stored in semantic memory. For example, the concept of "give" has its own language memory, sensory memory that enables a person to perceive the concept in an event, and motor memory that enables actions of "give."

3.2 Episodic Memory

Humans have what is called an episodic memory, which allows them to remember specific events from their past. For instance, a person's recollection of a party will include not just the music heard there, but also the location of the party and the people and events that took place there (i.e., the acts taken and the people who carried them out).

When learning anything new, the episodic memory just needs one exposure, whereas the semantic memory needs several exposures to acquire the statistical regularity of the material. Event actions are described in abstract terms by the episodic memory. In contrast, the sensory and abstract level ideas learned by the semantic memory aid the episodic memory in recording the event specifics.

PROCEDURAL MEMORY

Unlike declarative memories like short-term memories (SM) and long-term memories (EM), procedural memories (PM) are learned and recalled implicitly, without conscious, and result in far faster decision-making. This recall improves with time when you repeat the same series of choices (procedures). It is slower than declarative learning because it is not responsive to recent changes and instead learns gradually, leading to habit learning. One sort of PM is the cognitive procedural kind, which aids in making a series of judgments, forecasts, and way finding maneuvers. Learning the motor skills required to complete a task is stored in the motor procedural memory.

Applications of Humanoids and Robots

Humans have shown their intellect in a variety of real-world contexts by accomplishing complicated tasks, but the danger to human life in such missions is high and robots are needed to fill in for them. Here are some examples of where you may put the robot to use:

Robots in Space:

Shuttles that can give oxygen and shield humans from space's vacuum are very expensive, making space travel prohibitively difficult for the average person. In addition, there are risks associated with space settlements due to the repeated occurrence of mission failures. A robot will be preferable since it won't need air or shielding while traveling through space. It can survive for far longer than humans on tasks that are too dangerous for them.

Several rovers have been launched to Mars before, but they lacked the intelligence and sophistication of modern Mars rovers. In the future, though, these rovers will have a smart software that can take the role of people.

Robots in Wars:

A soldier gives up his or her life for the defense of one's nation and its citizens.

His sacrifice is priceless for his loved ones and for his nation. Incorporating robots into a military force is one way to lessen potential danger.

Robots in Rescue Operations:

Disasters that may kill hundreds or even thousands of people include landslides, volcanic eruptions, earthquakes, building fires, and floods. Army personnel execute rescue missions in such emergencies, but they, too, are human and would perish under the same conditions as the civilian population. Many lives might be saved by a robot that is both faster and more powerful than humans in performing rescue operations.

Robots as surveillance:

Humans are unable to maintain focused attention for an extended amount of time, which is necessary for effective surveillance. Since a robot's mentality is only a computer program, it can't become side-tracked. Since his brain is essentially a semiconductor chip, its processing speed is exponentially greater than that of a human brain. This enables them to think in tandem with surveillance and make sound decisions.

Robots to take care of an Old Person at Home:

There is a need for robots that can do the duties of the elderly and maintain their houses since the younger generation often lacks the time and energy to do so.

Functional Objectives of Robots

The use case of a rescue mission demonstrates how appealing features of a robot stimulate computational study into human long-term memory.

- • Procedures for Robotic Search and Rescue:

Figure 1: Robot performing a rescue Operation

1. First, a robot needs navigation skills so it can get to its destination.
2. Second, the robot has to be able to tell who is in danger based on their body language and the visual cues provided by their environments.
3. The next step is for the robot to be able to communicate with the person in danger so it can learn more about the other people who need assistance.
4. Fourth, the robot needs proper motor level activities to pick up the vulnerable human.
5. The robot should be able to plan its activities based on its episodic experiences or its semantic understanding to achieve its objectives.

We want robots to be able to do the things listed above, and this desire drives research into computer models of the human memory process.

CONCLUSION

Modeling human long-term memory computationally is the focus of this thesis. The thesis presents a deep strategy that addresses all three types of long-term memory, as well as a more surface-level answer. The second method is very abstract since it does not take into account a number of concerns that might arise in a real-world setting. The model did quite well in a simulated battlefield, therefore this strategy works well for AI-enabled video games.

The strategy proposes architecture in which semantic, procedural, and episodic memory are separate but interrelated subsystems of LTM. According to the literature review, each module is a set of related models or functional blocks that work together to accomplish a certain task.

- The computational model of the grid and the place neuron are made available to the proposed semantic module. To simulate the functioning of a genuine grid neuron and produce the hexagonal grid pattern via the coordination of body components, a quadrant model is provided. The suggested technique has been successfully tested, resulting in an AI agent that can effectively self-localize and navigate in a human-like fashion. Furthermore, the model has given the episodic memory the geographical context it needs to navigate by memorizing the locational specifics of past events.

- The semantic module presents a computational general semantic memory for making predictions and carrying out planning. Real-world generalizations are stored in the general semantic memory. The hypothesized method has been shown to be effective in learning both broad categories of activity and broad categories of event sequences in experimental study. The episode construction block of the episodic module also receives the general sequences learnt, allowing it to group events that make up a general sequence into a single episode.

REFERENCES

1. Anderson, M. C. (2003). Rethinking interference theory: Executive control and the mechanisms of forgetting. Journal of Memory and Language, 49, 415–445.
2. Barense, M. D., Bussey, T. J., Lee, A. C., Rogers, T. T., Davies, R. R., Saksida, L. M., Murray, E. A., & Graham, K. S. (2005). Functional specialization in the human medial temporal lobe. Journal of Neuroscience, 25(44), 10239–46.
3. Becker, S. (2005). A computational principle for hippocampal learning and neurogenesis. Hippocampus, 15(6), 722–38.
4. Becker, S., & Lim, J. (2003). A computational model of prefrontal control in free recall: strategic memory use in the california verbal learning task. Journal of Cognitive Neuroscience, 15, 821– 832.
5. Bogacz, R., & Brown, M. W. (2003). Comparison of computational models of familiarity discrimination in the perirhinal cortex. Hippocampus, 13, 494–524.
6. Botvinick, M. M., & Plaut, D. C. (2006). Such stuff as habits are made on: A cognitive neuroscience perspective. Psychological Review, 114(4), 101-124. doi:10.1037/0033-295X.114.4.101
7. Botvinick, M., & Plaut, D. C. (2006). Short-term memory for serial order: A recurrent neural network model. Psychological Review, 113, 201–233.
8. Brozinsky, C. J., Yonelinas, A. P., Kroll, N. E., & Ranganath, C. (2005). Lag-sensitive repetition suppression effects in the anterior parahippocampal gyrus. Hippocampus, 15, 557–561.
9. Burgess, N., & Hitch, G. (2005). Computational models of working memory: putting long-term memory into context. Trends in Cognitive Sciences, 9(11), 535–41.
10. Bussey, T. J., & Saksida, L. M. (2002). The organisation of visual object representations: A connectionist model of effects of lesions in perirhinal cortex. European Journal of Neuroscience, 15, 355–364.
11. Bussey, T. J., Saksida, L. M., & Murray, E. A. (2002). The role of perirhinal cortex in memory and perception: Conjunctive representations for object identification. In M. P. Witter, & F. G. Waterlood (Eds.), The parahippocampal region: Organisation and

International Journal For Advanced Research In Science & Technology
A peer reviewed international journal
www.ijarst.in
IJARST
ISSN: 2457-0362
role in cognitive functions. New York: Oxford.