A SURVEY PAPER ON IMPLEMENTATION OF HUMAN INFORMATION PROCESSING SYSTEM IN ARTIFICIAL INTELLIGENCE BASED MACHINES

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Abstract

Processing of information happened inside human brain is extremely much great and isn't conceivable to be copied 100% precisely in artificial intelligence strategy based machines. Researchers have attempted to show it as close in the matter of what precisely happens inside the brain. Human brain has a marvelous system in performing computation with the final product is new learning and human utilizes this learning to control is organs. This paper explains various models that have tried to explain this splendid mechanism which carries out information processing in human brain. In this paper we will demonstrate another approach for implementing the process occurred inside human brain to acquire new information in light of the sources of information detected by the machine from the environment. At the point when this procedure is carried out recursively the Machine's knowledge becomes more accurate and it is called Knowledge Growing. This approach is intended for the machines that has ability to think and act like humans. The machines on which this mechanism are implemented are called as Knowledge Growing Systems.

Keywords: Artificial Intelligence, Machine, Knowledge Growing, Knowledge growing System

I. INTRODUCTION

The American experimental tradition in psychology is the main reason of the evolving of the information processing Formative researchers who use the information processing point of view represent mental advancement as far as changes in maturation in fundamental segments of a kids mind. This hypothesis is based on the idea that humans do not only respond to the stimuli once they receive the information rather they process the information. This point of view tells that the human brain is same as the mind of a computer which analyses the information that it receives from the environment. As indicated by the standardized information processing system for mental advancement the brains apparatus incorporates consideration component for acquiring information and also holds working memory for currently controlling the data and long-term memory for an actively holding data with a goal that this data can be used in the future. This hypothesis shows that how as children develop, their brains also develop in the same manner promoting progress in the capacity to process and react to the data they get from their sense organs. Information processing as a system for human reasoning and learning is a piece of the occurrence of a cognitive point of learning. The cognitive viewpoint tells that complex psychological States to influence human learning and also tells that these psychological States can be experimental research. PC's which process information incorporate internal states that influence processing. PC, therefore, gives a model of conceivable human psychological states that furnished scientists with signs and directions for understanding the thinking and learning ability of human as information processing. In general, information processing model helped to set up mental procedures that can't be straightforwardly seen as a justifiable area in scientific research. The mechanism occurred within human brain from the beginning, which includes sensing the phenomena occurring in environment, do inference to the information regarding to the sensed phenomenon and then the formulation of the decision, then make a decision

and act on it, is simply represented by Observe-Orient- Decide-Act cycle which shows the decision-making cycle occurred within human brain.
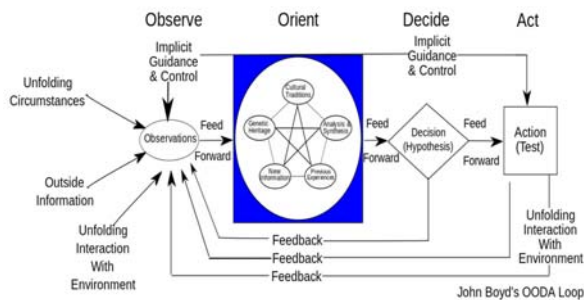

Fig 1. Observe-Orient-Decide-Act cycle

In some situations, human acquires result after observing an event directly as the time is passed. Based on the derived results he gains knowledge about that event or his knowledge about the event he has observed grows from zero to some level, which can be used by him so that he could recognize it in future. This is the process the researchers call as knowledge growing, and this stuff inspires us to do a research in order to build an intelligent agent called as knowledge growing system (KGS).

II. MODELS OF INFORMATION PROCESSING

Basically, data handling model is a hypothesis of human improvement that uses the computer as an illustration for clarifying manners of thinking. Like computers, people change data to take care of cognitive issues. Improvement is seen in terms of changes in memory-storage capacities and utilization

Of various sorts of cognitive procedures. Then again, information processing can be characterized as the acquisition, recording, organization, recovery, display, and dissemination of data. Information processing model can be seen from diverse disciplines ranges from psychology science to social and sport sciences. In this way the models proposed are proposed on its own need. In this segment we investigate four Information processing models namely Wicken's, Welford's, Whiting's and A3S models.

A.WICKEN'S MODEL

The Wicken's model of information processing system helps you to get a simplified thought of the stages and steps humans go through when the information is processed in the brain. It permits you to understand how the humans work as they mentally grasp the environment around them. This model portraits the human information processing by dividing itself into 7 segments:

Sense--This models begins with the input also called as stimuli which enters into the short term memory. This is the raw information from the outside environment,
these data doesn't have any meaning. We just collect the data as it is present in environment. Some meaning is given to this raw data when the data enters the perception stage. Both the long term memory and working memory is activated, and the meaning comes from them. It's here that our interpretation is shaped by our previous experience psychological state and value system.
Attention--We start to use our attention resources in the perception stage. In this model, humans have a limited number of attention resources so that they can devote them to various events. Only specific stimuli that are most important are attended by us when forced by these limited resources. There are two types of attention which are very important -- divided attention and sustained attention. Humans are poor at both of them, so they need to limit both of these attentions as much as they can.
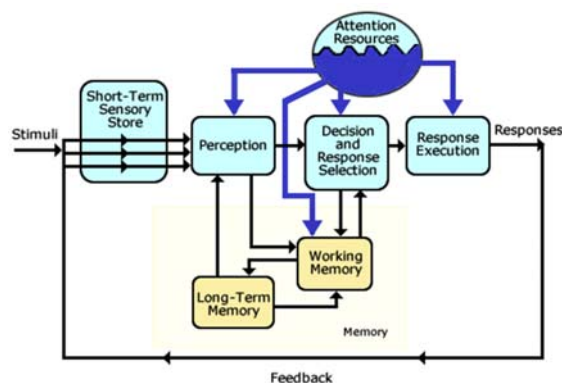

Fig 2. Wicken's Model

Long-Term and Working Memory--Both the perception stage and the decision and action selection stage are interacted by both long term and the working memory. Long term memory has an unlimited storage but it is slower compared to working memory. Working memory has limited storage and the past data is forgotten but it is very fast. These two stages interact with each other regularly and the information from the long-term memory is brought into the working memory for the selection of the action.

Decision and action Selection--The decision about the perception is done in the decision and action selection stage. This is not a very lengthy process. Humans must approximate as they have limited time and resources. Humans use laws of probability to come at the best conclusion in a situation when the tasks are easier.

Response Execution--Action execution is the phase where the actions which are decided in the last phase are performed.

Feedback --The process of information processing doesn't stop with the action being executed. New stimuli are constantly loaded and after the execution of an action, a whole new set of stimuli, related to that action, may be loaded.

An introduction to some of the basics of cognitive science that apply to the design of human thoughts is given by the Wicken's model. In this case, it is given to the people who work in aviation industry. Cautions must be taken while using this model as it is not a replacement for the actual users to test the systems. This model simplifies the process of information processing and it cannot be used to predict what happens in future no matter how well it is used.

B. WELFORD'S MODEL
In the Welford's model it is suggested that the information is taken through the sense organs and all the inputs are temporarily stored before categorising them, then the inputs which seems important to the making of the decision are stored in short term memory then a response is selected by comparing the prior experiences that is present within the long-term memory with the inputs stored in the short term memory, by keeping the long term memory as the reference, to carry out the decision for the required action, then the response and the conclusions are stored, so that it may be used in future for reference, then the whole procedure repeats again. This model is characterized into three processes called input identification stage, action identification/ selection stage and action programming stage and there are four elements in this model which are:-

Input from sense organs—The short term memory stores the information which are important for the situation. This information is taken into the system from the sense organs before making a decision in three main ways namely vision, auditory and proprioception.

Short-term and long-term memories-- The short-term memory stores all the information that are collected from various sense organs for a split second before it is processed. The short term memory has the ability to store up to 7 pieces of Information and it can retain those for less than a minute. The long-term memory which has unlimited storage contains all the information that are obtained from the previous experiences.

Decision process-- The decision procedure for the action to be taken is done by comparing the information obtained at present that is held in the short term memory with the information related to the previous experiences that are held in the long term memory to determine an accurate action.

Action-- The movement patterns stored in the long-term memory is used as a reference for the execution of the action. The long-term memory stores the situation and the conclusion for future reference once the action is executed.
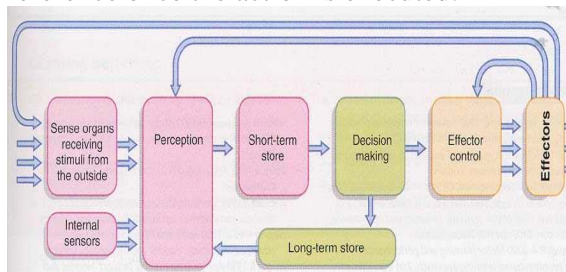

Fig 3. Welford's Model

A process called translation from perception to action represents the process of decision in this model, in which the most appropriate response from the available options is selected as the result of processing. The main application of this model is in sports as a sportsperson has to know and execute a large range of perceptual Motor skills and must select the most suitable response for a given task.s

C. WHITING'S MODEL
Even though this information processing model is similar to Welford's model, different terminologies are used in both. Whitting's model of information processing have 7 elements they are the input data, the receptors, the perceptual mechanism, the translators, effectors, the action and the feedback information.
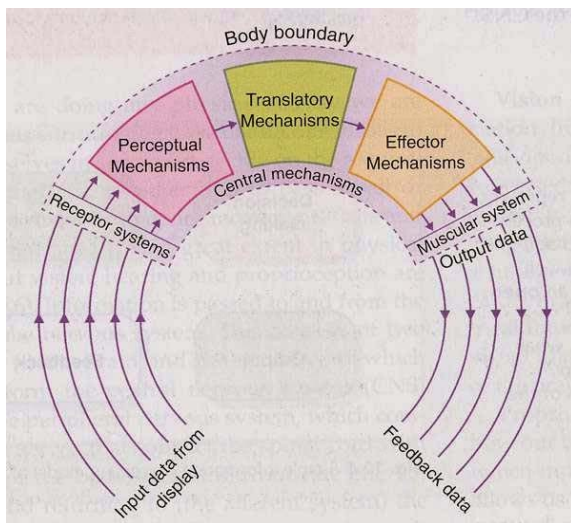
Fig 4. Whitting's Model

Input Data-- In the input data phase, the information that is received is displayed in front of you, which are detected by the receptors which tells the process of how the information is obtained, the sense of feeling, the auditory information and the visual information are included by these systems.

Receptor System-- The receptors are the sense organs which receives the information from the outside environment.

Perceptual Mechanism-- The next phase is the perceptual mechanism, In this phase the obtained information is interpreted by the brain and assigned a meaning so that it can be understood by the humans.

Translatory Mechanism-- The next phase is the translators which is where the information gathered from the perceptual mechanism are used to create the most appropriate decision for the environment and then this information will be sent to the effectors.

Effector Mechanism-- The effector mechanism which is also called as the action is a part of the brain where the decisions that is formed in the translatory mechanism, is performed, by sending the messages to the effectors that is various parts of the body via the nerves.

Action-- Both the effector mechanism and movement of the muscles forms the output, The Nervous System sends messages to various parts of the body based on the observed situation, which in turn activates the body parts.

Feedback-- The final phase of this model is the feedback information where you will know that if the action is successful or not by the brain, which is done by comparing the result to other previous experiences.

As we see in this model the memories are not considered during the processing of the information. The most vital thing in this model is that the translators obtains the inputs directly from the perceptual mechanism so that it can be later transferred to the effectors.

D. A3S MODEL (HUMAN INFERENCE SYSTEM)

The previously presented three models just describe the mental mechanism that occurs within the human brain and it focuses heavily on the working of the memories and the presence of the information science by the sense organs are the sensory system. So a new information processing model is presented which tells how the perceived information is processed to obtain new knowledge regarding the phenomenon which is observed. This model mainly focuses on the system where the knowledge is grown within the human brain and then this model can be implemented on an agent so that it becomes cognitively intelligent.

This model is named after it developers as A3S (Arwin-Adang-Aciek-Sembiring). In this model the agent receives information from the sensors and then uses this information to activate its effectors. If this process is continued, the knowledge obtained by the agent becomes newer and newer and this knowledge becomes new knowledge and this process is known as knowledge growing.

The base of this model is the human inference system which is the combination of human information fusion system and human information processing model.

In this method an agent contains various sensors and various hypothesis that could describe the observed phenomenon, We assume that any new information is the product of the fuse information from two or more sensors. We assume we have an agent with 'n' sensors, so that the total number of fused information is
$m = (2^n – i) – 1$. If fused information have a certain conclusion which may be a data a fact or an indication as observed by the sensor, if the conclusion gathered by the sensors at the first observation time is able to describe the observed phenomenon then this information becomes new knowledge else this information is stored in the memory and the sensors collect a set of new

information in the next observation time and this present information is combined with the previous information to form new information that can be able to describe the observed phenomenon, if its succeeds then it becomes new knowledge else the process continues on. The quality of the grown knowledge is measured by an unit called degree of certainty.
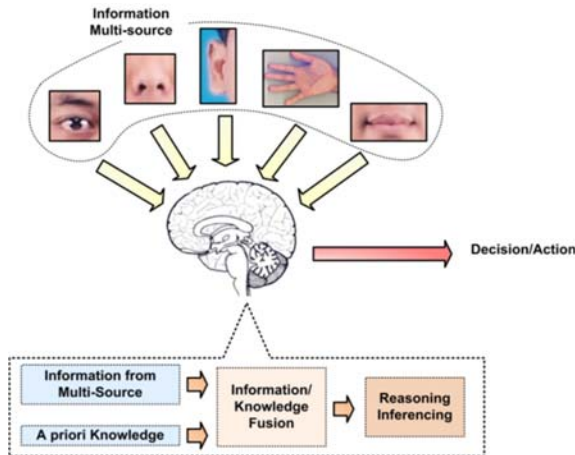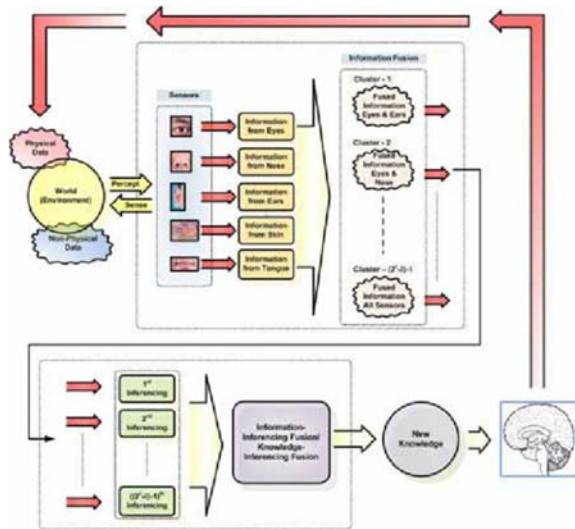

Fig 5. Human Information Fusion System

Fig 6. Human Inference System

III. RESULTS

A. Basic steps and stages that human go through when the information processing is being carried out in the brain is explained in the Wicken's model. Here the model is divided into 7 segments.This model acts as a basis for the design of human thoughts. This model is just used to explain the information processing in present and cannot be used to know what

happens in the future. The model acts as a basis for the people who work in aviation industry.

B. In the Welford's model it is said that the taken information is temporarily stored in the memory before being categorised. This information processing model is divided into three stages and has 4 elements. Here as once the input information is processed, the most appropriate response from the available alternatives is selected. The main application of this model is in sports, where the selection of an appropriate response is necessary.

C. The whitting's model is similar to the Welford's model. But this model has 7 segments instead of 4 as in welford's model. This model does not take into account the function of memories during the processing of information. Here the input information is not stored in any memory before processing, it is directly moved from the perceptual mechanism to the translators and then to the effectors.

D. A3S model not only explains the present processing of information but also predicts what happens in the future. This model is a combination of human information processing system and information fusion system hence to obtain human inference system in which the response is selected based on thinking and reasoning. This model is mainly based on how the new knowledge is created in a human brain and how to implement it on an artificial intelligence based machine so that they can act rationally as human.

IV CONCLUSION

Finally in this paper, we explain the 4 most important models of human information processing system namely the Wicken's model, the whiting's model, the Welford's model and the A3S model. As we saw in the previous sections the first three models just represent the mental process occurring inside the brain, it just shows the way the information is processed in a human being, it can be used just to know what is happening in the present. These models cannot be used to predict what happens in a future or how the new knowledge is created in human. But the fourth model can be used to predict what happens in a future and it explain the generation of new knowledge and it explains the concept of

knowledge growing and also explains how to implement this mechanism on an agent.

V. REFERENCES

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