

# A Computational Model for Machine Thinking

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## Abstract

Based on recent advances of computer vision and the recent results of neuroscience devoted to brain understanding, we propose a new model for machine thinking. Our model delivers result of thinking as a set of sentences either informative or decisional. These sentences are the result of reasoning performed on acquired and memorized data.

*Key words:* Machine Thinking, Machine Learning, NeuroScience

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## 1. Introduction

Giving the faculty of thinking for machine is a challenging research area. This will give to robots endowed by the perception and hearing senses to be autonomous and then to have the faculty to make itself the decision. There are a plenty of domains where machine thinking is necessary and useful for human development.

Our aim is to propose a suitable computational model for machine thinking based on recent advances of computer vision and the recent results of neuroscience devoted to brain understanding. From the recent state of the art, we propose a new model which deliver result of thinking as set of sentences either informative or decisional. These sentences are the result of reasoning performed on acquired and memorized data.

We are not concerned about the way humans ‘actually’ think, but we are inspired simply from what come from a lifelong experience with the way we

think and act [12]. Consequently, our purpose does not require a state-of-the-art review of dual-process models.

In this paper, we explain our point of view of machine thinking. A synoptic scheme is proposed and all functional units composing the model are explained and justified.

The proposed model is described in section 2. We conclude this paper with some suggestions and future works.

## 2. Machine Thinking: The proposed model

### 2.1. *The Meaning of Machine Thinking*

We believe that thinking for machines may be done similarly to thinking for brain. Due to the absence of understanding of brain thinking, we have been inspired by recent works of neuroscience and our comprehension of brain thinking.

We define **Machine Thinking** as the inference of decisional and informative information from many sources and its writing and/or drawing.

### 2.2. *Elements of our model for Machine Thinking*

The synoptic scheme of the proposed model is illustrated by figure 1, is composed by three main units and a central unit called Central Area of Thinking (CAT). The machine thinking is performed by the central area of thinking which process information received from:

- The unit of "The needs".
- The unit of "Description of the perceived scene from images and audio".
- The unit of "Description of the imagined scene".

Depending on the needs, the scene perceived or in mind, and the knowledge which has been learned, it delivers information from many sources and writes it and/or draws it on a virtual screen .

The generated information is informative or decisional.

The thinking is started, as illustrated by figure 1, if there are some stimulus sent by:

- "The needs" unit, when is active it sends the query to central thinking.
- "The perceived scene" unit, send continually the description of the perceived scene.
- "The imagined scene" unit, send the corresponding description when the machine is in the state of imagination.

The central area of thinking uses reasoning and all received information in order to infer a summary of the current state and a set of actions to be performed for satisfying the "needs" unit.

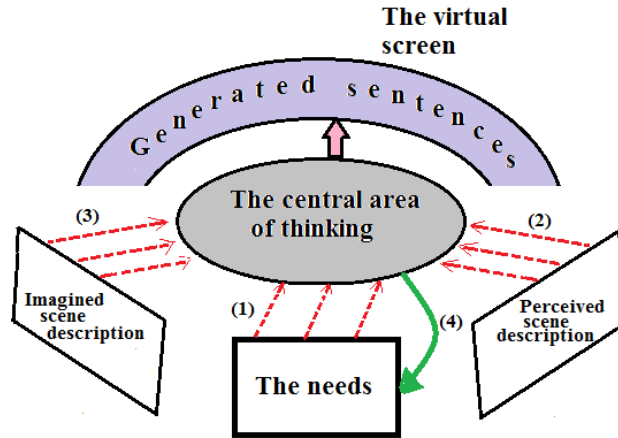


Figure 1: Overview diagram of Machine Thinking algorithms. Machine Thinking is a subset of artificial intelligence.

### 2.3. The "needs" unit

The "needs" is a unit which works on a set of data produced or generated during time. Its known that human express needs with external senses [11] and with internal senses. Essentially these data are:

- The road map of actions to be performed, scheduled after a machine thinking.

These actions are transferred from the principal area to this unit and stored (see figure 2).

- The knowledge acquired by the machine and represented in the "Knowledge" unit.

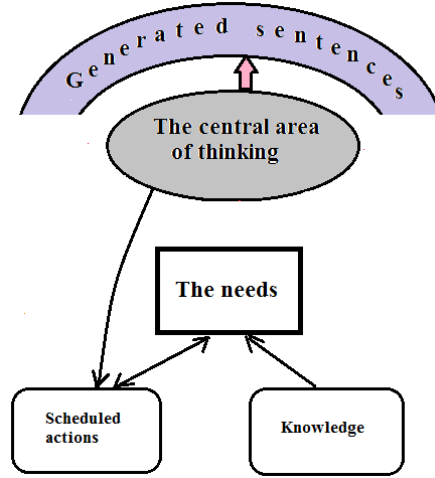


Figure 2: Overview diagram of the "Needs" unit.

#### 2.4. The "perceived scene" and the "imagined scene" units

The "perceived scene" is a unit which processes the acquired images, the heard audio signals and produces a set of sentences describing the scene. To do this, recent advances in computer vision using neural approaches may be used such as YOLO for object detection and recognition [3] and [7][9][8] for image translation to sentences and paragraphs.

The "imagined scene" [1] is a kind of scene which provides a tool to "central area of thinking" for reasoning. Neuroimaging and neuropsychological studies have identified several brain areas that seem to be particularly engaged during the viewing and imagination of scenes including the ventromedial prefrontal cortex, the anterior hippocampus, the posterior parahippocampal cortex, and the retrosplenial cortex [2].

Recent studies try to find a computational model for imagined scene activation. The European Research Council and the Human Brain Project, shows how different neurons in the brain work together to store our experiences so that we can later conjure up a mental image and even imagine how a place would appear from a vantage point we haven't experienced ourselves [10]. They built a computational model that shows how the neuronal activity across multiple brain regions underlying such an experience could be encoded and subsequently used to enable re-imagination of the event.

### *2.5. The Central Area of Thinking*

In this unit, thinking is performed as a reasoning based on the knowledge.

Thinking is the ability to reach logical conclusions on the basis of prior information is central to human cognition [15]. Therefore, The advent of neuroimaging techniques has increased the number of studies related the study of examined brain function [13] and to the neural basis of deductive reasoning [14].

## **3. Conclusion and future works**

In this paper we propose a new model for machine thinking. This model is based on three units: The needs, Perceived scene, Imagined scene. The thinking is a process using all received information and reasoning. The next steps consist to implement the different modules.

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