AS IT IS, INC.

TrueThinker Technical Backgrounder

Note: If any of the words/terms in bold italic type are unfamiliar to you, please refer to the glossary following this backgrounder.

Since the 1950s, computer-processing speed has increased by roughly a factor of 10^8 power. This magnitude of difference is the same as the difference between a leisurely walk and moving at the speed of light. Yet, over that period, the basic method for using computers has remained essentially the same--explicitly programmed instructions and domain-dependent data structures.

TrueThinker™ (www.truethinker.com) arises from original computer research conducted in the 1950s and 1960s on automated language translation. A small group of scientists, mathematicians and philosophers continued this work by developing a set of theories on human/machine learning, culminating in the 1990s with a partnership with Unisys Corporation to commercialize the technology, a patented AI application called the AutoGnome™, embedded in TrueThinker. The AutoGnome is a fundamentally different process for learning solutions—a clear alternative to constructing them.

The AutoGnome is a general-purpose system of automated ***inference***/***inquiry*** software exploiting a system of computerized ***Semiosis***. In the design of the AutoGnome, the essence of learning is the creation of reliable ***acts***, where the results of reliable actions generally satisfy one's intentions. Knowledge is a constructed collection of potential reliable acts, whereas experience is recorded as a series of actual performances of such acts. Acts, their components, qualities, and other essential internal states of the AutoGnome are represented by a system of ***signs*** that it constructs, interprets, and maintains for itself. Hence, the AutoGnome is a system capable of Semiosis—or often referred to as a ***semiotic technology***.

The AutoGnome acts as an intelligent agent residing in TrueThinker. With its continuous adaptive learning from mimicking the user's behavior, the AutoGnome will grow into a likeminded replica of a user acting in the virtual world of the Internet. This learning process is called the Synthetic Mind, with the AutoGnome its expression in software. Its primary capability today is knowledge organization (manual, supervised and automated categorization).

The AutoGnome mirrors the way the human brain interprets information and learns about its environment—in other words, how knowledge is created and used. As the AutoGnome experiences reality and obtains new information, it modifies its existing knowledge and, over time, continues to learn and become more intelligent. Unlike other Artificial Intelligence (AI) technologies such as neural nets and expert systems, the AutoGnome can then react in new ways based on this new knowledge—all without programmer or knowledge-engineer intervention.

Another point of departure from most other forms in the mainstream of AI development is that the AutoGnome is designed to approximate the known ***semiotic structure*** and processes of the human mind. It makes no assumptions regarding brain anatomy, neural-biophysics or biochemistry, neurophysiology, psychology, linguistics, psycholinguistics, information/communication theory, etc.

In semiotic terms, the current AutoGnome architecture comprises a ***perceptual*** module that codes a specific model of the theory of Semiosis, composed of the three modes of Semiosis (***monadic***, ***dyadic*** and ***triadic***) and three inferential processes (***deduction***, ***induction*** and ***abduction***).

These ***recursive*** inference processes operate on an ***experience store*** of information, gain experience through ***connective agents*** (***sensors***, ***mediators*** and ***effectors*** (actors)), and function (act) in both an inquiry cycle and a performance cycle. The process of induction determines if an observation or event is understandable (whether or not it has been previously experienced). If it has an existing knowledge of that specific event, the AutoGnome can, through the process of deduction, anticipate (predict) future observations and contemplate appropriate responses. However, if it is unable to understand the experience this way, it can form a new hypothesis about the surprising event via abduction. Abduction creates hypotheses of new and untested knowledge, which are tested through the iterative process of induction, deduction, and abduction. By testing and re-testing through further experience, the AutoGnome continues to learn and gain knowledge.

The ***probabilistic inference processes*** integrated formally with the logic of Semiosis are the processes of formal representation of the ***Disorder*** whereby an AutoGnome identifies and maintains its ***Identity*** (***Order***). The information stores at any particular time are stable states of such probabilistic processes.

In practical terms, the AutoGnome's primary function is looking at information—for argument's sake, linguistic text--in an unsupervised or learning mode. In this mode, it looks at signs in the text such as words or phrases and develops a theory of the patterns it both sees within the text and might see in future text. Its secondary function is called supervised learning, in which it applies its theory of signs against a set of documents—websites, for example--that the user has categorized. It then applies its theory of signs to other, uncategorized websites, pulling out patterns it sees. These become features the AutoGnome associates with the categories that the user chose, allowing TrueThinker to accurately categorize saved websites for the user, principally via the "Quick Add" function.

Significantly, the AutoGnome's intelligence is "generalized" because its ability to develop its theories of patterns does not depend on the "content" of its inferences (i.e., the three inferential processes do not pre-suppose what is being reasoned about). "***General intelligence***" is one of the most important design objectives of the AutoGnome and distinguishes it further from other specifically engineered forms of AI. Another important characteristic of this kind of basic learning mechanism is that its work can become incrementally and continuously more successful over time without requiring any alteration to the mechanism itself.

In the future, the AutoGnome architecture will comprise additional modules (***conceptual*** and ***valuational***), with capabilities including knowledge creation (ideation, autonomous search and automated community-building) and knowledge applications (human-capital management, intellectual-capital management and autonomous entrepreneurship).

Glossary of TrueThinker Terms

Abduction: creating a hypothesis that explains a surprising observation

Conceptual: reasoning about meanings that integrate multiple perceptions

Deduction: reasoning from general understanding to particular expectations

Disorder: indeterminate or uncertain experiences

Dyadic: a relation between two things, such as sign-object or predecessor-successor

Effector: a device generally employed to produce intended changes in the environment

Generalized intelligence: a system for learning and using knowledge that does not rely on assumptions about the content of that knowledge

Identity: a system of relations describing the unique organization of an autonomous entity that it seeks to maintain

Induction: reasoning from observations to general understanding

Inference: In logic, the process of reasoning from a premise to a conclusion.

Inquiry: any process that has the aim of augmenting knowledge, resolving doubt or solving a problem

Mediator: a device generally employed to maintain or modify the relation between other entities or devices

Monadic: the simplest form of relation—that of something by itself without regard to any other

Order: determined and certain experiences

Perceptual: reasoning about the form and significance of actions directly on the environment

Performance: applying existing knowledge to interpret a situation and produce effective acts in it

Pragmatic: reasoning about the value of behavior from a particular entity's perspective

Probabilistic: referring to the belief that certainty is impossible, therefore decisions must be based on probabilities

Recursive: self-repeating

Semiosis or semiotic technology: the theory of signs; any form of activity, conduct, or process that involves signs, including the production of meaning

Semiotic structure: a system of the essential sign types and processes

Sensor: a device generally employed to act on the environment for the purpose of determining its state

Sign: something that stands for something else; a discrete unit of meaning including words and images; mechanism for creating understanding

Triadic: a relation between three things that cannot be decomposed into equivalent sets of dyadic or monadic relations

Valuational: ability to estimate the importance or usefulness of an experience or act