The Application of Artificial Intelligence to Classical Mythology

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Résumé.

Nous présentons une stratégie pour le traitement de l'information concernant la mythologie classique, avec l'application d'un système appelé intelligence artificielle. Ce traitement se déroule selon les étapes suivantes :

a) l'analyse logiciste dont la fonction est d'établir une forme d'enchaînements d'inférences en partant des propositions de base jusqu'au sommet de la construction, c'est-à-dire, les conclusions;

b) l'utilisation du système expert *Snark* qui se compose d'une base de faits initiale, d'une base de règles et d'un moteur d'inférences, permettant de déclencher automatiquement une base de faits finale qui reproduit les nouvelles informations créées par les règles.

Keywords: artificial intelligence, classical mythology, expert system, logicist analysis.

Mots-clés : intelligence artificielle, mythologie classique, système expert, analyse logiciste.

1. Introduction

It is general knowledge that the treatment and the transmission of information underwent deep alterations with the appearing of knew technologies linked to Data Processing.

In the beginning this application was directed to the universe of the so-called Exact Sciences, but the increase of the volume of information in the Social Sciences and Humanities made its extension to these matters inevitable.

The first necessity that was felt, due to the difficulty in controlling the production, was the organization of bibliographical Databases. As a second step this organization was directed to inventorying the Databases in the most diverse areas (Rodrigues: 1989).

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Nevertheless, we verify that however complete these Data Banks are, they do not give us the arguments which support the texts. This shows us that we must not reduce the consultation of scientific literature only to the observation of facts, for these are isolated from the argumentation that gives them the epistemological status.

To get out of this situation that has arrived it is necessary and urgent to renew the form of information from texts relating the Humanities and Social Sciences to benefit from other new ways of presentation applied to facilitate access to knowledge according to modalities closer to consultation than reading (Gardin: 1986).

In this perspective there is a possible way which is narrowly linked to the philosophy of the system of "Artificial Intelligence". The main aim is to reduce the essential of the content of texts traditionally written in a "natural language", which presuppose a severe control of reasoning in the analysis of those texts themselves.

At this moment we are applying this strategy to the treatment of classical mythology whose roots are plunged in Prehistory. About this subject, the myth of Demeter and Persephone was already an object of study and the myth of Dionysos is being prepared.

In this article we will limit ourselves to exposing the theoretical principles that give ground to this new methodology applied to classical mythology.

2. The schematization of texts

Experience has shown that the passage from information to an expert system will need to pass by a schematization of the text built as a logical structure. In this perspective the logicist analysis is an intermediate way between the description in a "natural language" and an expert system.

This strategy follows the one adopted by Jean-Claude Gardin and his team for one decade and it has, as its field of practice, not only the specific literature of the new production from some research but the traditional texts (Gardin: 1987). The method consists of linking "facts" to ideas, whichever their designation – interpretations, theories, models, etc. through a symbolic construction whose function is to establish a bridge between descriptive propositions in a basis of argumentation and interpretative propositions which link one end to the

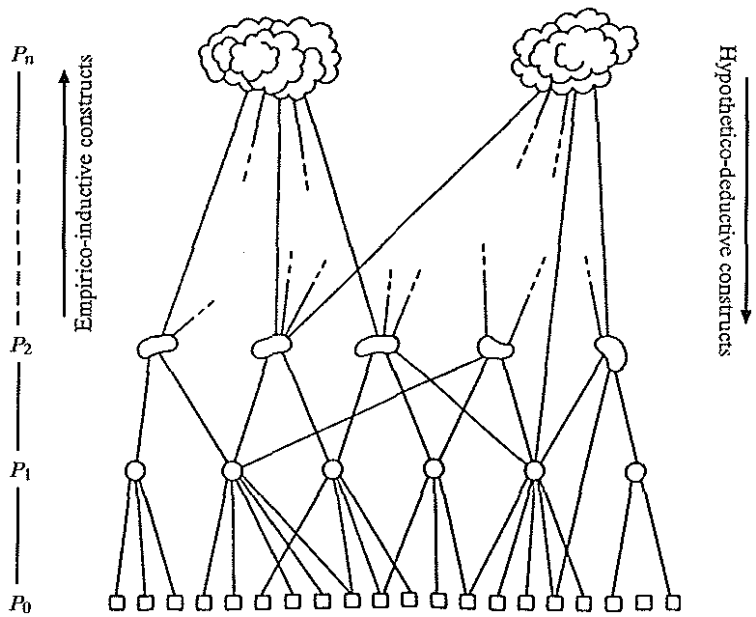

Fig. 1.– Schematization of the logical structure of scholarly papers in archaeology and other human sciences (after J.-C. Gardin: 1987).

other end through a chain of inferences whether by the empiric-inductive way (ascending) or by the hypothetical deductive way (proceeding) [Fig. 1].

In the first case we link the facts to conclusions; in the second case the hypotheses to facts.

The strategy intends to produce a symbolic architecture starting with writing texts in "natural language" necessarily including two component orders: the "facts" transformed into "data" in the construction base which corresponds to propositions P_0 of a pyramidical scheme; the intermediate logical operations P_1, P_2, etc. made from "data" P_0 that support the conclusion placed at the top of the architecture. This means that the scholarly constructions can be composed of:

a) a system of representation shown to express in databases;
b) the calculation in the logical sense of the term which establishes the bridge between this data and the hypotheses or conclusions that we will want to found under successive operations of inferences or derivations of the "`IF pi THEN qj`" type.

A real example of logical architecture can be observed through the scheme of the myth of Demeter and Persephone (Rodrigues: 1992) [Fig. 2].

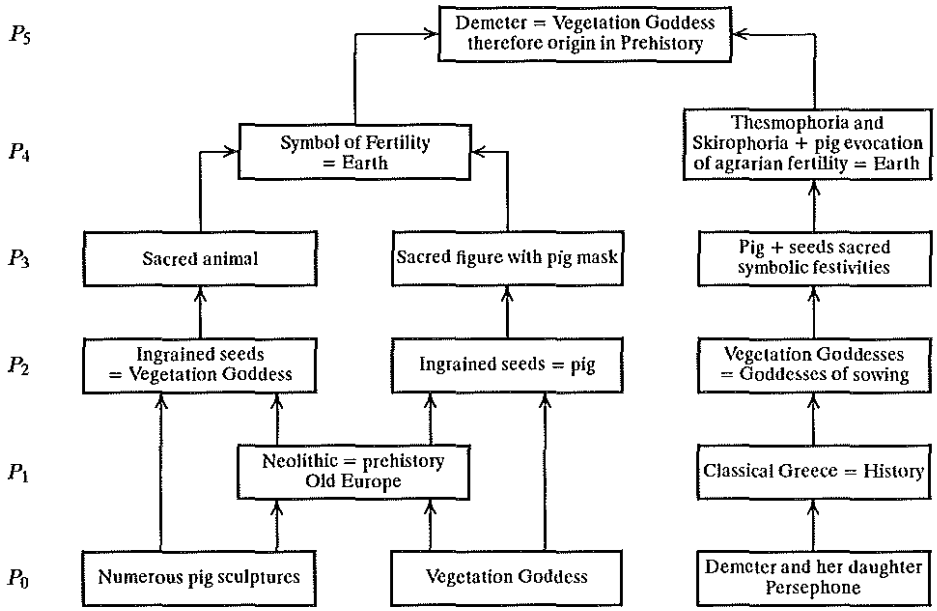

Fig. 2.– The logicist analysis.

The scheme is divided into two parts: the chain on the right gives the written documentary information, that on the left shows the available documents relating to Prehistory.

The proposition P_5, which is the conclusion, links two types of documents. The complete reading of this proposition is the following: the myth of Demeter has its origin in Prehistory because in the agrarian festivities in honour of the Goddess there are strong analogies with the symbolism of the Prehistoric Vegetation Goddess.

The proposed transformation facilitates the reading of traditional compact texts with an equal information content. This does not deal with a résumé but, indeed, a different way to organize information, so that the reader may immediately grasp essential elements, that is, facts, arguments and results.

3. The expert systems

The type of logicist schematization has its convergence with the expert systems, that is, knowledge base system.

This knowledge relating to any subject is taken under two forms: one, the "Facts" established in "Databases"; the other, the reasoning operations, generally of the "`IF p. THEN q.`" type, stored in the rules.

The active part of the system is the inferences engine whose function is to engender new propositions through the conjugation of facts and rules just as the A.I. perceives them.

This means that two conditions are necessary for the application of A.I. to be a success:

a) the organization of datafacts;
b) the definition of rules that support the process of inferences of new facts itself.

The structure of the system can be represented as in Figure 3.

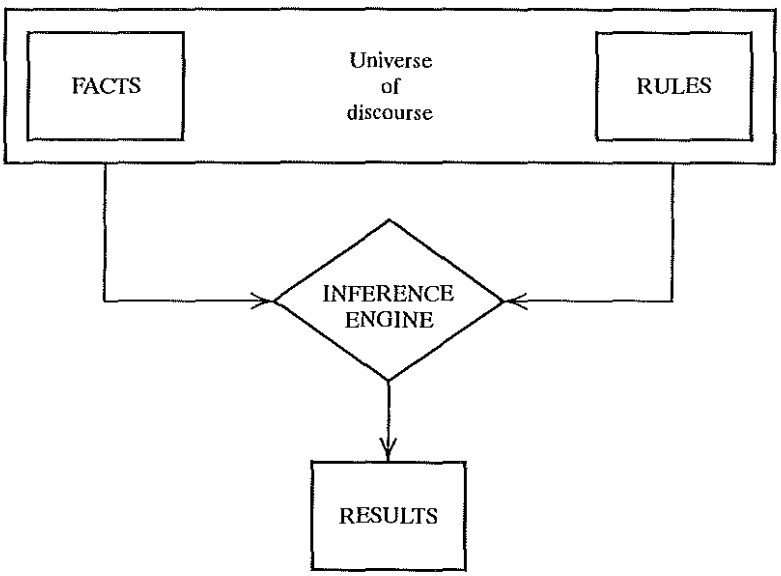

Fig. 3.– The structure of an expert system (After Gardin: 1986, p. 8).

3.1. The Datafacts

The minimal unit of a fact in an expert system is composed of three elements:

1) an entity or object a;
2) a relationship R;
3) a value b.

The set can be represented by the following formula: a, R, b.

Example of a datafacts setting according to the scheme of Figure 2

	a	*R*	*b*
(1)	Divinity 3	Nature	Goddess
(2)	Divinity 3	Name	Persephone
(3)	Divinity 3	Provenance	Greece
(4)	Divinity 3	Epoch	Classical
(5)	Divinity 3	Kinship	Daughter
(6)	Divinity 3	Association	Skirophoria
(7)	Divinity 3	Association	Thesmophoria
(8)	Divinity 3	Function	Sow
(9)	Divinity 3	Attribution	Killer-Pigs

This means:
(1) the *Divinity* 3, that is *Persephone* has as *Nature* to be *Goddess*;
(2) the *Divinity* 3 has as *Name Persephone*;
(3) this divinity has her *Provenance* from *Greece*;
(4) her *Epoch* belongs to the *Classical* period;
(5) her *Kinship* is to be *Daughter* of *Demeter*;
(6,7) she is associated with the *Skirophoria* and *Thesmophoria* festivities;
(8) her *Function* is to *Sow*;
(9) her *Attribution* is then to be *Killer* of *Pigs*.

The semantic content of a, R and b is fixed freely by the user. Each fact, composed by three words, will be written in a different line. The order in which the lines are written is not important for the engine. The three words will be separated either by commas or blank spaces. The example presented constitutes the block relating to facts which characterize Persephone.

3.2. The Rules

3.2.1. Format of the rules

RULE	(name of the rule)
IF	(antecedent)
	(antecedent)
	(...)
THEN	(consequent or action)
	(consequent or action)
ER	(end of rule)

3.2.2. Antecedents or actions

The antecedents are all of the same form:

(NAME) R (X) ⟨code of operation⟩ (Y)

R is the symbol of binary relation which links (X) and (Y), where (X) and (Y) are variables which are replaced by the names that appear in the datafacts.

The antecedents of a rule are linked by "and". The order of registration is not important for the engine.

Example of antecedents

IF	Nature	(D2)	=	Goddess
IF	Name	(D2)	=	(X)
IF	Name	(D3)	=	(Y)
IF	Kinship	(D3)	=	Daughter
IF	Kinship	(D2)	=	Mother

This means:
If the *nature* of (D2) is to be *Goddess*, and if the name of *Divinity* 2 is Demeter, and if the name of the *Divinity* 3 is *Persephone*, and if the *Kinship of Divinity* 3 is to be *Daughter*, ...

3.2.2. Consequents

If the order of the antecedent record is not important the consequent actions are made by the engine by the order of their appearance. Like the antecedents, the consequents are linked by "and".

The consequences or actions of a rule are generally of the following format:

R (X) ⟨operator of affection⟩ (Y).

Its principal function is to affect a new value (Y) to the set ⟨relation⟩ ⟨entity⟩.

Example: R (X) $\Leftarrow$ (Y).

The symbol $\Leftarrow$ adds to the datafacts a line where the set $R(X)$ is affected by a new corresponding value (Y).

Example of consequents:

THEN ASSOCIATION (X) $\Leftarrow$ VEGETATION_GODDESS
THEN ORIGIN $(D2)$ $\Leftarrow$ PREHISTORIC

This means:
Then, *Demeter* is associated to the *Vegetation Goddess* and her *Origin* is in *Prehistoric* time.

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* *

In the shown example we have used the expert system *Snark*/Open. *Snark* is a French computer programme and was written in Pascal V.S.

4. Conclusion

An exercise of this nature obliges us to unify the information and clarify the reasoning operations. In fact, the greatest contrast between the rhetoric of written texts in a "natural language" and writing imposed by expert systems consists of standardising the description in first place.

In second place a set of syntax rules, expressed through the reasoning implicit in texts, leads to inferences deduced in the same way as a calculation.

The merit of these operations is, above all, of pedagogic nature since these teachings avoid a much more severe control in our reasoning. Although this seems elementary, practice shows that it is not.

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