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TOWARDS A DOMAIN ONTOLOGY DEDICATED TO THE DESCRIPTION OF ANTHROPOGENIC TRACES IN ROCK ART

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INTRODUCTION / CONTEXT

Around 178 Paleolithic caves and rock-shelters are scattered around the French territory. The former represent a particularly sensitive heritage. Their study can be quite complex, involving experts from a variety of scientific fields that can vary from a cave to another (archaeologists, geologists, climatologists, microbiologists, etc.). The collaboration of these **multidisciplinary teams** is however complexified by the diversity of their work supports or formats and by the disparity of the produced documents.
The question that arises concerns the **semantic articulation** of the analysis elements produced by the experts and therefore the **structuration of heterogeneous data**.

The cross-referencing of the information that is produced becomes essential for an overall understanding. A proposal based on the use of a conceptual model formalising the knowledge of the expert field is thus envisaged. This resides in a **domain ontology**, a knowledge model designed to meet the above-mentioned need for semantic structuration of the collected data (fig. 1).

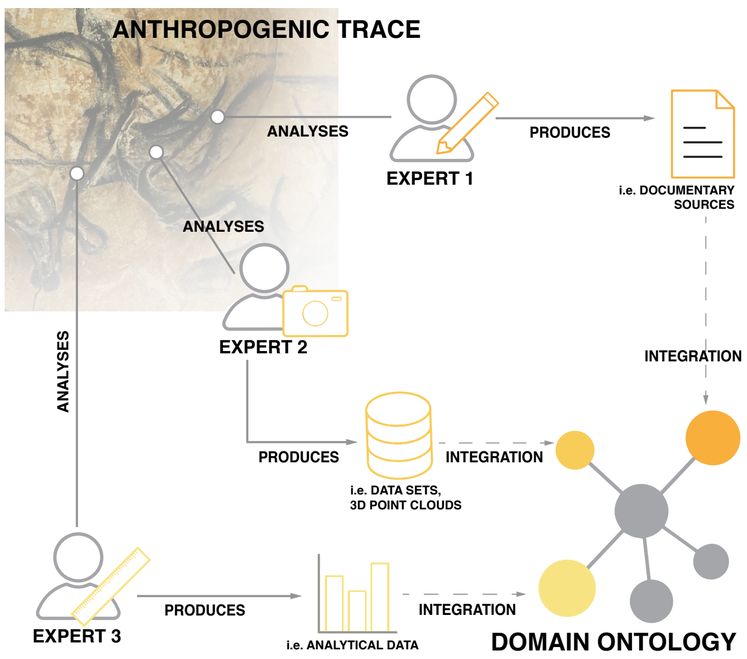

Figure 1. Diagram illustrating the production of heterogeneous data following the analysis of multidisciplinary experts

METHODOLOGY

The ambition is therefore to create a domain ontology dedicated to the **description of anthropogenic traces**. This work is largely based on the approach developed for the domain ontology built as part of the ANR MONUMENTUM project [2]. In order to do so, we relied on the structure of archaeological context sheets and the scientific literature of the domain to reveal the **knowledge** domain and model the top-level classes of the ontology, their properties and sub-classes (fig. 2.A.). The ambition is for the domain ontology to be merged later with **CIDOC-CRM**, the conceptual reference model for cultural heritage information and its extensions (fig. 2.B., 2.C.).

FIRST RESULTS

This allowed us to model **5 conceptual classes**, considered as being **necessary and sufficient** for the description of anthropic traces, as well as the properties that structure them (fig. 3) : **Alteration, Support, Anthropogenic Trace, Realisation Technique, Theme**.

The main question that arrised during the modelling of these concepts concerned the status of the anthropogenic traces. The latter could indeed be considered as a form of rock alteration. It was however decided that a distinction is to be made, Paleolithic graphic entities are of an incommensurably artistic, historical and cultural value. **Ancient anthropogenic traces are thus at the heart of this ontology.** The subclasses of these thematic concepts are thereafter structured into a conceptual mapping (fig. 4).

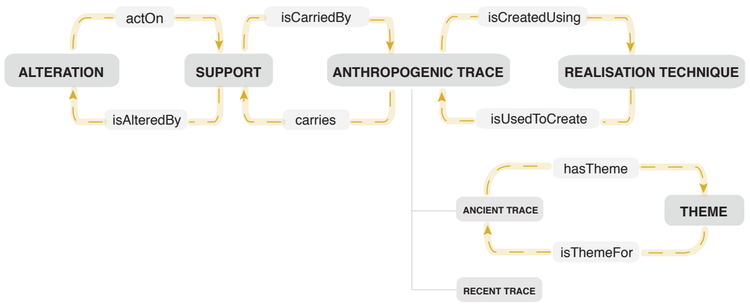

Figure 3. Conceptual model of the top-level classes of the domain ontology and their properties

STATE OF THE ART

Anthropogenic traces are the main reason for specialists' accorded interest in Paleolithic caves. This is also reflected in the survey methods. Oscar Fuentes thus distinguishes two types of surveys : the **plastic analytical** and the **technical analytical** survey [1]. The former translates the traces in an aesthetic way, the Paleolithic traces being at the heart of the study. In the second approach, they are given the same level of importance as their support, or the rock stigmas. The graphic entity thus becomes the result of a process and not the entry point.

As a bearer of an aesthetic but also symbolic value, the description of cave art is subject to interpretation. The classification of traces types often requires the creation of new terms, terms that do not always enjoy consensus. In addition, the **controlled vocabulary** existing in the archaeological field is insufficiently oriented towards the description of anthropogenic traces and cave art analysis in general.

CONCLUSION AND PERSPECTIVES

The domain ontology can serve as a basis for an eventual **information system** and is a response to a need for **semantic structuring of heterogeneous data**. This articulation of the analytical elements produced within a domain is indeed interesting from the perspective of the **extraction of new knowledge resulting from data cross-referencing**.

A first perspective is the implementation of the domain ontology in an information system dedicated to the study of heritage objects [4] in order to structure **spatialised semantic annotations**. A system based on annotations made on **3D point clouds** organised using a domain ontology could facilitate the crossing of these different information layers. **Correlations** between the domain ontology and archaeological databases can furthermore be performed using **SQL/SPARQL mappings**. Finally, the question of the **visualisation** of this data must be addressed, particularly from the perspective of information cross-referencing.

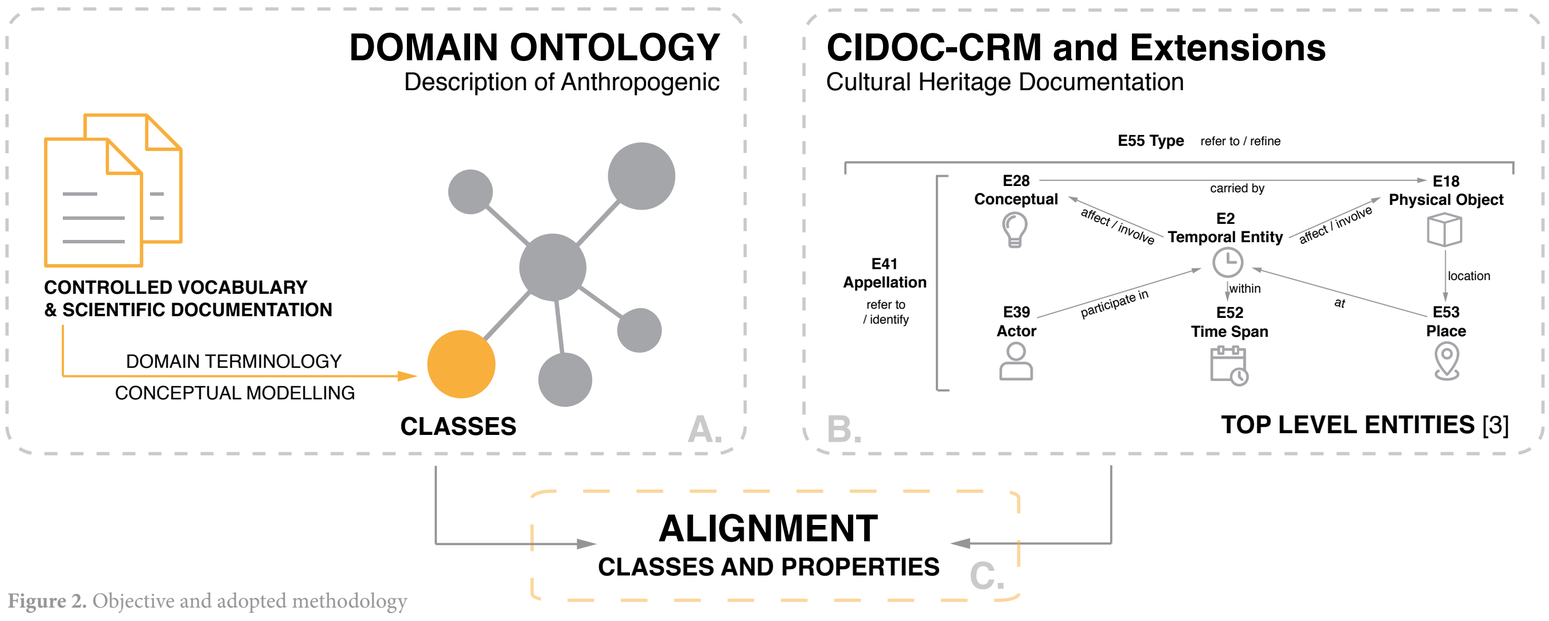

Figure 2. Objective and adopted methodology

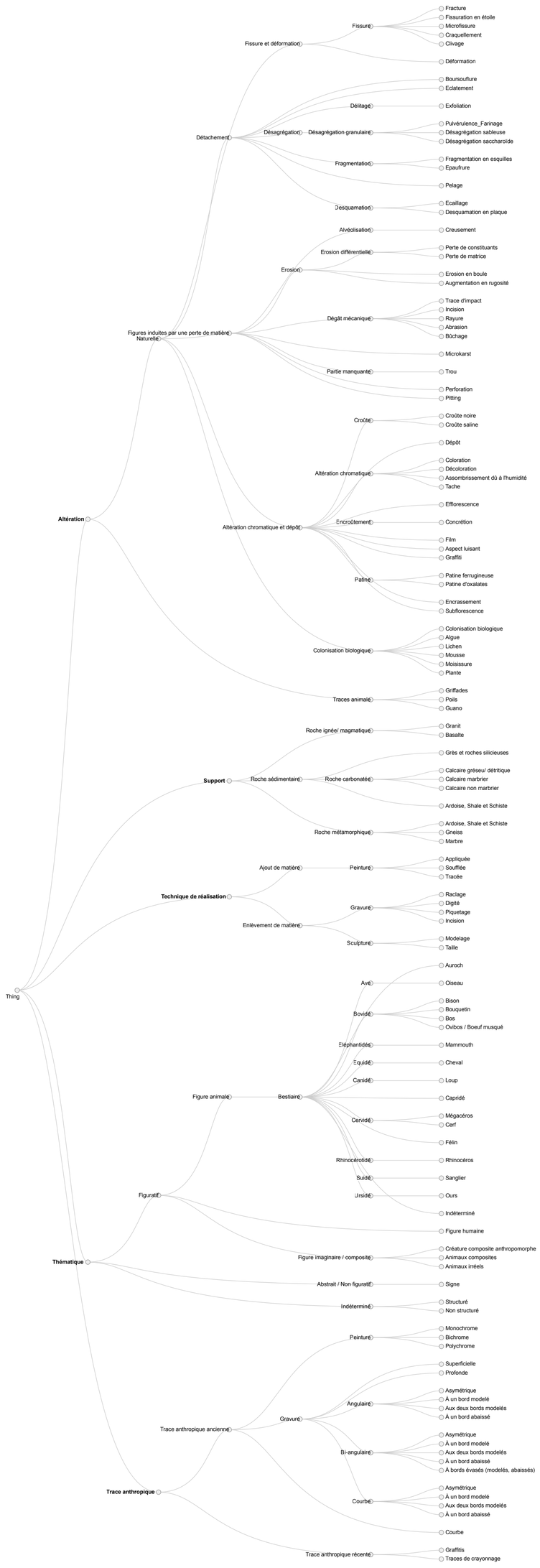

Figure 4. Conceptual model of the classes tree developped in French

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