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MAP syntax diagrams: an online tool to visualise, describe, and compare Ancient divine onomastic sequences

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SUMMARY

MAP syntax diagrams is an online R Shiny application for studying Ancient divine onomastic sequences. It uses the format defined by the “Mapping Ancient Polytheisms” project to:

- represent sequences and
- describe semantic relationships between the parts of the names of gods (called “elements” in the MAP terminology).

The focus is on the **structure** of the sequences, not their content. These structures are modelled as **graphs** (a mathematical object composed by a set of nodes and a set of edges), so that they can be **visualised**, **characterised**, and **compared** using quantitative measurements.

FROM SEQUENCES TO GRAPHS

In the MAP format, the sequence

Δηώ και Κόρη Ἐλευσινίαι

is represented as

[Δηώ + Κόρη] # Ἐλευσίνιος, α, ον

and coded as

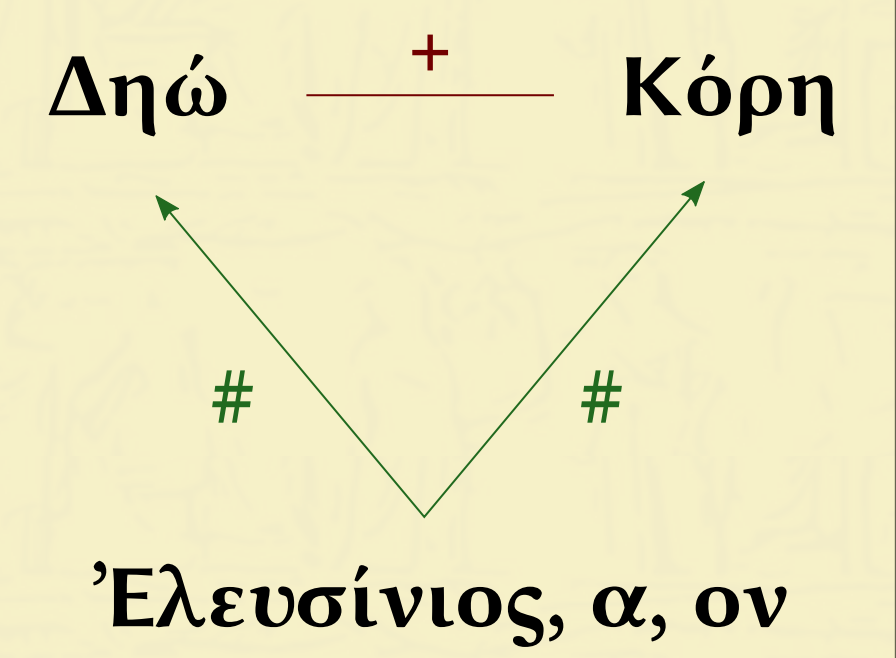
[1 + 2] # 3”.

In *MAP syntax diagrams*, this sequence is modelled by a graph.

The [and] symbols enclose a syntagma,

+ indicates a relation of coordination between two elements,

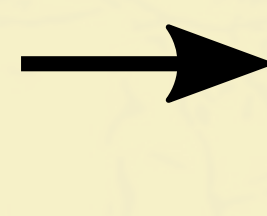
indicates a qualification.



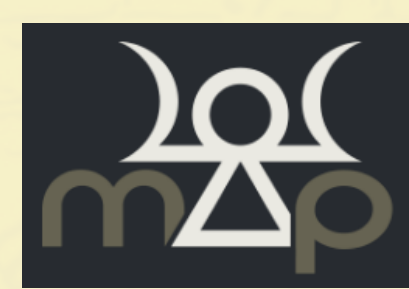
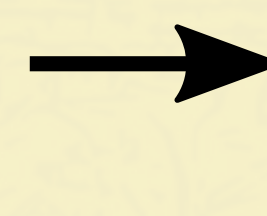
WORKFLOW



Online extraction from the MAP database¹



Recoding of the relevant variables



Input in MAP syntax diagrams and analysis

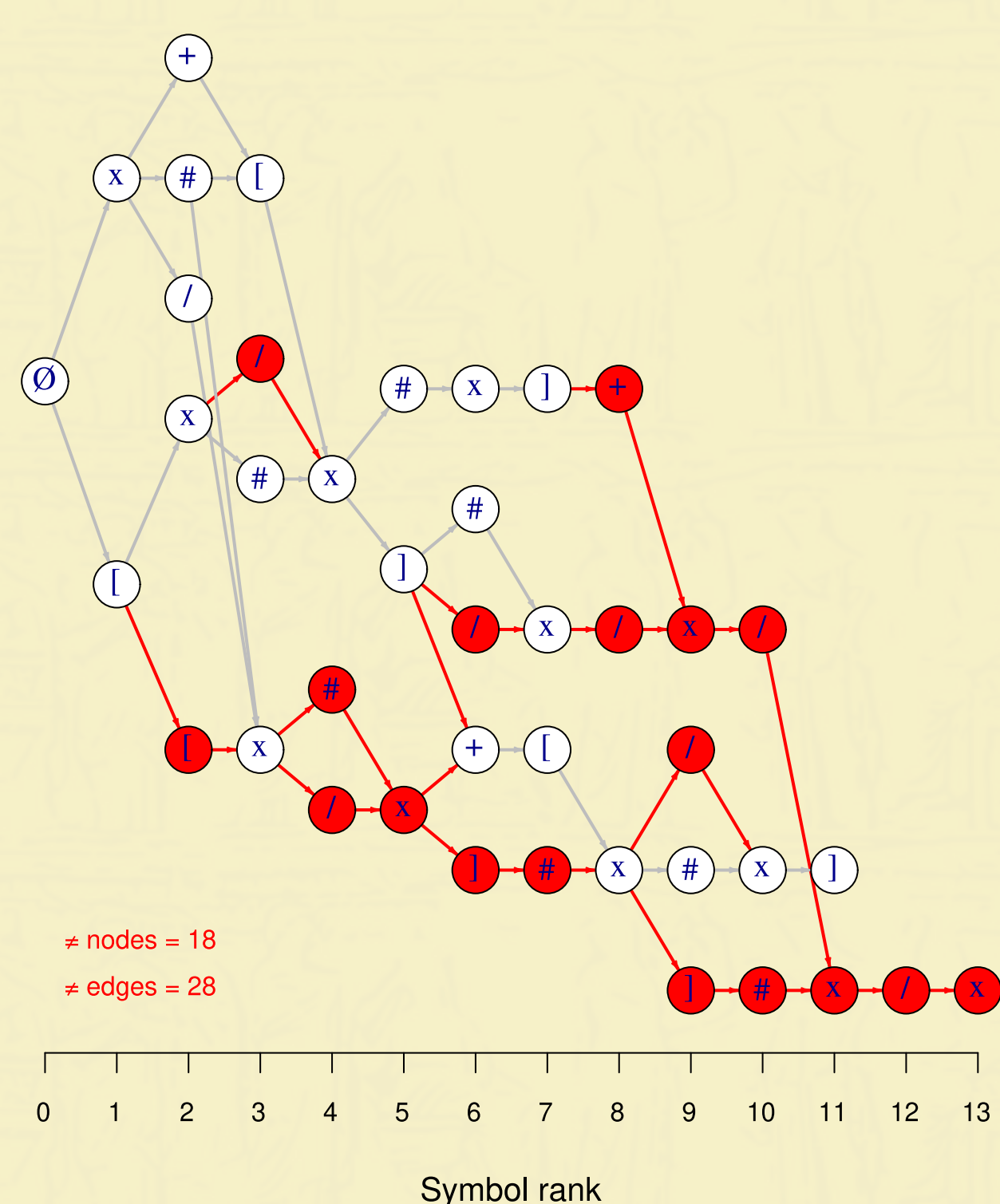
¹ <https://base-map-polytheisms.huma-num.fr>

APPLICATION MAIN FEATURES

- **Selection** of subsets of sequences for comparison
- Summary **statistics**: diversity of the elements (Shannon-Weaver entropy) and structural properties (network metrics)
- Measurement of the **difference** between the subsets graph (Euclidean and “graph diffusion kernel” distances); display of a hierarchical **clustering** of the distances (for 4 and more subsets)
- Generation of **diagrams**:
 - 1) to graphically summarise a set of sequences and
 - 2) to highlight the differences between two subsets
- **Export** of statistics (in csv format) and diagrams (in svg format)

COMPARING GODS: APOLLO & APHRODITE

Greek sequences (up to 11 elements) from Cyprus related to Aphrodite (n=92) and Apollo (n=46) are compared. The statistics indicate that Apollo’s sequences have **more diverse** elements (diversity index: 1.81 vs 1.19) and subsequences (median transition rate: 0.11 vs 0.01). However, using the diagrams to study the differences (coloured in red) we can see that, for example, the complex nested structures (“[[]]”) observed in Aphrodite’s sequences are **absent** in Apollo’s sequences.



STRUCTURAL CHANGE THROUGH TIME

Greek and Phoenician sequences from Cyprus are compared across three periods (see table). This demonstrates an **increase in diversity and complexity** over time, as reflected by:

- an increase in the length of the sequences, in the numbers of different symbols, the different sequences, and the nodes in the structure.
- a decrease in the centralisation value, meaning that the edges are less concentrated on some particular elements. However, the **diversity** of the **elements** composing the sequences (nouns, adjectives, etc.) is virtually **unchanging**, reflecting stability.

	-500/-300	-300/-1	1/400
total number of sequences	64	105	124
number of selected sequences	63	104	122
number of different sequences	8	13	17
sequence max. length	11	19	23
sequence median length	3	3	3
diversity of the elements	3.41	3.16	3.36
number of nodes	24	49	72
number of different symbols	5 / 9	6 / 9	9 / 9
number of terminal symbols	3	3	5
number of articulation points	10	3	12
degree centralisation	0.07	0.03	0.04
median transition rate	0.05	0.01	0.01

- **MAP project**: <https://map-polytheisms.huma-num.fr>
- **Application**: <https://analytics.huma-num.fr/Sebastien.Plutniak/map-syntax-diagrams>
- **Code**: <https://github.com/sebastien-plutniak/map-syntax-diagrams> DOI [10.5281/zenodo.4443133](https://doi.org/10.5281/zenodo.4443133)
- **Manual**: Plutniak. S. 2020. *MAP Syntax diagrams : visualiser, décrire et comparer les séquences onomastiques divines de l'Antiquité*. <https://hal.archives-ouvertes.fr/hal-02532617>