

Database of the Mayan Script*

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Abstract. The deciphering of Mayan script is an intricate but interesting problem. During years, the community of Mayan researchers was not open to the usage of computer tools. Still, the progress of the computer science and the current state of Mayan research proves the necessity of this type of software. We present the project related to the development of Mayan script database, which is the first necessary step in development of computer representation of Mayan script data. The database contains several tables and allows for various queries. The main idea of the project is the development of the system that would allow managing Mayan script data for specialists and as well for persons without any previous knowledge of Maya. This includes structural visual description of glyph images, expert system facilities, and, in future, calculation of glyphs similarity and development of digital corpus for analysis of similarity of the contexts on the fly. Another possible direction of further investigations is confirmation of deciphering results using large corpus data.

1 Introduction

Mayan hieroglyphic writing contains more than thousand of different glyph signs. Many of them are variations of one sign (allographs), others are different signs with the same reading (homophones). Some other signs are glyph variants, – as the mayanist Tatiana Proskouriakoff describes them, – that were used during a certain period of time or in a certain area.

Mayan writing system can be described as a logosyllabic system ([3], [4], [5], [7]), based on signs that represent words (logograms) and syllables that also can be used as phonetic signs. There are approximately 200 different syllabic (i.e., purely phonetics) signs, of which about a 60 percent are homophones. Namely, there are about 80 syllables in the classic Mayan language (according to its phonetics); still more than 200 glyphs signs were used in the phonetic writing. The Mayans used a system of writing capable to register complete oral manifestations of their language.

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The discoveries of the last decades in Mayan epigraphy field allowed deciphering of almost all documents and known inscriptions, according to the dominant theories of deciphering. Nevertheless, during interviews with epigraphists of the Center for Philological Studies, National Autonomous University of Mexico (UNAM), we realized that there is no kind of computational tool that can be used by the Mayanists in their investigations. These investigations are normally carried out manually on the basis of facsimiles of documents and Mayan inscriptions ([1], [6], [8]).

On the other hand, the public in general should also have possibilities of using some specific computer tools if they are interested in reading Mayan glyphs. Though they are not specialists, the subject is interesting from the general cultural perspective.

Even though the specialists are aware of the existence of various dictionaries in the Internet, they are not frequently used. Even more: during years, the community of Mayan researchers was very skeptic as far as the usage of any type of computer tools. Still, the progress of computer science and the current state of Mayan research proves the necessity of this type of software, because it makes the work of a researcher more fast, reliable and productive.

We present the project related to the development of Mayan script database, which is the first necessary step in development of computer representation of Mayan script data.

We believe that developing of this application would be impossible without support of investigators of Maya and without considering their needs as end users. Our purpose is development of the application in which investigators of Maya would participate in design and implementation. Also, this application should be able to resolve specific problems that can solely be raised by a specialist.

This software will help to diminish the burden of many rather complex procedures that are performed manually by now, like context comparison or glyph identification. In addition, this software offers to the investigators a tool that facilitated the process of search and classification of the Mayan glyphs and can serve as a didactic tool that helps in learning of the glyph signs that compose Mayan writing system.

2 Database Description

2.1 Database

We based our development on John Montgomery's dictionary [2]. It contains hieroglyphs of Mayan classic writing, organized alphabetically by phonetic writing of words, phrases or syllables, and also includes appendices that list signs using additional classification categories.

The developed application is a relational database – and the corresponding interface – that stores general information about glyphs: glyph image, translation, transcription, Thompson numbers (these can be considered as glyphs identifiers (ID), they were assigned in arbitrary manner by E. Thompson, an outstanding Mayan investigator), phonetic reference and descriptive notes corresponding to each glyph that forms part of John Montgomery's dictionary. Total size of the dictionary is 1,241

entries. The database is ordered according to Thompson numbers, but the system offers two more options for its ordering using the fields containing transcription or translation.

Due to normalization of the database, in the cases that a glyph has more than one meaning according to the dictionary, these are separated and marked with ID that corresponds to the sign and as well with the IDs that correspond to the number of meaning (translation); thus, different meanings are stored as separate records in the database.

The database can also store information provided by the user related to the structural visual graphical image description. This is based on a feature set created by each user if he wants to describe the glyphs using his own feature set, see Section 2.3. Besides, the system has the predefined feature sets. The user has a possibility to use any feature set: the predefined one or his own set.

Fig. 1. Interface for the database (main dictionary view).

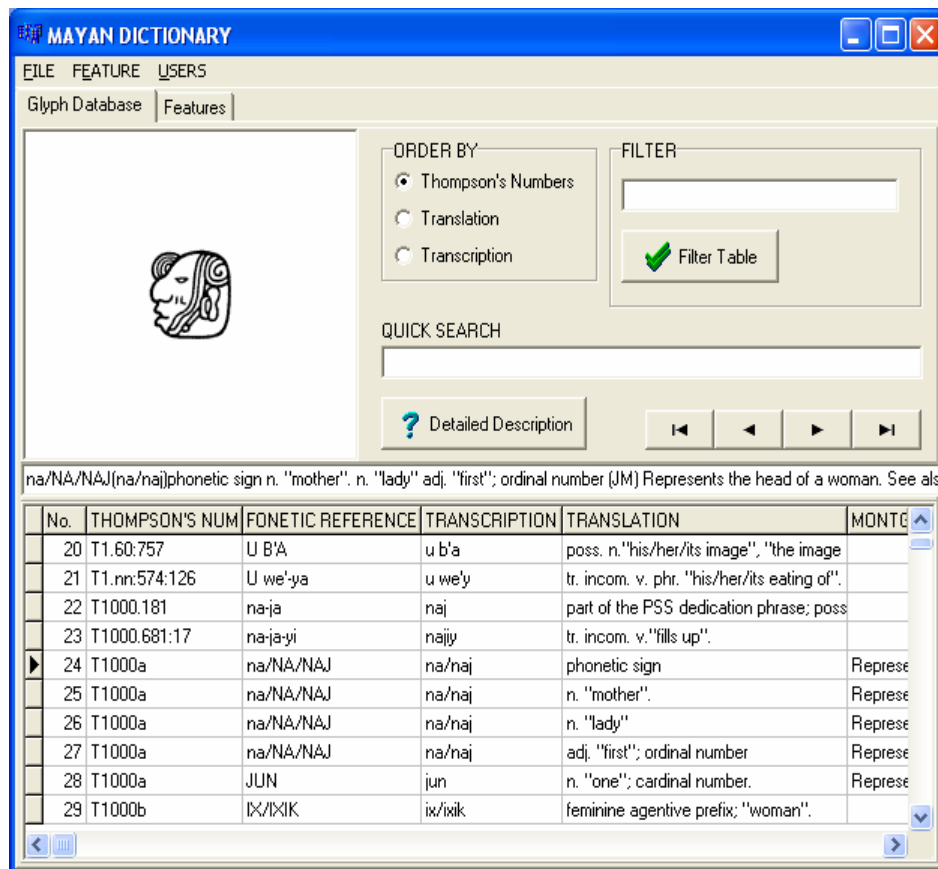
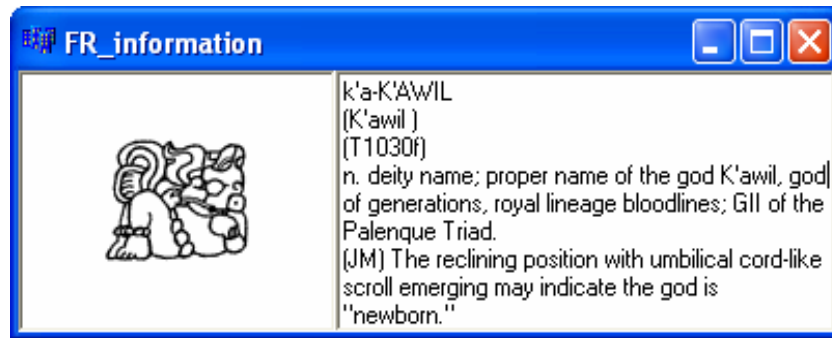


Fig. 2. Complete information about a glyph.

2.2 Dictionary Representation

The information about glyphs is visualized as records in a standard tabular way, i.e., each visual field value corresponds to a specific database field. The following fields are used: glyph image, Thompson number, phonetic reading, meaning (translation from Maya), and comments.

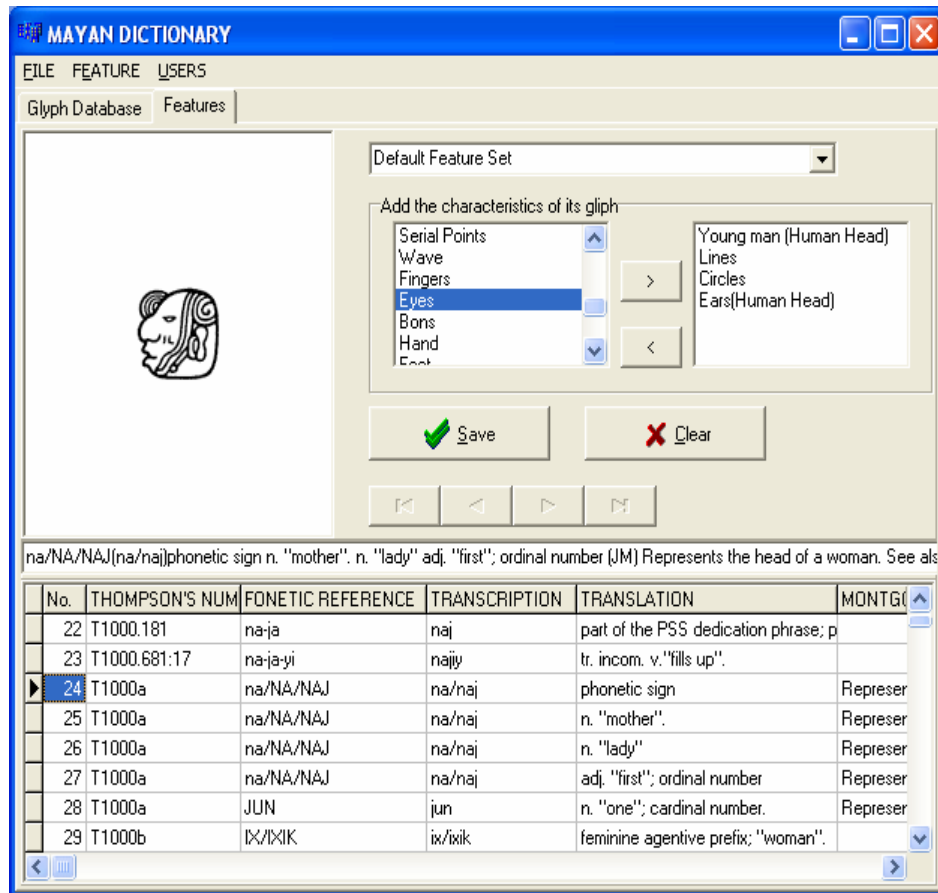
Different meanings are stored as separate records (Fig. 1), thus, duplicating other field values. We chose this option for enabling searches in the field “meaning”. Still, we have only one glyph image visible at a time and we present additionally the concatenated information of values referring the meaning (from several records) just below the glyph. This is justified by the fact that otherwise this information is presented in separate records and, thus, it is not clearly related to the same glyph.

Also, the complete information about glyphs can be visualized within separate dialog window, see Fig. 2.

The user has an option to choose the ordering by marking the corresponding field in the RadioButton “Order by”: Thompson numbers, translation or transcription.

This interface also allows for two types of searches: fast search and filtering. Both of them are performed in accordance with the selected ordering. The fast search moves the table cursor to the desired value according to the ordering. The filtering restricts the records that are shown to the user according to the data present in the field “Filter” and the current ordering.

Fig. 3. Feature set assignment.



2.3 Glyph's Characterizing Facilities

The system allows for structural description of glyph images using various feature sets. This facility permits a user who is not familiar with Maya glyphs to make searches and identify the glyphs.

The user can use predefined feature sets or create his set and describe glyphs according to this set.

The systems shows the window, where provides general information about a glyph. Also, a list of possible graphical features (characteristics) is presented, see Fig. 3.

The user can add and remove these features while describing an individual glyph. This makes possible assigning characteristics that correspond to each one of the glyphs. Each user (professional or amateur) can use his judgments for this characterizing.

The system stores each one of assigned feature values and allows visualizing of the characteristics that have been assigned previously to the glyph. Each set of features has its name, thus, changing the set is just picking up a different set name. This allows for different users applying different feature sets prepared by them or by other users.

This information allows for development of an expert system capable to recognize the glyphs on the basis of their structural visual graphical characteristics, asking a user several questions about the glyph image.

3 Conclusions and Future Work

We present the project related to the development of Mayan script database, which is the first necessary step in development of computer representation of Mayan script data. The database contains several tables and allows for various queries. The main idea of the project is the development of the system that would allow managing Mayan script data for specialists and for persons without any previous knowledge of Maya. This includes structural description of glyph images and expert system facilities.

We hope that the experts in the field will reconsider their position towards the usage of computer tools starting from the usage of the described system that will help them to identify glyphs and reduce the time spent for search and classification of the glyphs.

The developed application will serve also as a didactic tool that helps not only the professional investigators, but it will also serve to any person interested in the Mayan writing system.

We plan to implement a determinist expert system based on the structural characteristics of glyph images. This will allow for performing automatic glyph classification, so that when the database contains the characteristics that correspond to each glyph according to the selected feature set, it will be possible to make reasoning procedures for quick glyph searches.

When the glyphs are classified, it will be easier to locate them within documents and Mayan inscriptions. As further perspective, we plan to develop a corpus when the glyphs are represented by their identifiers, for example, Thompson numbers. Next interesting step in the future is related with applying statistical methods of corpus linguistics to confirm the results of the deciphering procedures.

4 References

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