ORPHEUS: A Virtual Learning Environment of Ancient Greek Music

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Abstract — **The applications ORPHEUS and ARION have been presented to vast audiences during the International Fair of Thessaloniki between 8-17 September 2006. They were presented in international conferences, in nation-wide radio emissions, in newspaper and magazine articles. ORPHEUS has been supported by the "HERMES"[1] project, while ARION is under the auspices of the SEEArchWeb[2] project. ORPHEUS is an interactive presentation of Ancient Greek Musical Instruments. The virtual environment of ORPHEUS allows the experimentation with the use and the sounds of the modeled ancient instruments. The Ancient Greek Guitar ("Kithara"), which was the first modeled instrument, can be virtually strummed using the mouse or the keyboard. The auditory result is ancient Greek melodies. The application, which is accompanied by information about the history of Ancient Greek Music and a picture gallery relative to the Ancient Greek Instruments, has mainly educational character. Its main scope is to demonstrate the Ancient Greek Musical Instruments to the audience.**

I. INTRODUCTION

It is true that we know very little about Ancient Greek Music (from this point and forth: AGM) primarily because we have no actual recordings or hearings and secondly because sources about Eastern Music, the successor of AGM, are scattered and not thoroughly indexed as is the case with its counterpart, Western Music. Furthermore, it is difficult for researchers with a profound musical education in Western Music and culture, well advanced in diatonicism and tempered scales to understand the chromatic [4][5] and enharmonic background of AGM (West 1992). On the other hand, researchers and pioneers like West [12] and Pöhlmann [7] have managed to collect and organize a very large amount of documents and actual music scores and have given a scientific insight for a music system over 2000 years old. The ORPHEUS project takes their work and tries to make a connection between that music and prevailing modern Western Music. Two software instruments are already produced: ARION and ORPHEUS.

According to Greek Mythology, Orpheus (son of Apollo and the muse Calliope) was a poet and musician.

After his wife Eurydice's death, he went to the underworld to ask for her return. The guard dog Cerberus fell asleep listening to his music, while Hades was moved by it and let her go under a condition: Orpheus should not look at her eyes until they were back to the sunshine. Orpheus couldn't resist and as he turned around to look at her, she died again forever.

Arion was a famous musician at the court of Periander, king of Corinth. A dolphin saved his life, after he tried to commit suicide by springing into the sea from a boat. Before his drowning attempt, he played lyre and sang on the boat. His music was so wonderful, that fascinated the dolphins in the sea. So, they just followed the boat and one of them saved him.

II. MUSIC IN ANCIENT GREECE

A. An overview

A first elementary clue, which is extracted from the research on AGM, is that the singer possessed the main role on a musical performance. The soloist's voice was the basic "instrument" in a performance. The melody came indispensably from singing. A musical instrument accompanied the sung Greek poetry. Ancient Greek poetry and tragedy was inseparable from music [1]. The term 'lyric' stems from the word 'lyre' or 'lyra'.

Although not so many handwritten scores of AGM have been saved, there are (luckily) abundant sources about AGM theory. Numerous treatises in Greek, Latin and Arabic have survived which, mingled with the study of other material, became integrated into the cultures of all Western peoples, the heirs of Hellenic learning (Harmonia Mundi, 1979) [3].

B. Musical instruments

There are several references about the musical instruments, which were used in AGM. Some of them namely are: the lyra, the avlos, the kithara, the hydravlis, the monochordon, the trichordon etc.

The monochordon, the lyra, the kithara and the trichordon constitute some examples of ancient stringed instruments. The monochordon (or monochord) was a rectangular sound box of arbitrary length with a single string, which could be derived by a movable bridge [8]. The kithara was a plucked string instrument and consisted of a square wooden box that extended at one end into heavy arms. Originally it had five strings, but additional strings were later added to include seven and finally

eleven strings. These were stretched from the sound box across a bridge and up to a crossbar fastened to the arms (San Francisco Performances) [9].

The avlos and its variations were a kind of wind instruments. In this first version of ARION, the sound of the musical instrument, which accompanies the Ancient Greek Singer, is an approach of the sound of avlos, while the ancient kithara is the first instrument that was modeled in ORPHEUS.

C. Ancient Greek Musical Notation

The Greeks had two systems of musical notation, which correspond note for note with each other: one for the vocal and one for the instrumental melody. The instrumental system of notation is comprised of numerous distinct signs probably derived from an archaic alphabet, while the vocal system is based on the 24 letters of the Ionic alphabet.

The whole system covers a little over three octaves. In particular, it contains notes between E^b_3 (155,56 Hz) and G_6 (1567,98 Hz).

III. PROBLEM FORMULATION

The challenge of the ORPHEUS project is to create an AGM software module that can help contemporary musicians experiment with a virtual AGM instrument [10]. The same time, it provides an introductory, interactive learning tool with an easy to use interface targeting non-computer science experts.

A. Ancient Greek Music Sources

Over 40 melodies, most of them fragmented, have survived as stone inscriptions or musical papyri (scraps of papyrus, the ancient equivalent of paper) containing musical notation. While it is certainly true that the hearings are lost recent research has satisfactorily deciphered AGM notation and rhythm.

B. The ARION Application

The graphical user interface of ARION can be seen in the following Fig. 1.
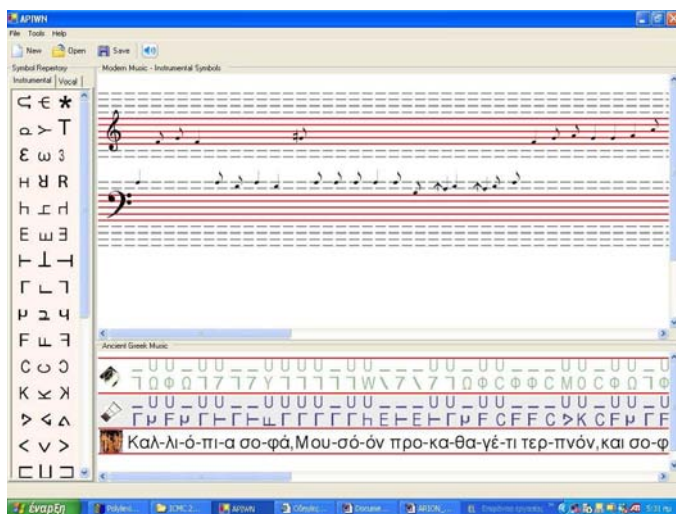

Fig 1. The Graphical User Interface of ARION.

The application is a Cakewalk like software module that allows the composition of Ancient Greek melodies. It consists of three major surfaces: The Symbol Repertory surface, the Ancient Greek Music Surface and the Modern Greek Music Surface.

The Symbol Repertory is the container of all AGM Symbols used by the application. It holds the Instrumental and the Vocal symbols. While browsing through the symbols the user can see as a tool tip the symbols frequency and the corresponding modern note.

Its innovation is that it can reproduce instrumental and vocal AGM melodies.

C. The ORPHEUS Application

ORPHEUS is a multimedia application, designed with Macromedia Flash MX, which also incorporates Microsoft Agents Technology. ORPHEUS has mainly an educational character[3].

The central user interface of ORPHEUS is presented in Fig. 2. The music track that can be listened to during the introduction of the presentation has been exclusively written for the application and is about a musical composition with contemporary hearings, which is influenced from AGM in many ways (melody, instruments, modes, rhythm.)

Fig. 2. The graphical User Interface of ORPHEUS.

The six circles – buttons correspond to the six different functions of the application. After selecting a submenu by clicking one of the six pictures, the user can confirm the selection in the next screen or return to the main menu by pressing the "Back" button.

The first circle contains a rich photo gallery with pictures that are relative to the Ancient Greek Music. The user can get acquainted with the way AGM instruments looked like, as well as the way they were used by

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[3] You may download ORPHEUS from the following site: www.seearchweb.net -> Arion -> Orpheus and install it on your PC by running setup.bat. If you have already installed an Adobe Flash Player, ignore registering the Flash.ocx file.
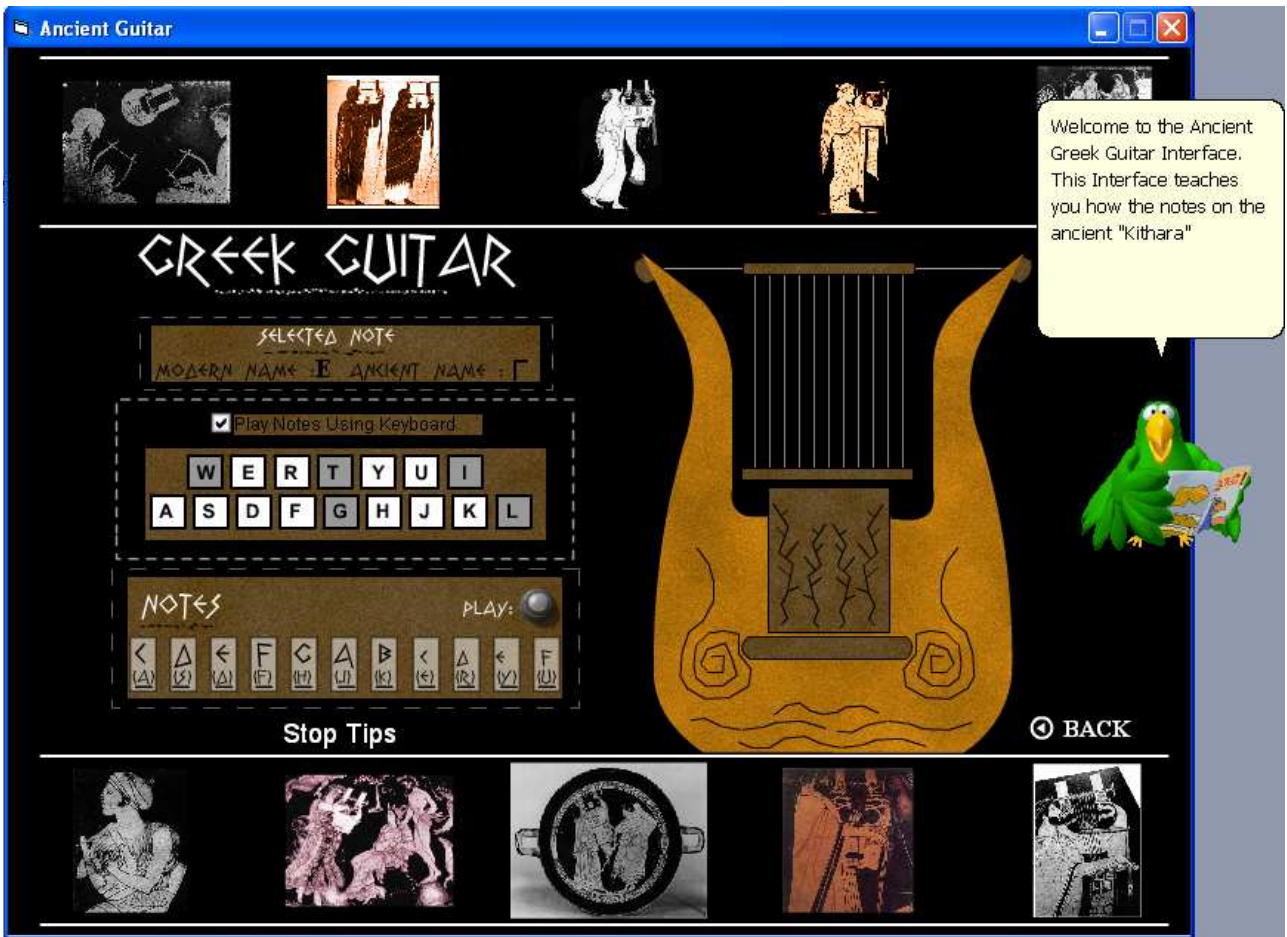
Fig 3. The Ancient Greek Guitar ("Kithara"). On the right is visible the "talking parrot", a Microsoft text-to-speech agent that orally instructs on the use of the "kithara."
The Graphical User Interface of ARION.

musicians, through snapshots from angiographies and wall paintings. The photographic material comes from real archeological treasures of Ancient Greece. Information about the AGM instruments can be found in the second circle.

The third circle leads to the interactive surface, where the Ancient Greek Instruments are presented. The first modeled instrument, which is the ancient Greek kithara, is presented.

The electronic visualization of the ancient guitar is based on information that was extracted from writings and angiographies, which have survived from that era. The user is able to "touch" the strings of the guitar (either using the mouse or the keyboard shortcuts) and create that way Ancient Greek melodies and sounds.

As Fig. 3 shows, the modeled guitar represents the latest version of the instrument: the one with 11 strings. The microtonal nature of the ancient guitar's strings (the sound has been materialized with physical modeling) has been implemented according to the correspondence of the Ancient Greek symbols to the modern notes [12], which can be seen in Table I.

The last three circles – menus of the application concern the common functions "Help", "About" and "Credits".

TABLE I.
MAPPING OF AGM SYMBOLS TO MODERN NOTES FOR THE ANCIENT GREEK GUITAR.

AGM symbol	E	⊢	Γ	Ϻ	F	C	K	⊳	<	⊏	N
Modern Note	C	D	E	F	G	A	B	C	D	E	F

IV. CONCLUSIONS

In recent years several efforts have been recorded in Greece and elsewhere in reconstructing AGM instruments, both physically and with physical modeling techniques [6][11]. The most notable was the reconstruction of the ancient hydraulis by the European Cultural Centre of Delphi in 1999. A wide range of other instruments has been also presented in exhibitions and live performances [2]. As prototypes for this restoration have been used fragments of AGM instruments found in excavations or descriptions of them in papyri.

However, an electronic instrument has never before been presented that can be used as an editor, composer and synthesizer the same time. ARION and ORPHEUS are the first tools of this kind.

V. FUTURE WORK

At the moment we are working on the upgrading and improvement of the whole system. The next version of ARION will contain a far more improved sound reproduction, in terms of the singer's voice. There will be a much better sound quality, so as the voice to be heard as more 'natural' and less digitized. Our efforts also focus on an even more exact approach of the ancient Greek accent and the precise ascription of lyrics.

The next step also envisages a 3-D animated figure of an ancient Greek singer. Our aim is to create a consistent figure, in terms of presentation (clothes, characteristics etc.) and oral movement, while singing.

Part of our future work is also the enhancement of ORPHEUS with more musical instruments, like lyre, monochord and trichord. This task presupposes the electronic modeling of instruments and the sampling of the corresponding sounds each of them produces.

VI. REFERENCES

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