ΑΡΙΩΝ – An Ancient Greek Music Composer

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Abstract: - This paper describes an instrument that can compose a song using predicates of Ancient Greek Music. It employs the methodology and musical notation of this specific music system and at the same time, it provides a mapping mechanism that depicts the whole process to composition predicates of the usual notation of Western Music. The aim of this application is to facilitate the efforts of Ancient Greek Music researchers in getting closer to what Ancient Greek Music really was by parametrically performing melodic pieces.

Key-Words: - Ancient Greek Music, Music Composers, .NET Framework, Csound.

1 Introduction

"Ancient Greek culture was permeated with music. Probably no other people in history has made more frequent reference to music and musical activity in its literature and art. Yet the subject is practically ignored by nearly all who study that culture or teach about it. Sometimes its very existence seems to be barely acknowledged." [1]

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 [2][3] and enharmonic background of AGM [1]. On the other hand, researchers and pioneers like West [1] and Pöhlmann [4] 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.

This project takes their work and tries to make a connection between that music and prevailing modern Western Music. A software instrument is produced, ARION, capable of reproducing whole songs both musicaly and vocaly and the same time the user can experiment with the various scales, symbols and frequencies having the total freedom to "imagine" and hear how AGM music really was.

2 Problem Formulation

2.1 The Challenge

The challenge of the project is to be consistent to the source material and create an AGM composer with scientific accuracy and the same time to produce a synthesizing instrument with an easy to use interface targeting non-computer science experts.

How can you faithfuly reproduce ancient music when you had never heard something like it*? The only safe way is to follow the work of experts in the field and the actual musical scores. But even these are usually incomplete. Also, there is little knowledge about the instruments used at the time and we are sure that they were very different than modern or even medieval ones. Moreover, the true Ancient Greek accent is different from the Modern Greek one and from the one used by foreigners today (the so called *Erasmian*) [5], so extended research had to be carried out on the vocal reproduction of the lyrics.

2.2 The .NET Framework

This project was built using Microsoft's .NET Framework [6]. The framework is a set of libraries engineered specifically to enhance the development of Microsoft Windows oriented applications. It provides smooth interconnectivity to the underlying Application Programming Interface of the operating system and the means to manipulate each aspect of it. This application implements extensive use of the GDI+ calls that affect the Graphical User Interface

* Having heard several CDs from bands all over the world claiming that they sing more or less AGM, we have concluded that they are strongly biased by their musical tradition rather than by the AGM acquis.

and provide us the ability to create our own controls or to extend pre-existing ones. The application also uses and XML table for storing the data of the Ancient Greek notes and their assocation to modern ones.

2.3 The Csound Music Language

The sound of the instruments that his project performs was made with the use of Csound. Csound is a programming language designed and optimized for sound rendering and signal processing. The language consists of over 450 opcodes - the operational codes that the sound designer uses to build "instruments" or patches. Usually, two text files are created - an .orc (orchestra) file containing the "instruments", and a .sco (score) file containing the "notes". The Csound interpreter works by first translating the set of text-based *instruments*, found in the *orchestra file*, into a computer data-structure that is machine-resident. Then, it *performs* these user-defined instruments by interpreting the list of *note* events and *parameter* data that the program "reads" from: a text-based *score file,* a sequencer-generated *MIDI file,* a real-time *MIDI controller,* real-time *audio*, or non-MIDI devices such as the ASCII keyboard and mouse.

Depending on the speed of the used computer (and the complexity of the instruments in your orchestra file) the performance of this "score" can either be auditioned in real-time, or *written* directly into a file on your hard disk. This entire process is referred to as "sound rendering" as analogous to the process of "image rendering" in the world of computer graphics.

2.4 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.

In fact, we know quite a lot: we know a great deal about the rhythms and the tempo of the music, since these are reflected in the metrical patterns of Greek verse [4]. Adequate knowledge has been gathered about the musical system, that is, how the scales were conceived and the like, since the works of several Greek musical theorists survive, like those of Aristoxenus[†]. Instead of using ratios, he divided the tetrachord into 30 parts, of which, in his diatonic

[†] Aristoxenus, of Tarentum (Magna Graecia, - 4th century BC), a peripatetic philosopher, and writer on music and rhythm.

Fig. 1. Symbol Repertory. Notes for instrumental and vocal performance.

syntonon, each tone has 12 parts, each semitone 6 [7]. Some of the musical intervals that were used are even smaller than the space between two keys on our piano, a common feature of oriental scales. We can infer much about the instruments, using as evidence surviving fragments of ancient instruments [8][9][10], depictions on vases and wall paintings, literary descriptions, and cross-cultural comparison.

In AGM scripts, above each line of Greek is notation that looks mostly like Greek letters, but is in fact vocal musical notation. Interestingly, ancient musicians had two completely separate systems of musical notation, the one meant for voice, and the other for instruments [1]. Some of these symbols can be seen in Fig. 1.

3 The Application

The application 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.

By right-clicking the Edit Ancient Note Dialog Box is invoked (Fig. 2). In that dialog box the user can modify the type of the note and the note's frequency. The AGM Drawing Surface consists of three fields, Vocal Symbols, Instrumental Symbols and Lyrics. The user can either drag'n'drop a

Fig. 2. Editing an AGM note - the Dialog Box.

symbol from the Symbol Repertory to the corresponding field or one can use the Text Tool (which is located in the Toolbar) to change each field (Fig. 3).

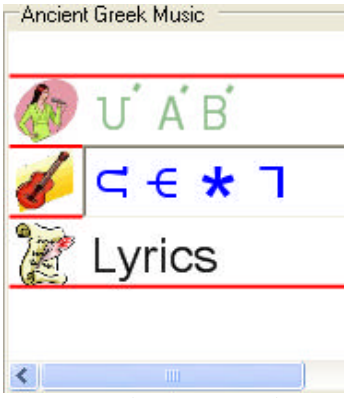

Fig. 3. AGM surfaces: notes for vocal and instrumental melodic scripting along with the lyrics.

The Modern Music Surface has two modes, the Vocal Mode and the Instrumental Mode (Fig. 4). The user can interact with only one mode at a time.

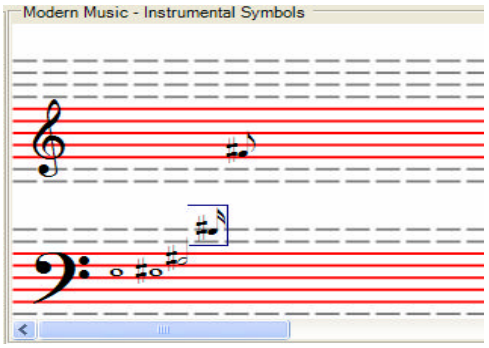

Fig. 4. Transcription to the usual Western Music surface.

By right-clicking on a note the Edit Modern Note Dialog Box is invoked where the user can modify the note's duration and frequency shifting it from double flat to double sharp and in between (Fig. 5).

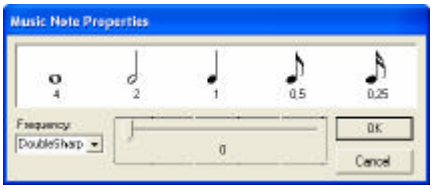

Fig. 5. Altering AGM note's pitch and duration.

Many notes of AGM have difficulty in their correspondence with their Western music counterparts. Especially in modes like Phrygian and Lydian, a creeping substrate for the development of oriental music systems can be detected. Since no accurate correspondence can be made, the instrument gives its users the flexibility to experiment by assigning different pitch levels, and therefore the fuzziness of scales can be resolved in a trial and error manner by hearing the note.

The Toolbar of the application has six functions (Fig. 6). The first three (New, Open, Save) manipulate the music document. The other two (Select, Text) are used to drag'n'drop symbols from the Symbol Repertory to the AGM Surface (Select) or to change the text in the AGM Surface (Text).

Fig. 6. Application's Toolbar.

The last function is used for creating an audio representation of the current music document. By clicking it a Microsoft Wave file is created in the current working directory and the user can use an audio player to listen that file. The audio file is produced by using Csound's rendering processes.

Last but not least there is the MenuBar which has 3 menus. The File menu deals with file handling as well as the document's identity which contains information such as the date of creation of the document and the composer. The Tools menu has the Edit Association Table command and the Export to Wave command. The Association Table is the table from which the mapping function reads the data and maps AGM notes to Western Music notes. The last menu is the Help menu which at the moment contains only the credits for this application.

4 Usage

The usage of the application is quite trivial. It works into two modes, the Vocal and the Instrumental mode. The user chooses the current mode by clicking on the desired Symbol Repertory page. When the application starts the default mode is Vocal mode. The user can add a note to the Ancient Greek Music Drawing Surface.

Since Ancient Greek notes do not provide any information on their duration the user can simply change the duration by right-clicking on the modern note and choosing the desired duration in ?. When the composition is complete he can convert the composition to a Wave file and listen to it via his audio player of choice.

5 Conclusions

In recent years several efforts have been recorded in Greece and elsewhere in reconstructing AGM instruments, both physically and with physical modeling techniques [8][9]. 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 [10]. As prototypes for this restoration have been used fragments of AGM instruments found in excavations or descriptions of them in papyri.

However, never before an electronic instrument has been presented that can be used as an editor, composer and synthesizer the same time.

ARION is the first instrument of its kind. Its main advantage is that it provides researchers a user interface that alters scales, accents and pitch assignments helping them experiment with music forms and scales that have an inherent fuzziness.

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