

## CSC484A/CSC589A/MUS490/MUS590 MIR

### Assignment 1. Fall 2006 (8 pts)

Read the questions carefully. One of the questions involves simple experimentation with Matlab/Octave as well as Marsyas. There are many online resources for learning Matlab and it is very straightforward. We will also be covering Matlab/Octave during lectures. We will also be looking into Marsyas. There are 6 questions and each question is worth 2 points. You can choose to answer any 4 questions out of the 6. You are welcome to try to do all them but your grade will be based on the 4 you select. Most of the questions intentionally require some amount of searching for information on your own. In addition 1 extra credit will be given to exceptional answers or creative extensions to any of the questions. If you have any question don't hesitate to contact me.

The assignment is due Oct. 19th in class.

Enjoy, George Tzanetakis

### 1 Question 1 (2 pt)

Scenarios are frequently used in Human-Computer Interaction to help convey to shareholders information about a system as well as help the designers to clarify their vision of it. A scenario should be relatively informal and concentrate on the main aspects of the interaction with the system rather than specific implementation details.

In addition you should try to personalize the scenario. For example instead of writing something like *“To start a session the user must sing into the microphone .....*” you should write something like: *“Mary is 22 years old and is finishing her degree in anthropology. She doesn't have much experience with computer and gadgets but her partner gave her as a present a brand new MIRPod. After reading the quick start instructions which seem very simple she decides to give it a try. She hums “Stormy Weather” one of her favorite jazz balads .....*”

Write two scenarios of usage for an ideal version of the system you plan to build for your project. (Note: Each person in the group must write their own version of the two scenarios). Try to make the two scenarios different. Each scenario should be about 2-3 paragraphs minimum with each paragraph

about 3-4 sentences minimum. Also use specific music examples (artist/title) in your scenarios.

## **2 Question 2 (2 pt)**

This question requires usage of Matlab or Octave. As we discussed during the lectures the class of sinusoids of a particular frequency are closed under the operation of addition. That means that adding two sinusoids that have the same frequency with different amplitude and phase results in a sinusoid at the same frequency. You can find the Matlab/Octave code for demonstrating this not so obvious property under the Resources link of the course webpage.

Write similar Matlab code to show that this property does NOT hold for sawtooth waves of the same frequency but with different amplitude and phase.

## **3 Question 3 (2pt)**

In a programming language of your choice implement a parametric animation of multiple rotating vectors (phasors) (something like the spokes of a bicycle or the hands of an analog clock). As a minimum your implementation should show two phasors and should allow to adjust their rotation speed (frequency), their magnitude, and starting phase. In addition create dynamic plots of the x and y projections of each of the phasors (total of 4) and verify that they are sinusoids. Using your implementation try to create the phenomenon of beats which happens when you add together two sinusoids that are close in frequency.

## **4 Question 4 (2pt)**

Try to find examples of as many music notation systems as you can and write a short description providing historic and geographical context for each. Include at least 2 music notation systems in addition to the standard western music common music notation that most of us are familiar with. Provide an example image for each type of notation and a minimum 1-2 paragraphs (minimum 3-4 sentences each) describing it. In addition for each music notation write a minimum of 1-2 paragraphs (minimum 3-4 sentences each)

describing how music was produced, distributed, retrieved and consumed at that time and place.

## **5 Question 5 (2pt)**

Either using Marsyas or any other programming environment/language you want implement a bank of 8 sinusoidal oscillators. A sinusoidal oscillator allows the programmer to adjust the magnitude and frequency of a sinusoid. Using any spectral analysis program (for example Audacity) view the spectrum of 3 recordings of a single musical instrument playing different note. Repeat with another instrument. Based on the spectrum try to recreate the sound synthetically by adjusting the frequency and magnitude of your 8 sinusoidal oscillators. Describe your experience. Can you identify the original sound by hearing the synthesized one ? Provide plots and information supporting your conclusions.

## **6 Question 6 (2pt)**

Write a short “science” fiction story that as part of it describes an idealized Music Information Retrieval (MIR) system of the future. Feel free to use any exotic technology you can imagine: holographic displays, voice recognition, tactile displays, peta byte usb thumbdrives etc. The only constraints are: 1) you need to weave specific music examples (artist-title) for your story 2) there should be concrete retrieval and browsing problems involving large collections of music 3) and you can’t invent exotic technology that trivializes the problem (for example reading of minds).