Tides in Five Score

Tiffany Chong

Smith College, Northampton, MA, tchong@smith.edu

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Abstract

In this paper, the structure of the KeyKit-generated song, "Tides in Five Score" is presented. "Tides in Five Score" is composed of a mixture of algorithms and predetermined notes. Its base structure imitates many popular new age songs.

1 Introduction

Computer music is a relatively new genre of music. Especially new about it, is the fact that it takes a technical know-how of a computer, which makes it ideals for the programmmer. The following is an attempt in this field, a program that generates a score called "Tides in Five Score".

We will look at the song, it's making and structure as well as its meaning in detail. "Tides in Five Score" is my first full-length venture into this field.

2 Making a Melody

This program has been designed to produce sounds related to water. It uses few voices though to produce this: midi voice 90 (warm), midi voice 1 (grand

acoustic piano), midi voice 18 (percussive organ). Midi voice 123 (sea shore) is also included, but only for a short time and is not as predominantly used as the prior voices.

When making the melody through this program, there are a few things a user should know before they start:

- Notes can be predetermined on entering them.
- This program contains a pseudo-graphical interface designed in an attempt to make this program more user friendly.

2.1 Predetermining the Notes

The notes used to determine most phrases used in the final song can be predetermined. This predetermination occurs when the user either chooses (randomly or not) a default phrase or enters in one of his own. This phrase shall from now on be called the mother phrase. The notes in the resulting mother phrase are then taken and used in various ways to help determine the other resulting phrases used.

A common way the mother phrase is used is by taking one note from it and sending it to a certain function. That function processes the note in several different ways depending on which function is chosen. A common processing method is to use the note as the start of the phrase it will produce and then build other notes off of that note by changing pitch values.

2.2 Pseudo-Graphical User Interface

KeyKit, which this program was written in, can be considered limited in the area of interactivity. Because the user plays a role in generating the composition, a pseudo-graphical user interface was attempted. Because of

limitations though (where is the equivalent to `scanf` (C) or `cin` (C++)?), the user interface can only be called pseudo.

To begin, a user can type directions() at the prompt. The program then retrieves a list of directions and options the user may choose from. The user may type this at any time again if he feels he or she feels they need help, though it is of course most helpful at the beginning of the program.

After entering a choice at the prompt, the program takes over composing the phrase. However, it attempts to make this process more user-friendly by outputting any notes that may have been changed in their original mother phrase and after, outputting the programs location in terms of which section it is in.

3 Analyzing the Melody

A melody is made up of many different things: beats, notes in scale, sections etc. This composition is in a new category that calls for additional analyzing. It is made up of algorithms, which are the basis for many beats, notes and make up different parts of the sections.

It is only fitting then that we take this approach to analysis of this piece:

1. Analyze, in detail, the algorithms used.

2. Present the structure of the song and the impact it has on the song as a whole.

3. Dissect the individuals sections and understand how their own part was played in relation to where in the structure they were placed and what algorithms they used.

3.1 Algorithms

This program uses six algorithms to produce the composition. These algorithms are:

- intro
- icicle
- hard
- cantor
- pickPhrase
- varyVoldur
- drums0

3.1.1 Intro, icicle and hard

Intro, icicle and hard are grouped together because of the similarity in their algorithms. They all base the phrase they output on one note, which is taken from the mother phrase. By adding and subtracting pitch values, varying volumes and duration and also sometimes times, they create additional notes.

These algorithms were made with the fact that every user may enter different notes in mind. In trying to keep the phrase generated by these algorithms sounding in melodic, pitch values added or subtracted in additional notes should match up to produce or notes in the starting note's pentatonic scale (either major or minor).

In addition to their other similarities, all three algorithms use both mid voices 1 and 90 (respectively grand acoustic piano and warm) in the resulting phrases.

Intro also uses other notes taken from the mother phrase to produce a layering effect in the resulting phrase. The actual resulting phrase is melodic, warm with a sense of lightness.

Icicle repeats notes it generates to create a twinkling sound. Any notes that don't function in pairs are spaced somewhat far apart. This creates a tension between the notes.

Hard immediately lowers the pitch of the note it receives (effectively moving it down an octave or two). It generates sounds that are discordant.

3.1.2 cantor

Cantor is an algorithm that simply takes the middle section out of a phrase (even or odd) and adds it onto the end. The phrase it generates is no doubt different than the phrase input, yet similar because it contains the same notes, durations and voices.

3.1.3 pickPhrase

The pickPhrase algorithm accepts a note and matches it up with corresponding phrase. The corresponding phrase is composed of notes within it's major or minor pentatonic scale. It can pick either the phrase (major or minor) based upon a randomly generated number.

The phrase generated will have what seems like repetition despite the different notes in every corresponding phrase chosen. The notes in the corresponding phrases have the same order of occurrence in the pentatonic scale each time.

To further clarify this, imagine every note in a major or minor pentatonic scale having a number 1 through 5. The first note bears the number one and so on till the last note, which bears the number five. The corresponding phrase for the note A picks either the A major or A minor pentatonic scale.

Say it picks the A major pentatonic scale, it will pick in note order 1, 5, 2, 4, 3 and return a phrase made up of those notes in that order. If the next note chosen, C, picks the correspond C major scale, the phrase it returns also has the note order 1, 5, 2, 4, 3.

3.1.4 varyVolDur

VaryVolDur accepts a phrase and find each notes and puts vary volume settings and duration on the notes. Volume settings are random. Duration settings are every multiple of 3 and 4 (a multiple of 3 has priority over a multiple of 4).

This produces a phrase the sounds similar every time because of the constant duration settings.

3.1.5 Drums0

Algorithm drums0 creates a rhythmic, percussive beat using regular midi voices (thus using those not on midi channel 10). Specifically it uses midi voices 18 (percussive organ) and 90 (warm). Using specific notes, it generates the percussive sound. Though that in itself is not algorithmic, drums0 accepts a number as well that partially controls volume by adding the value onto existing volume settings.

Drums0 also contains several handmade volume envelopes. These volume envelopes are responsible for fading sound in and out, particularly the bass sound. The bass sound is very deep and has a "rumbling" effect to it, accomplished by layering the notes. Intermixed are also three other melodic notes to finish off the deep sound.

3.2 Structure

Structure plays a very important role in this and any composition. The structure of this piece is ABBACD (D being a diminutive of A) and is heard in many real life examples, a prominent one being new age music (e.g. Enigma's," Callas Went Away."). This structure is simple in itself and is meant to cause repetition in of certain types of sounds (not phrases). In the implementation of this structure, a graph on page ten of the GEMS article [2] was kept roughly in mind for dramatic shape.

The structure was observed very strictly in this composition, though not all examples of this structure are so strict. As the structure denotes, bass is only heard prominently in the B and C sections. This is not to say that bass sounds cannot appear in sections A or D, but these sections are set aside for calmer, contrasting sounds. In any case, "Tides if Five Sore" does not feature any bass sounds in sections A or D.

This structure made it very easy to section the music and assign each section a length according to what it was for in the composition. A short recap: the first two A sections were to introduce and break the song respectively; the B sections contained the main body of the composition; the C section was kept for the climax; the D section (or alternatively the third A section) was to be a short piece played at the end of the composition to contrast the climax.

3.3 Individual Sections

The sections that make up this composition make up the "feel" of the composition by placing the sounds in order. In order to cover all of them in an orderly fashion, different sections will be denoted with the section names and an identifying number. For example, section A0 is the first section of A; section B1 is the second section of B. Note: Section A3 and D refer to the

same section.

3.3.1 Section A0

Section A0 begins it all. Composing this section, the introduction to the song is always difficult because introduction in songs are similar to introductions to people. The first impression always counts. The introduction to this song was to be "uplifting". In forming this, Belkin's "A Practical Guide to Musical Composition" [1] was consulted. He felt very strongly that harmony and giving the user a sense of resolution was important in an introduction to make it memorable.

With the advice of Belkin in mind, section A0 uses the intro algorithm (Section 3.1.1), which was written to stay within a note's (the sixth note in the mother phrase) pentatonic scale. The result is firmly melodic and with thanks to midi voice 90 (warm), very uplifting.

The purpose of this section is to lull the listener into good feelings of the water/tides. This feeling will later be repeated in the song.

3.3.2 Section B0

The "rough" sound, made to mimic tides, comes in in this section. To make this sound, drums0 (Section 3.1.5) is called. This section also contains it's own volume envelope which intensifies drums0 continually till it plateaus around the third time and just loops.

This sound, its rumbling and constant presence, mimic tides. However, this is a definite contrast from the first section. The sound produced is not uplifting, but deep and disturbing. Over this is layered another sound, random in nature. pickPhrase (Section 3.1.3) is called numerous times (along with the option of a one beat rest) to make this phrase. The function is to calm the rumbling beat as well as to provide a bit of contrast, in an attempt

to call on feelings of hesitation. This is a definite turn in the music, to begin warnings to the listener that the water/tides are not what they first assumed.

3.3.3 Section B1

Like section B0, it calls to drums(). It is quite similar to section B0 and when the sections change, it is almost undetectable because the beat continues. It only discernable difference is a pause that is easily mistaken for a one beat rest in the section before. This ties them together well as the main body.

However, to keep up the progression and movement, instead of pickPhrase (Section 3.1.3), cantor (Section 3.1.2) is called. Given into cantor is the introduction phrase, so the resulting phrase sounds uplifting as well. This change is needed to tempt the listener back to the water/tides.

3.3.4 Section A1

Section A1 breaks the song again (as seen before in the introduction transition). It begins with a rest and then calls the function icicle (Section 3.1.1) several times with notes one, five and three. Section A1, as one can expect, is calm. But it is a different type of calm than heard in A0. It is easiest to describe the sounds made from this section as "non fluid", though that is not entirely true. It instead sounds more "dangerous" than any previous section, though it is a static melody.

This is thanks to icicle (Section 3.1.1) which achieves an "icy" feel from it's underlying dangerous calm. This danger and contrast is meant to capture the users attention to the dangers of the waters and to make them feel a sense of foreshadow, a sense of anxiety, waiting to hear what it builds up to. This building up that is achieved here was inspired by GEMS [2]. This serves to usher the listener into the climax, section C.

3.3.5 Section C

C is for climax, at least in this case. It starts off with a discordant sound - like someone banging on the piano, a warning that it's starting. From there, C begins to be a synopsis of sounds that have come before and in a very short time period becomes discordant and noisy as more and more sounds find their way in. C calls most previous functions (such a icicle (Section 3.1.1) and drums0 (Section 3.1.5) and has access to all previous phrases from A0, B0, B1, A1, though at the current time, it only uses A0.

It plays with volume, by trying to up the volume continuously on the various notes in the phrase. Section C winds up emitting danger sounds for the water by piecing together a cacophony. It does this twice at different volume levels for fuller impact. The rest between the two cacophonies also provides a good anticipation in which the user is unsure whether it is over or not.

3.3.6 Section D

Section D or A3 was meant to be a short calm melody to phase out the cacophony. It calls only pickPhrase (Section 3.1.3) and cantor (Section 3.1.2) on the mother phrase. It then assigns them all the midi voice 90 (warm) The idea was "the calm after the storm" when the water is once again safe. It begins as described above, but ends instead in a loud clapping/seashore noise that was meant to sound like noise dispersing.

This is very effective because with only warm midi tones, the stress that has been present is taken out. After being lulled by the warmth, the user experiences a sudden scattering noise, symbolic of the noise leaving.

4 Conclusion

In the beginning, no one would have envisioned this as being the end product. It has achieved a certain amount of success though. This endeavor has taught lessons in music construction as well as sound nuisances and successes. It has taught lessons on how to best impact the user, as well as how to make devices to help the user along.

This composition (and paper in turn!) would not have been possible without the help of my fellow CS 354b classmates and an encouraging teacher named Judy Franklin. I also thank Alan Belkin and Matthew Fields for inspiration in completing my composition. In the future, it's hopeful that better interactivity will be achieved, as well as new insights into computer music. We are still at the beginning of this era. One day, it will no longer be new. We will be the part of that history.

References

[1] Belkin, Alan. "A Practical Guide to Musical Composition." 1995

[2] Fields, Matthew H. "The GEMS series." 1993. http://cara.gsu.edu/courses/mus_com/biggems.htm