Adaptive game engine

Resonator

By Volkovyy Pavlo

# Part 1: The problem

Past -> Present (you can skip this part)

Let’s look back to the history of human-sound relationship through the history.

* Part of our perception

It does not take a genius to realize that if you hear the roar of a wild bear you should better run or hide yourself somewhere safe. From the beginning of ages our mind continuously connected sounds to preferred reactions. Some of those were transferred through generations imprinted into our reflectory system while others we obtained during our personal experience.

* Language

Since long time ago humanity took one step forward and by that lifted importance of sounds in our lives on the next level. Ability to hear and analyze sound was essential to the learning and communication process.

* Music

After some time, analyzing the deep emotional and instinctive connections, people realized it is possible to directly influence emotions by recreating some sounds. While music advanced, more mind-blowing sound cocktails were made.

That leaves us with 2 levels perception

1. Informational (conscious) – Analyzing sounds (ex. Spoken language) to get useful data.
2. Emotional (subconscious) – Hard-wired connections with subconscious (emotional) reactions in our brains.

Each of those can greatly influence any human experience and therefore can be used in any project involving interaction with human.

While being a great Informational and emotional handler, ordinary music is created to be ‘standalone’ experience. After being combined with any other activity the overall perception of environment may become inconsistent, braking the music integrity and damaging the effectiveness of both of the use-cases.

The adaptive music, on the other hand, is designed to intertwine into everything it is accompanied with. So we have the way to increase emotional and informational feedback of created content. The question is: “why the only place where it’s being used is a bunch of computer games and films?”.

So what this fancy word is all about?

Adaptive music is a music with only 1 tweak – it is able to change itself when the changes in other parts of perceptual picture are changing or being changed. Why is it so important? Just consider playing any fallout-like shooter and watch a couple of films on 0-volume. Not cool? How about your everyday life?

Let’s imagine the bounds of interactive music usage were removed and it was developed in all the ways it should have. What would it be like? I say adaptive music would take 3 key usage alternatives

1. **Common app feature**. Were you ever abused by irritating music while visiting some website? I was. The worst thing for me (after not asking my permission first) was its distracting influence on site content perception. But what if that music actually helped me understanding the content? I think that integrated music would become much less arguable feature. Painting a flower in Photoshop? Writing persuasive comment in social network? Adaptive music will be always there to help you focus on your work and praise your creativity.
2. **Real-life supplement**. Do you remember any of those moments, when you finished a stunning game or just gone out of a cinema? Most of those times you will be packed with emotions, but also a little bit sad experiencing the contrast with real life. What if it never ended? The epic soundtrack from the titles would chase you through your phones. Minutes after, when you helplessly try to outrun the last bus to get home before tomorrow, you will be supported with an energetic composition, featuring the exact same rhythm as your footsteps. And then, when your GPS detected you are about to cross the road, the music is artistically cut off, leaving you the better chances not to be killed by a car, only to seamlessly continue after your foot will reach the pavement again. And why entering your house you hear particular riffs that you can already associate with the baked key. The program already checked your mail, so you have no reason to reach out for your phone to get the notification about the delicious food awaiting you in the next room.
3. **Trend.** It only takes a quality start-up to scrub the dust of a genius idea and expose it to the universe, changing the way people think of their lives. Sadly, interactive music is now much underdeveloped. The good news is – that imperfection is treatable.

If you still disregard adapting music, I can only recommend to stop reading and wait until the project will reach its final release. However, if you are interested, there are a bunch of problems to be solved before anyone can make a final decision to use such technology in one’s project.

Current industry state.

What kind of adaptive music do I need? (1) Where can I get one? (2) How do I make it work? (3) Let’s try to answer those questions.

1. You should choose for yourself. The problem is that there is nothing to choose from. You can find no standards or file extensions for adaptive music. So the only way is to let your creativity bite off some of your time and create your own AM structure.
2. Here is the tricky part. There are no specialized resources to upload, test and download adaptive music. Maybe I missed something, but the only possible ways I found was:
   1. Wonder through general file hosting in hope of finding any archive with combinable mp3s. Then spend large amount of time to figure out how to connect those to your project.
   2. Create a task. Hire some music designers. I was not expecting to write this in here, but the reality is this is the way that is used in all kind of games and films and by that I mean 99% of all adaptive music.
   3. Make it yourself. Just download that multi-gig music-creation software or buy a bunch of Instruments, invite several friends, lock yourselves up in a recording studio and you have it! (This way makes some assumptions though. For example, the one that you have an exceptional musical taste and have no doubts your music will be liked by everyone who encounter it).
3. There is no spoon. But you can find some libraries to help you with your work at this point. Here are some examples:
   1. <https://github.com/oamldev/oaml> - basic adaptive music lib to use not only with C++
   2. ?

Yet all those libraries have to be given specific instructions on which files should be played in which situation. That adds you another part of work you might not want to do.

However, all those inconveniences can be avoided with a solution, that is to be explained in the next part of this document.

Key points

1. Adaptive music has not much examples outside of the game and film industry.
2. Adaptive music is nearly impossible to find.
3. There are not so many tutorials on how to implement adaptive music into different type of software

# Part 2: The solution

So now, when the key existing problems are determined, it is time move on to the solution.

The great concept.

Let’s solve this problem step by step. Look at the next picture

There is no specialized service for playing(testing), downloading and uploading of adaptive music

Musicians do not make adaptive music because no one can listen to it (there is no player)

Adaptive music has no chance of becoming popular among non-dev society

**Most developers never consider making anything involving adaptive music**

The process of implementing adaptive music into a project usually involves recreating its logical structure

Implementing adaptive music feature becomes less cost-effective

All already created adaptive music ends up being thrown into a recycling bin

The main issues that hold adaptive music industry to remain in the shadows are an absence of a proper sharing resource and implementation complexity. Now the goal becomes simple.

**Goal:** create file-sharing resource, specialized for use with the adaptive music. This resource must include several features:

* server:

1. adaptive music encoder. (Creates adaptive music bundles that store tracks and all the rules that should be applied to them)
2. Enough space to store big amounts of data (Each composition might consist of several hundreds of tracks: each can weight about a couple Mb.)

* Site (client web application)

1. Tools to create a structured adaptive music composition from a bunch of audio files.
2. Tools to listen to the adaptive music (with ability to influence the parameters)
3. Test videos/WEB-games to test different compositions in work
4. Ability to search for the adaptive music based on different characteristics (for example genre, or setting, or available states).
5. Ability to download adaptive compositions as a bundle as well as a separate audio files with instructions file.
6. Ability to download specialized library to work with adaptive music bundles on different programming languages.
7. User cabinet. Used to sign yourself as an author of your music (can be monetized later) as well as to make playlists of your favorite compositions.

Also there are some additional features

1. Ability to collect user preferences and calculate best music structure based on all of reviews.

The project was already given its name. And the name is Resonator.

I NEED MORE DETAILS.

The concept may be a fascinating thing to read but it is not the easiest thing to implement. Let’s structure it a beet deeper:

## UML

1. Use-case diagram.

Users:

