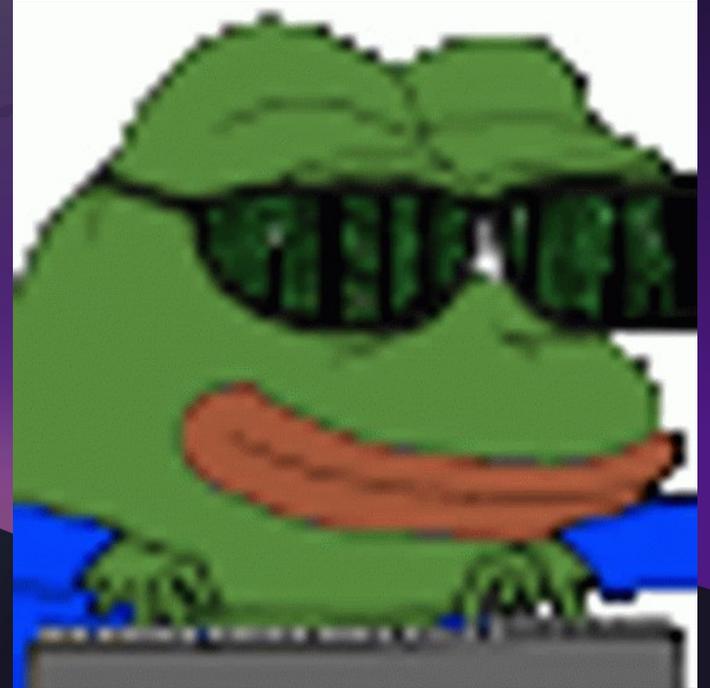# Making an enthusiast rhythm game in Godot Episode 3

By Álex Román (EIREXE)

Who are you?

- I'm an NFT crypto expert

- With lots of expertise in the blockchain

- Please HODL your questions til the end

EIRTeam

Who are you?

- I'm Alex Roman, AKA EIREXE. I'm from Spain. I make a rhythm game called Project Heartbeat

- I am monumentally stupid, so take whatever I say with a grain of salt

- Used to develop racing simulator software, got sacked because I called me boss a cunt

What is this talk about?

- Unlike my online talks, this is a bit less technical

- We are gonna talk about my adventures making Project Heartbeat in Godot and the mistakes I made
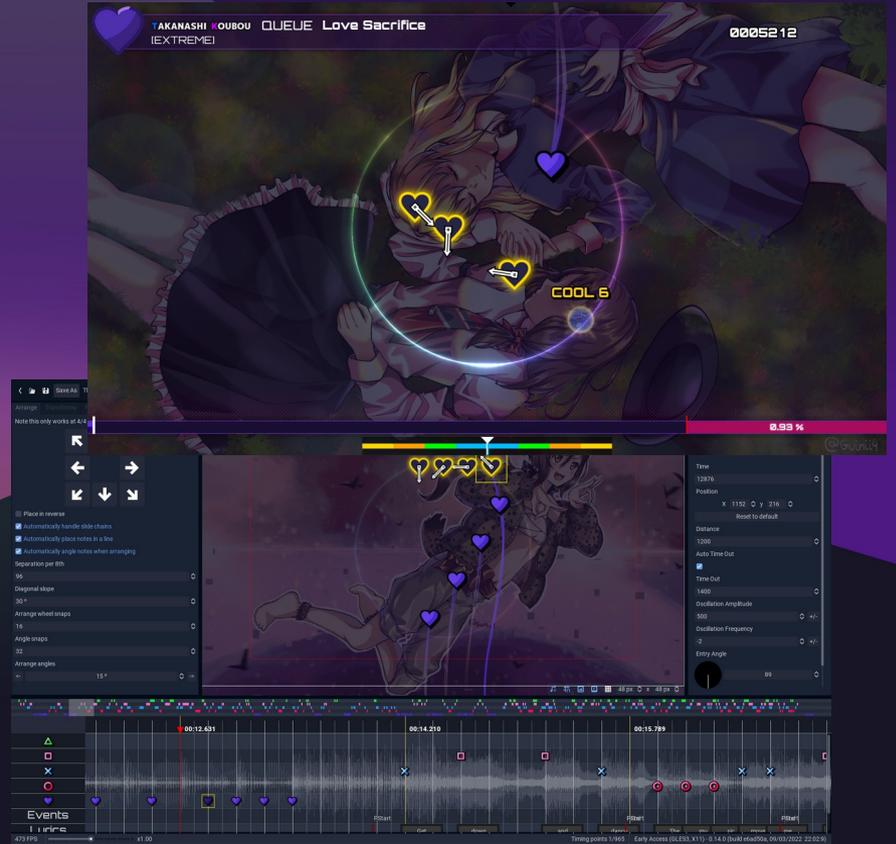
Project Heartbeat
@PHeartbeatGame

Pain

6:52 PM · Jan 11, 2021 · Twitte

What the hell is a Project Heartbeat?

- Rhythm game with heavy focus on UGC

- Project DIVA clone

- Gameplay heavily dependent on timing being just right

- Please buy it Mr. Putin made gasoline way too expensive
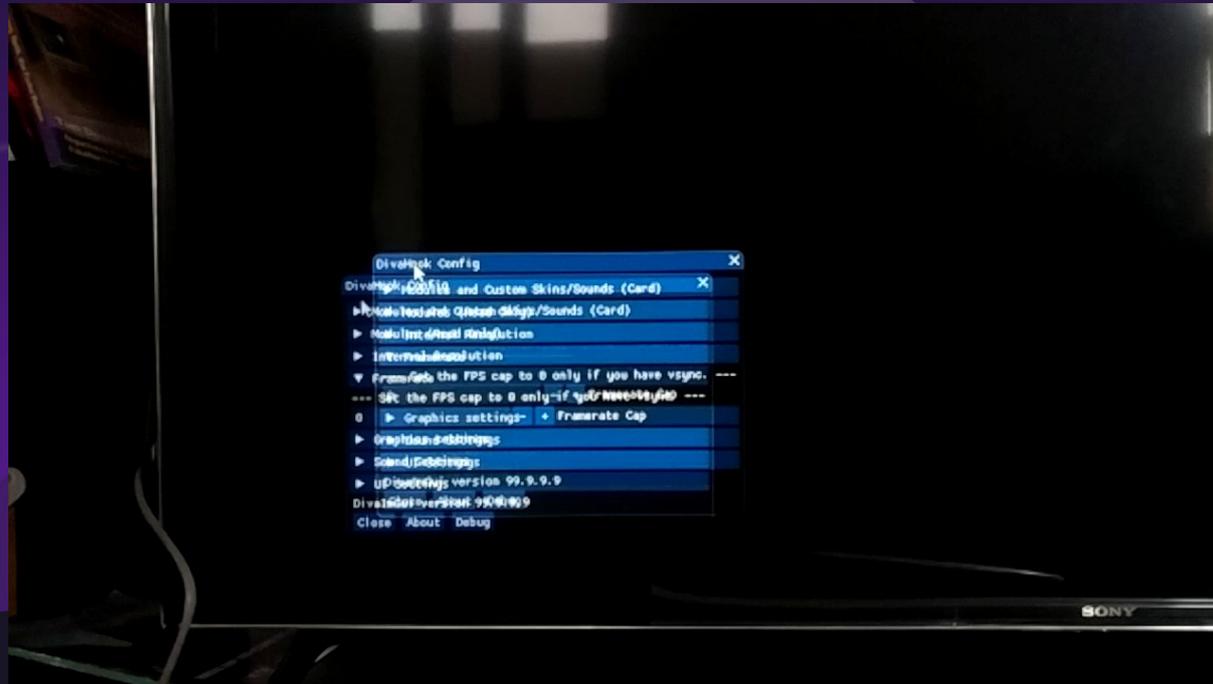

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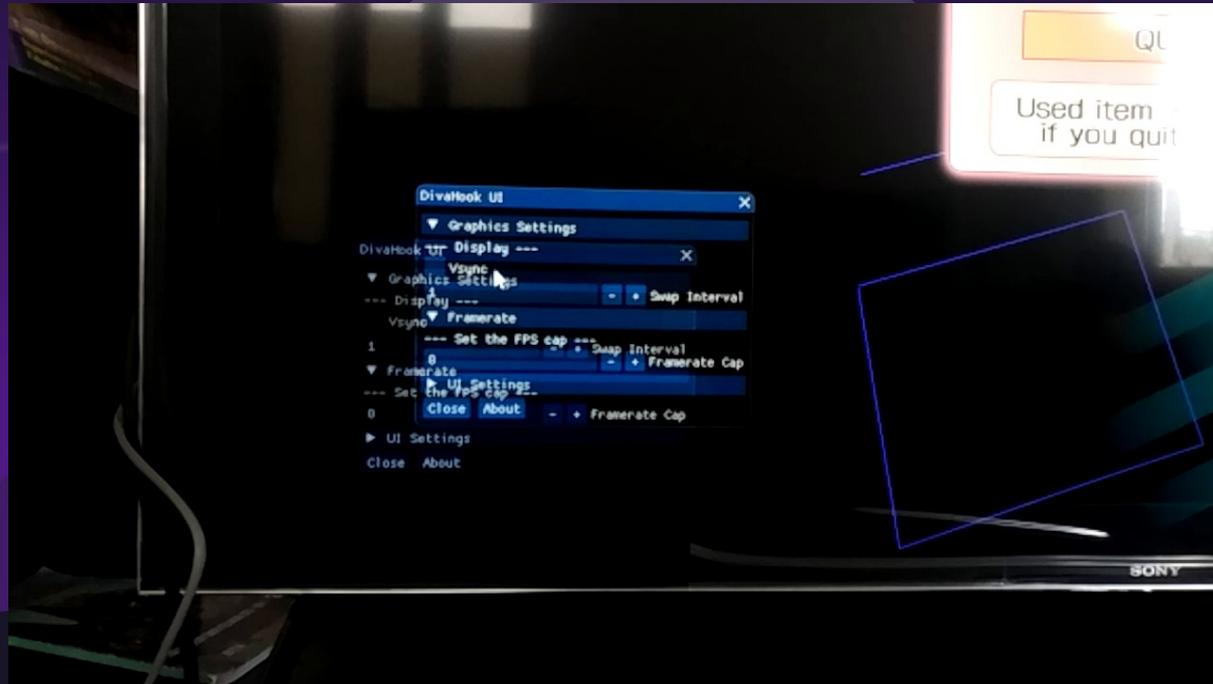# The absolute state of rhythm game development on desktop

- Every operating system is hellbent on making your life miserable

- NVIDIA are idiots and optimus works worse than my social life

- All OpenGL drivers on windows suck

- WASAPI works in misterious ways

OpenGL on Nvidia Optimus: a tragic story (I)

OpenGL on Nvidia Optimus: a tragic story (I)

This is why you need ANGLE!

- Not entirely compatible with Godot's 3D engine (yet)

- Good enough for 2d games

- Is actually quite faster than native OpenGL on Windows.

Syncing

- A common theme in rhyhtm game development is chasing the perfect gameplay-audio sync.

- Way harder than it looks

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The godot documentation approach

- Sync at the start of the song's playback and use the main loop's clock to progress through the song, pray it doesn't desync.

- Or… use get_playback_position, which is a bad idea because it is likely to be jittery.

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The (speculative) Project DIVA approach

- Use the audio thread's current playback position only to decide when to spawn notes

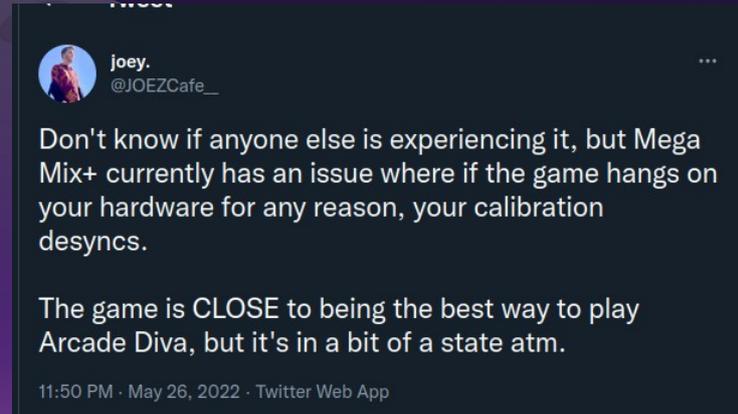- Use the main loop's clock to "animate" the note

Con & pros of both approaches

- Generally consistent

- Desyncs only affect currently spawned notes, but are still possible

- Desyncs affect all notes

- A bit easier to implement (not much though)

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Do desyncs actually happen?

- **Yes** in Project Heartbeat (old engine)

- **Yes** in Project DIVA Arcade/MegaMix+ for PC

- Caused by any hang in the audio/main thread

joey.
@JOEZCafe__

Don't know if anyone else is experiencing it, but Mega Mix+ currently has an issue where if the game hangs on your hardware for any reason, your calibration desyncs.

The game is CLOSE to being the best way to play Arcade Diva, but it's in a bit of a state atm.

11:50 PM · May 26, 2022 · Twitter Web App

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The BASS in the pond

- BASS is a nice audio library, used by Osu!

- It's too expensive for a game that barely sells like PH

- It's also proprietary which obviously means it's bad

Average FNF fan VS Average OSU enjoyer

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The dream

- To not use the main loop's clock at all, and get it all from the audio thread, program the game's logic to be based around it.
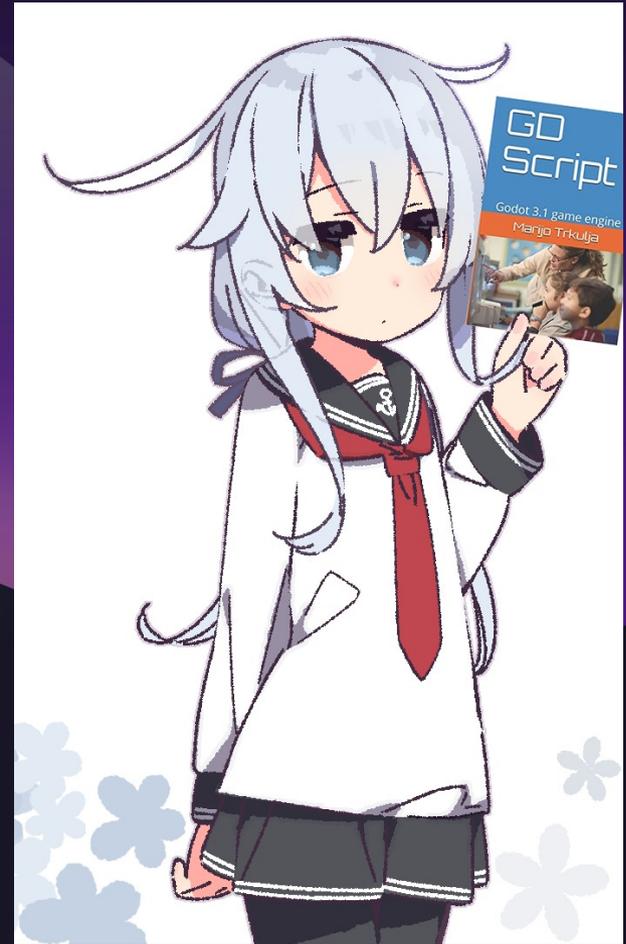
The nuclear option: Let's make an audio engine!

- We want to make our own audio engine, but:
  - We have no money for fancy libraries like BOOST (used by osu!)
  - We are lazy
  - We are spanish

Confía en mí, soy ingeniero

EL PAÍS

SUSCRÍBETE

AGENCIA ESPACIAL EUROPEA ›

El cohete que transportaba el satélite español Ingenio se desvía de la trayectoria y la misión se pierde

La Agencia Espacial Europea asegura que se produjo una anomalía en el recorrido ocho minutos después del lanzamiento

El momento del despegue del cohete 'Vega'. JM GUILLON HANDOUT / EFE

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The solution: Miniaudio!

- Beautiful C library that achieves surprisingly low latency, even on Android somehow.

- We are going to completely ignore godot's audio system and write our own using miniaudio.
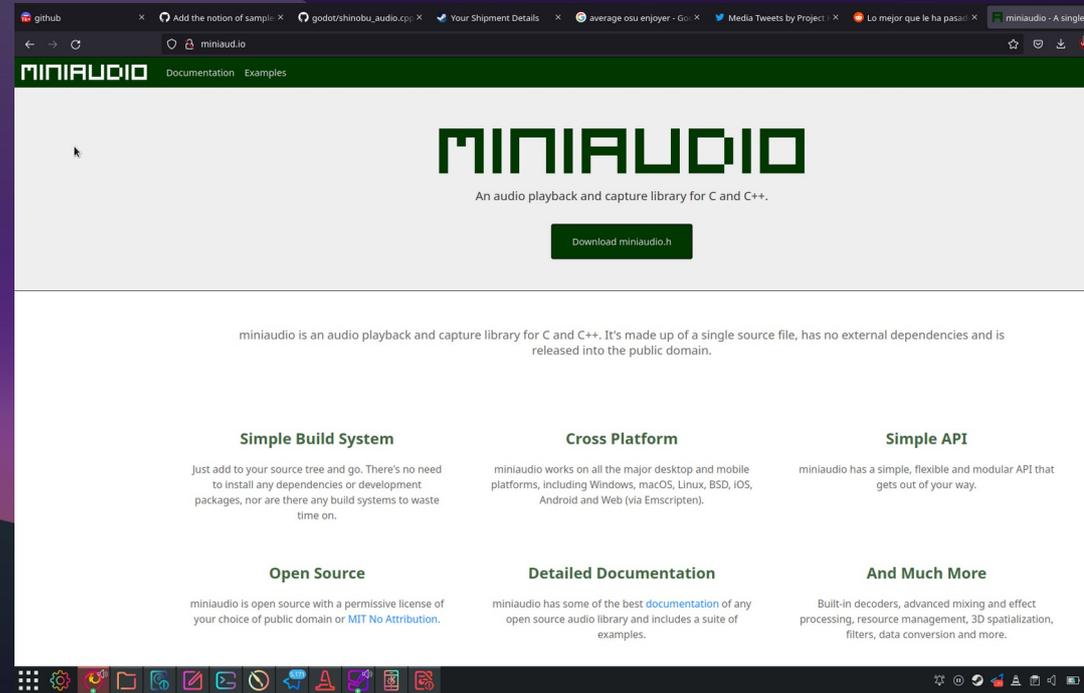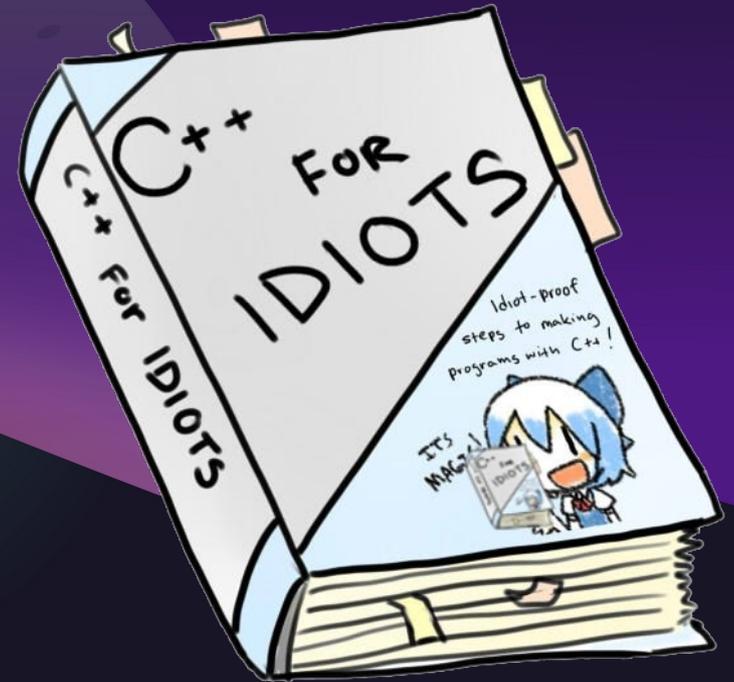
Behold: Shinobu

- Shinobu is the audio engine I made for Project Heartbeat in C++ using Miniaudio

- It's engine-agnostic, but comes with an integration for Godot

- No godot nodes, no bullshit

The Shinobu approach
(First iteration)

- Everytime an audio chunk is mixed we store the cursor position

- Might be jittery/steppy if the audio chunk sizes are too big

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The PH Approach (Magic)

- Instead of just storing the cursor position we also store a measurement of the current time of the high precision timer.

- Use this value (which is consistent across threads on Linux/Windows) to interpolate the audio position.

- Makes desyncs physically impossible! (I think)

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Important miniaudio features

- Actually synchronized clock from the main thread.

- Ability to "fire and forget" sounds.

- Scheduled playback of sounds (big!)

- Groups and a sound composition graph with effects (similar to godot's audio buses).

Miniaudio tips

- Set wasapi.noAutoConvertSRC to true in your device config for low latency mode on WASAPI.

- Set periodSizeInMilliseconds to something smaller than 16 ms (if you are targetting 60fps).

- Miniaudio will automatically snap the buffer size to whatever your OS says it will accept

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Miniaudio tips 2

- Remember to implement dataCallback since it's necessary for using low latency mode.

- Set performanceProfile to ma_performance_profile_low_latency.

- Make yourself a favor and ignore stb_vorbis, libvorbis and libogg work much better.

Priming the audio decoder

- Learned this trick from stepmania.

- Seek to the position that the song will start at and start decoding to build up a small buffer.

- This means that the audio thread is ready to start playback instantly!

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How to hide priming

- Play a second long animation or something to gain time, PH uses a 1s fade from white for this.

- If your game has video, you may also use this time to prime the video decoding
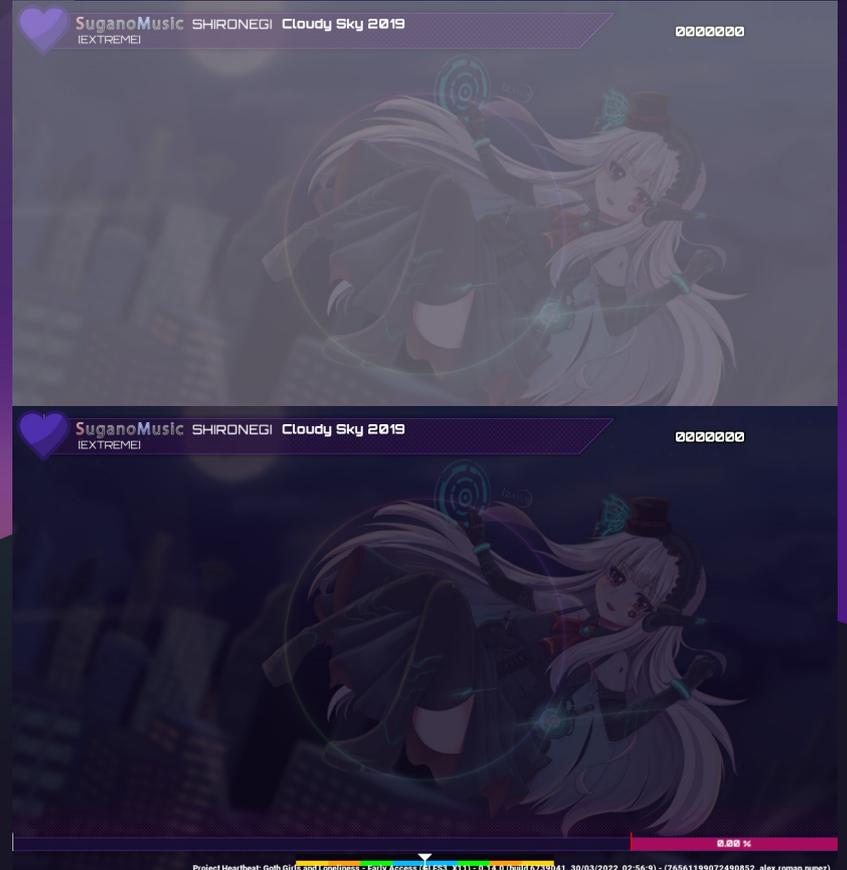
Spectrum analyzer

- "Port" of godot's AudioSpectrumAnalyzer to C as a miniaudio effect

- Works very much the same way it did in godot

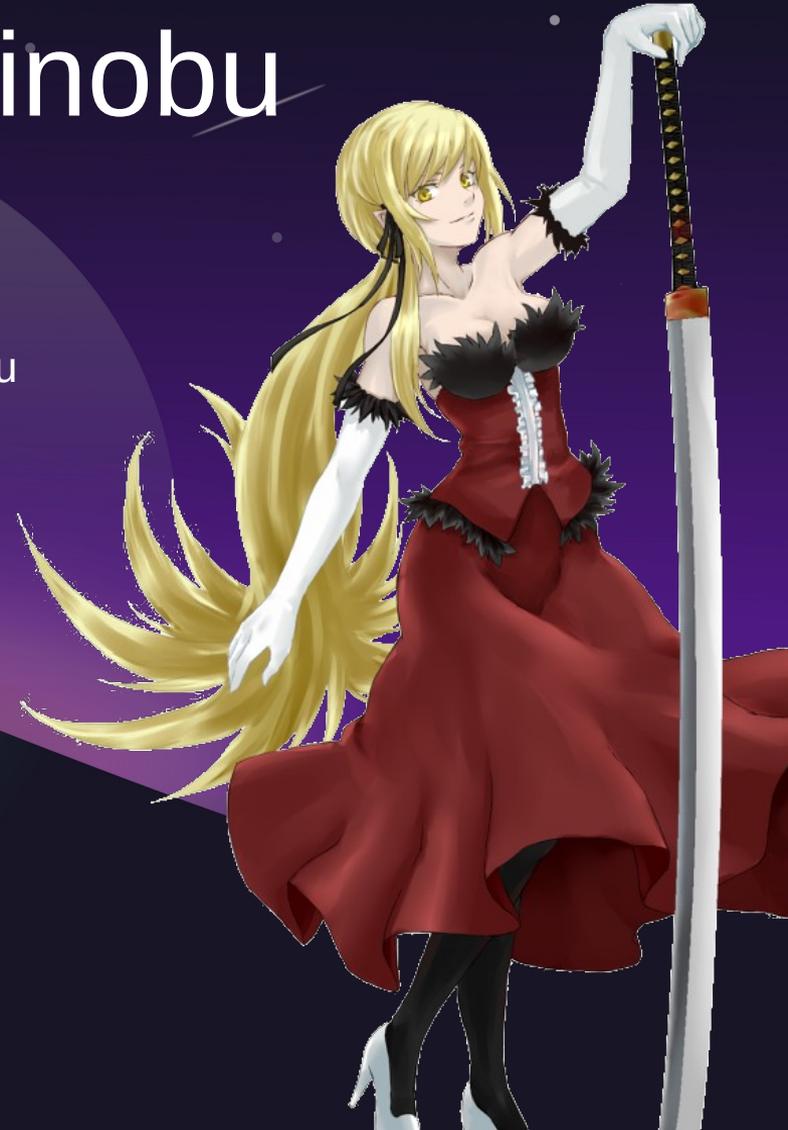- Used for funky bg effects

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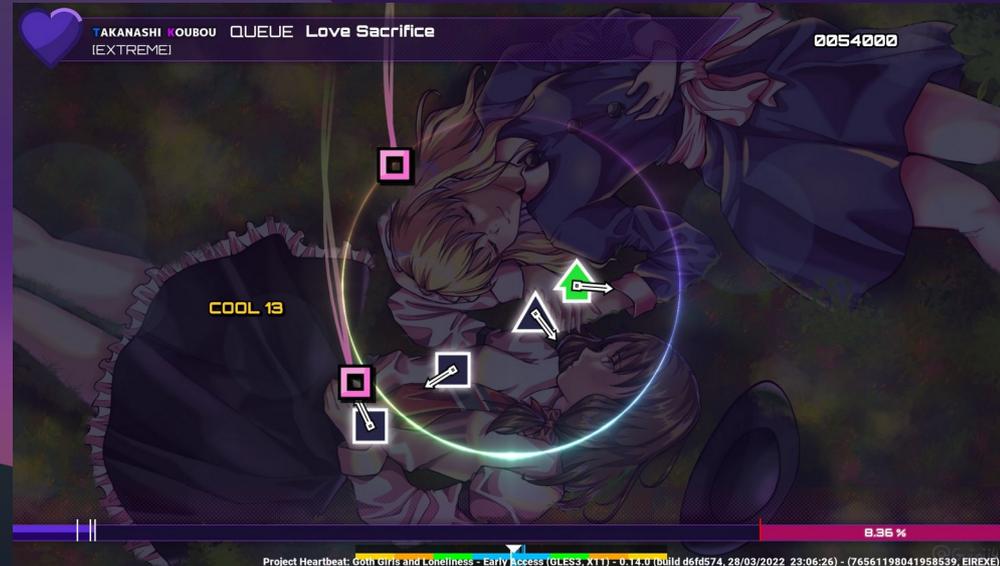
Pitch shift

- I didn't want to bother with this but lino forced me to

- Allows one to run the audio faster or slower without changing the pitch, among other things

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Where to get shinobu

- ## As a part of PH's godot fork

  - https://github.com/EIRTeam/godot/tree/0.14/modules/shinobu

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In conclusion

- Making enthusiast-grade rhythm games is hard, painful and very technical, only recommended for the brave

- Buy Project Heartbeat

- Godot 4 is amazingly good and I'm hyped

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