Sound Patterns Project

*~ User Manual ~*

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# **Introduction**

The Sound Patterns project is a Python-based program that enables users to play sounds in different patterns through multiple speakers arranged in a circle. This usage manual provides step-by-step instructions for setting up and using the software, specifically with the "MADIface xt RME Audio" device.

# **Getting Started**

## Prerequisites

Before you begin, ensure that you have the following:

- A computer running Python.

- Access to a multitude of speakers arranged in a circular configuration.

- The "MADIface xt RME Audio" device.

## Installation

- Start by installing Python on your computer. You will also need PyCharm installed in order to be able to use Python.

- Familiarize yourself with the Python language, if needed, by referring to online tutorials.

- Make sure you have the necessary Python packages installed, such as `numpy`, `sounddevice`, `soundfile`, `keyboard`. You can install them by opening Pycharm, going into settings, then “Project:ProjectName” and then “Python Interpreter”, and by clicking on the plus you can add all these packages.

# **Hardware Setup**

## Driver Installation for MADIface xt RME

You will need to install the MADIface xt RME driver which you can find on their website, and it is the one called “MADIface XT”. You can find more information about this on the following link: <https://github.com/Acute-hi-is/Acute-procedures>.

## Connecting the MADIface xt RME Audio Device

To connect your laptop to the "MADIface xt RME Audio" device: Physically connect the "MADIface xt RME" to your computer, ensuring all connections are secure.

# **Using the Software with MADIface xt RME**

## Code Configuration

You will control the sound patterns using Python code. There are three versions of the code available, each designed for use with the "MADIface xt RME Audio" device. In order for the code to run you will need the media files put into the following path folder: “C:\Users\your\_user\_name\PycharmProjects\SoundPattern” This needs to be the folder where your project is saved and if you install Pycharm and Python using default settings it should be similar to the above one. Also, before being able to play the songs on the device you will need to get your device ID to use it in the code. To do this you will need to access “device manager” and go to “Sound, video and game controllers” and look for what number the MADIface device is in that list. Usually, it is 8.

 - First code: This first code reads the provided mp3 files and converts them into wav, as it is easier to get information from wav files in Python, in order to play them afterwards. Then it overlays all the sounds together and plays them for the whole duration of the song, going in a circular motion through all the speakers. You can choose from what speaker you want it to start, and also on how many speakers to play at a time. The problem with this code is that there appears to be a small delay when changing speakers. We are playing the sounds in a for loop, and we think that may be the cause of this problem. One solution would be to define a callback function which changes the speakers after a given time, but we haven’t managed to make it work.

- Second code: The first part of the second code is just like the first, but after converting the files into wav it does not overlay them, so in the end it allows you to select what part of the sound plays over what speaker, allowing you to animate the sound pattern however you like.

- Third code: The third code generates a random pattern for the mapping of the speakers through a function, and then it also uses another function to change this mapping while playing the song. The problem is that there may seem to be an error because it does not change the mapping of the speakers just after the song has finished playing.

## Playing Sounds

To play sounds using the modified code with the "MADIface xt RME Audio" device:

- Run the Python script with the appropriate arguments, such as `-d` to specify the output audio device (in this case, the "MADIface xt RME Audio").

## Understanding Speaker Groups

The code's mapping patterns define how audio is routed to different output channels. For instance, `[1, 2, 3, 4, 5, 6]` routes audio to channels 1 to 6, creating sound patterns through the "MADIface xt RME Audio" device.

# **Troubleshooting**

## Invalid device id

This error can have multiple causes. One of them is the wrong id of the MADI Face device. In order to address this, you need to find the appropriate id for the MADI Face device by following the steps described at “Code Configuration”. If the device id is correct, than you would need to check all the connections of the device, to be sure they are connected properly, and also make sure that all 3 devices are powered on so that the sound plays.

## Code running but the speakers are not playing anything

If nothing is being played over the speakers, but the code is running without errors, you need to make sure that you specify the correct folder path in the beginning of the code, and also make sure that the audio files are in that folder. If this does not fix it you need to check the connection and make sure that all the devices are turned on.

# **Conclusion**

The Sound Patterns project allows you to create unique sound patterns through a circular array of speakers, with a focus on using the "MADIface xt RME Audio" device. The modified code is designed to provide advanced control over sound routing and playback for tailored experiments and testing scenarios. Further experimentation and research may be necessary to fully understand and optimize sound playback for your specific project needs.