PATTERN PLAY: INTERACTIVE MUSIC SYSTEM FOR THE ENVIRONMENT

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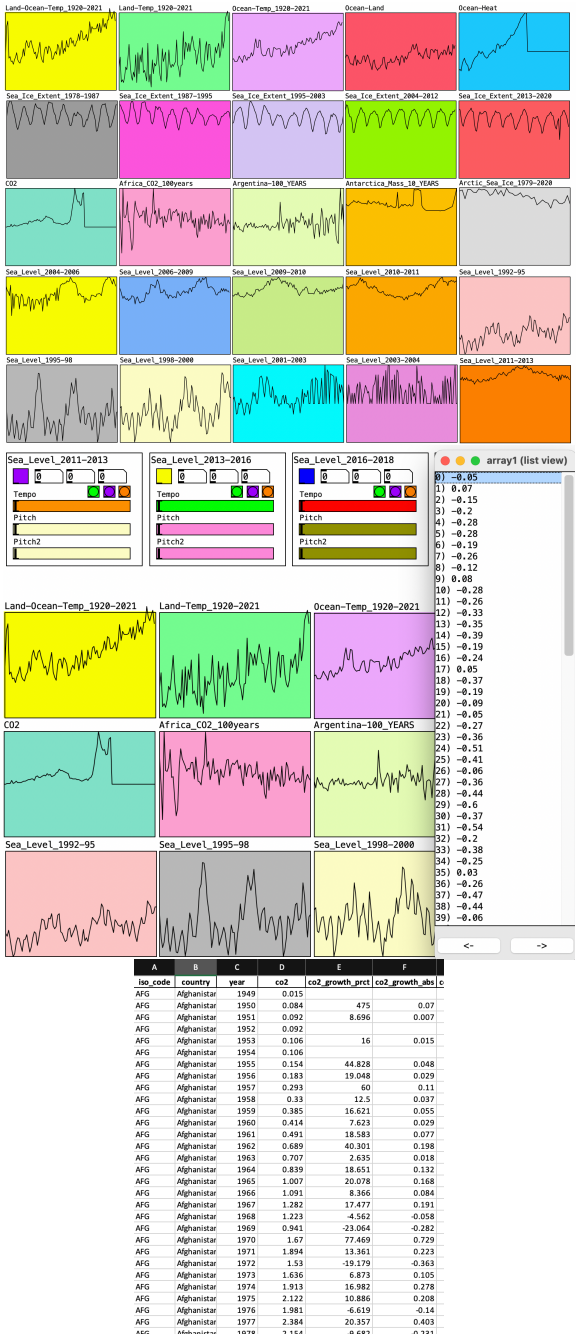
ABSTRACT

"Pattern Play: Interactive Music System for The Environment" is an interactive sound performance that represents specific scientific data of global warming and climate change. Playing along with the MIDI-equipped interactive interface, "Pattern Play" aims to reflect the impacts of the climate crisis through sound by representing the alarming records of diverse environmental sectors, such as global land-ocean temperature, Sea Level change, Antarctic Ice mass variation, atmospheric carbon dioxide (CO2) levels, and more. There have been several ongoing collaborative projects among scientists, artists, and musicians in the Bay Area to combat climate change and bring the urgency of this challenge to inspire people to take meaningful action through music. The development of this project is therefore aligned with those endeavors to strengthen collaborative efforts and interdisciplinary solutions, seeking new methods and techniques of experimental music that can raise awareness of environmental challenges.

1. DESCRIPTION OF THE MUSICAL WORK

The main interface for "Pattern Play" is built in Pure Data (Pd, https://puredata.info/), a data flow programming language for electronic music. The Pd interface of Pattern Play is composed of various types of Graphical User Interface (GUI) objects in which the scientific data array is stored in the form of tables. These tables contain the information of a growing number of weather-related catastrophes, including Land-Ocean Temperature from 1880 to 2020, Global Mean Sea Level (GMSL) variations data between 1993 and 2021, the monthly records of ocean heat from 1957 to 2020, Antarctic Sea Ice Extent from 1978 to 2020, and CO2 emission trends from 1958 to 2021 measured by different scientific research organizations: NASA, NOAA Climate.gov, United States Environmental Protection Agency (US EPA), and the U.S. National Climate Assessment. Values stored in the Pd tables draw line graphs. Each table expresses its own unique sound qualities and textural complexities, referencing the data sets of climate sectors as listed above. Figure 1. below shows the examples of the table compositions.



iso_code	country	year	co2	co2_growth_prct	co2_growth_abs
AFG	Afghanistan	1949	0.015		
AFG	Afghanistan	1950	0.084	475	0.07
AFG	Afghanistan	1951	0.092	8.696	0.007
AFG	Afghanistan	1952	0.092		
AFG	Afghanistan	1953	0.106	16	0.015
AFG	Afghanistan	1954	0.106		
AFG	Afghanistan	1955	0.154	44.828	0.048
AFG	Afghanistan	1956	0.183	19.048	0.029
AFG	Afghanistan	1957	0.293	60	0.11
AFG	Afghanistan	1958	0.33	12.5	0.037
AFG	Afghanistan	1959	0.385	16.621	0.055
AFG	Afghanistan	1960	0.414	7.623	0.029
AFG	Afghanistan	1961	0.491	18.583	0.077
AFG	Afghanistan	1962	0.689	40.301	0.198
AFG	Afghanistan	1963	0.707	2.635	0.018
AFG	Afghanistan	1964	0.839	18.651	0.132
AFG	Afghanistan	1965	1.007	20.078	0.168
AFG	Afghanistan	1966	1.091	8.366	0.084
AFG	Afghanistan	1967	1.282	17.477	0.191
AFG	Afghanistan	1968	1.223	-4.562	-0.058
AFG	Afghanistan	1969	0.941	-23.064	-0.282
AFG	Afghanistan	1970	1.67	77.469	0.729
AFG	Afghanistan	1971	1.894	13.361	0.223
AFG	Afghanistan	1972	1.53	-19.179	-0.363
AFG	Afghanistan	1973	1.636	6.873	0.105
AFG	Afghanistan	1974	1.913	16.982	0.278
AFG	Afghanistan	1975	2.122	10.886	0.208
AFG	Afghanistan	1976	1.981	-6.619	-0.14
AFG	Afghanistan	1977	2.384	20.357	0.403

Figure 1: Table compositions and line graphs with the values implemented and the data sheet of Territorial emissions in $MtCO_2$ ($MtCO_2$: 1 million tons of CO2).

2. THE COMPOSITIONAL PROCESS

Sounds generated algorithmically from the table arrays are played through the main Pd interface in which the performer can control and improvise on the digitally generated sounds through the GUI modules (Fig. 2) to respond to the trends of the latest climate data and, more importantly, interpret a sense of urgency about the climate crisis. The key indicators of the GUI modules affect and change the sonic textures, such as tempo, pitch, melody, and octave dramatically to provoke more compelling experiences of the increasing effects of climate change and ultimately portray its catastrophic consequences in the future. This sonification process allows the performer to be able to add the conceptual domain to the soundscape by reassembling the climate data and sending the sounds reinterpreted back to the main interface system (Fig. 3), which is still driven by the certain numbers implemented in the arrays. By turning data into sound, the composition of Pattern Play aims to bring a message that climate change is far more than an environmental issue; it is the *cry* of the Earth and the consequences of climate change are already here.

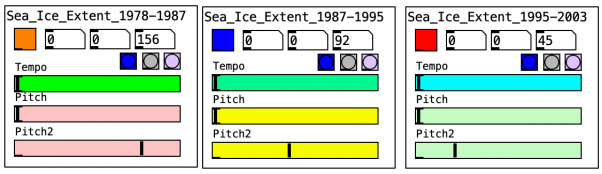
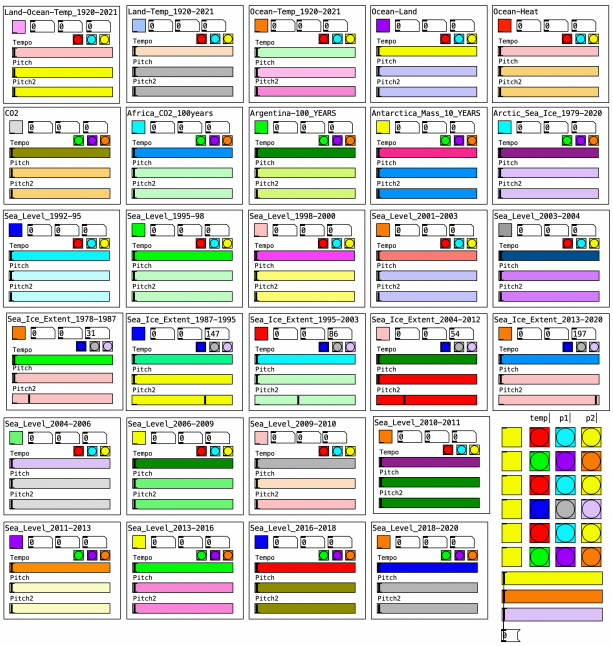


Figure 2: GUI Modules for "Arctic Sea Ice Extent."



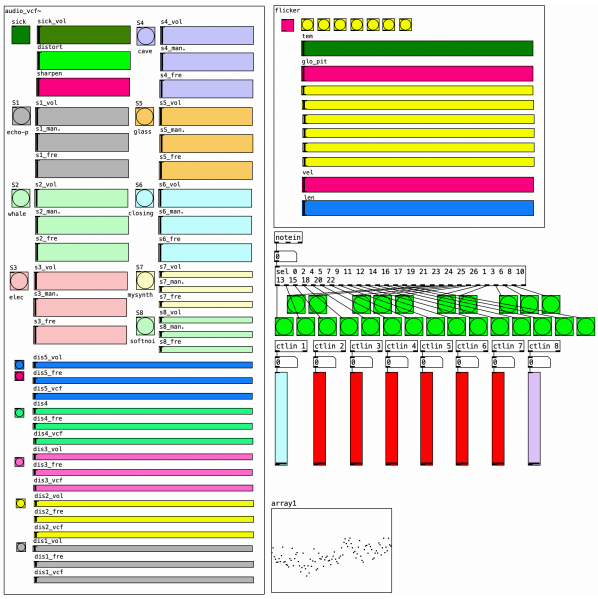


Figure 3: The main Pd interface design for Pattern Play.

3. LINKS

[1] "The Climate Music Project" in San Francisco: https://climatemusic.org/

[2] NASA's Global Climate Change: Vital Signs of the Planet: https://climate.nasa.gov/vital-signs/carbon-dioxide/

[3] Climate.gov: https://www.climate.gov/

[4] The United States Environmental Protection Agency (EPA): https:// www.epa.gov/

[5] National Climate Assessment: https://nca2014.globalchange.gov/