

POLITECNICO
MILANO 1863

Electroacoustic Composition

Project Report

Authors: Nicola Nespoli
Professor: **Andrea Vigani**

1 Introduction

This document presents the report of the project developed for the Electroacoustic Composition exam. For the final assignment, I opted for a **fixed media format**, as it aligns closely with my previous experience in music composition and production. This choice enabled me to concentrate on sound design, a central aspect given the theme selected.

The entire composition was realized in **Logic Pro**, the digital audio workstation (DAW) with which I am most familiar. Its extensive library of virtual instruments and audio effects, provided an ideal creative environment.

2 Theme

The theme chosen for this project is "Sound synthesis across the decades." This topic was selected for two primary reasons. First, it reflects my personal interest in sound synthesis and its historical evolution. Second, it demands a thorough exploration of sound design to achieve historically informed and stylistically coherent results. By researching the synthesis technologies and instruments associated with each decade, this project also served as an opportunity to deepen my knowledge of the field.

When selecting instruments, a key question emerged: *what truly defines the instrument of a given decade?* The **Yamaha DX7** serves as an exemplary case. Although released in 1983[1] and it rapidly gained widespread adoption, its most iconic FM synthesis patches are arguably linked to tracks by **Michael Jackson** and **Depeche Mode**, produced between the late 1980s and early 1990s.

Consequently, I positioned the DX7 in the **1990s section** rather than the 1980s. This decision allowed greater emphasis on **subtractive synthesis**, the main synthesis style of 1980s synth-pop, exemplified by instruments such as the **Prophet-5**[2] and the **Minimoog**[3].

Instrument choices were guided by both chronological accuracy and stylistic relevance, trying to synthesize the prevailing technologies and music genres of each era.

3 Structure

The composition is organized into five instrument groups: Drums, Basses, Keys, Leads, and Pads; which persist throughout the composition but evolve with era-specific instruments and note variations to match distinct grooves and genres.

The piece unfolds across five sections:

1. **Intro**: This section introduces the foundational chord progression: Cmaj7 – Am7 – Fmaj7 – G6 – G; used throughout with subtle variations. Maintaining this harmonic framework ensures structural cohesion considering the diverse instrument shifts between sections. The chords are played by a Fender Rhodes emulation which will play throughout the next section.

2. **1960s**: Featuring a **Fender Rhodes** (Keys), **Clavinet** (Bass), and **Mellotron** playing a string tape (Pads), this section employs a sample-based drum kit, as synthesized drums emerged only later (late 1980s), this drums choice is carried out for the next two sections. Lacking full-featured synthesizers, this section prioritizes electroacoustic instruments emblematic of the era. All VSTs here are sample-based emulations.

[1] https://web.archive.org/web/20070707155506/http://www.vintagesynth.com/yamaha/dx7.shtml
[2] Reid, Gordon (March 1999). "Sequential Circuits — Prophet Synthesizers 5 & 10 (Retro)." *Sound on Sound.*
[3] Weiner, Sophie (October 2017). "Minimoog: The First Truly Portable Synthesizer." *Red Bull Music Academy*

3. **1970s**: This section employs **additive synthesis**, the state of the art in technological innovation in the 70's. I utilized Logic Pro's **ES2** and **ESP** synthesizers, both digital recreations of early additive designs. All patches were crafted from scratch by miself using only basic waveforms (sawtooth, triangle, square, sine), ADSR envelopes, and low-pass filters; deliberately constrained to mirror the technical limitations of the hardware used in the decade.

4. **1980s**: This section centers on the predominant synthesis technique of the era: **subtractive synthesis**. For the Keys and Lead, I employed a digital emulation of the **Prophet-5** via **u-he Repro-5**, this allowed me to create chronologically accurate patches. The Pads feature a custom patch created on my **Behringer DeepMind 12**—a modern analog synthesizer modeled after the iconic **Juno-106**. To balance the rich harmonic content of these instruments, the Bass utilizes a minimalist square-wave patch programmed within Logic Pro's **ES2** synthesizer.

5. **1990s**: This section emphasizes **FM synthesis**, employing the **Yamaha DX7** through a faithful software emulation for both Keys and Lead groups (featuring the characteristic "FM bell" timbre). The Bass pays homage to the acid house genre with a **Roland TB-303** emulator, capturing its distinctive resonant timbre[4]. For Pads, I evolved the 1980s Juno-inspired patch used in the previous section by introducing tone modulation and resonance, aligning with the peculiar timbre of this section.

   Finally, the Drums shift to a **Roland TR-808** emulation[5], symbolizing the transition from sample-based to fully synthesized drum machines, a breakthrough made possible mainly by Roland's innovative synthesis techniques and the miniaturization of circuit components.

4 Final considerations

A primary consideration is the decision to conclude the composition with the **1990s**. This choice was deliberate: by this decade, sound synthesis technology had reached a level of sophistication where digital instruments could emulate virtually every synthesis technique from analog subtractive and FM to additive as well as new techniques such as Physical Modeling and Granular Synthesis. The natural consequence is that contemporary music no longer adheres to a singular synthesis methodology or timbral signature, instead embracing an incredibly vast diversity of stylistic possibilities.

Attempting to encapsulate 2000s music comprehensively would have been virtually impossible. Any representation would have meant selecting a single genre such as dubstep or EDM resulting in an incomplete representation as well as deviating from the project's core theme which is the connection between technological advancements and the resulting evolution of music. By concluding in the 1990s, the composition maintains chronological coherence while respecting the thematic constrains of synthesis evolution.

[4] Reid, Gordon (December 2004). "The History Of Roland: Part 2." *Sound on Sound*. Link.
[5] Roland Corporation. "Four Decades, One Sound: Celebrating 45 Years of the TR-808 Drum Machine." Link.