CMPE 491 – Senior Project I

Project Proposal

Team Members

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Project Name

Sphere DSP

Project Web Page URL

spheredsp.com

Supervisor & Jury

• Supervisor: Prof. Dr. Gökçe Nur Yılmaz
• Jury Members: Dr. Mehmet Evren Coşkun & Eren Ulu

Project Description

The aim of this project is to develop artificial intelligence (AI) driven intelligent audio processing software that operates in near-real-time. As the Sphere DSP team, we aim to provide innovative solutions to emerging needs in audio and music production while enhancing our expertise in artificial intelligence (AI) and digital signal processing (DSP). Our main project, AI Mixing Assistant, is an audio processing software powered by the Large Language Model (LLM). It analyzes input signals to provide users with the most natural and impressive sound experience, eliminating the need for a professional mixing engineer. This system offers suggestions through a user-interactive chatbot and dynamically processes the audio signal.

The AI Mixing Assistant operates through sub-modules we will develop in-house. The first is Smart EQ, which automatically detects and compensates for resonances in specific frequency ranges, and the second is Smart Compressor, which analyzes the dynamic range of the audio and offers intelligent compression recommendations. These two methods encompass the frequency and dynamic processing processes that form the basis of a professional mix. In the later stages of the project, different audio processing methods will be integrated based on the team's assessment. All our software will be developed in VST (Virtual Studio Technology) format and will be compatible with all DAW (Digital Audio Workstation) programs. Our ultimate goal is to provide a reliable and interactive audio production environment where users can unleash their creativity without being hampered by technical obstacles.

Initial Literature

1) U. Zölzer (Ed.), DAFX: Digital Audio Effects (Wiley) – spectral/dynamic processing fundamentals.
2) D. Giannoulis, M. Massberg, J. D. Reiss, “Digital Dynamic Range Compressor Design—A Tutorial,” JAES (2012).
3) S. W. Smith, The Scientist and Engineer’s Guide to DSP – accessible DSP basics.
4) ITU-R BS.1534-3 (MUSHRA), BS.1116-3 – subjective audio quality test methods.
5) JUCE Documentation (AudioProcessor, DSP module, GUI); Steinberg VST3 SDK – plugin architecture & APIs.