In the current era of digital software, audio processing plug-ins have become complex and feature-rich, offering more choice and flexibility with greater Central Processing Unit (CPU) efficiency. However, clarity, simplicity, and an open User Experience (UX) are often lost in the excess of features. This project aims to create a simple, easy-to-use, and non-intrusive digital equalizer for mixing and mastering. Developed using JUCE, C++ programming framework for Pro Tools, the industry-standard digital audio workstation. This project’s design component focuses on creating an equalizer plug-in that caters to my learning disability called dysgraphia, which makes it difficult for me to write by hand and operate machinery. The plug-in, for example, does not require fine mouse movements to operate its controls and allows one to focus on subjective spectral changes. One unique feature of the plug-in is the use of intuitive terms such as “presence” and “warmth” for the various controls, allowing for perceptual control of the equalizer. The plug-in’s user interface consists of utilizing the plug-in to “mix Left Feet” as described by singer-songwriter Maggie Aldridge, which I chose because it is my favorite song. The equalizer was developed using JUCE, a C++ programming framework, and Pro Tools, the industry standard Digital Audio Workstation (DAW). JUCE has many pre- built functions such as filters, gain modifiers, and measurement tools that allow one to design and program a plug-in without having to worry about spending time to create one’s own functions. The convenience of this allows the programmer to focus on their design and implementing their vision. As such, they can spend time refining the behavior of these filters through manipulating their parameters, for example, rather than the Digital Signal Processing (DSP) components and coefficients. I found that Pro Tools is the ideal DAW for me to test my plug-in designs because it is the industry-standard DAW, and because of my familiarity with it as a graduate student in audio.

This project started from a simple design and has grown into a simple and versatile one. The first drawings I have of the GUI and first descriptions of what I wanted the core functions of the device to be featured a high-pass filter, input gain, and two peal filters with a wide range of flexibility in terms of center frequency selection and gain selection. The most recent design that one may see in the photograph above features subjective names for each of the peak filters, rather than names of frequencies explicitly. The purpose of this is to provide the user with a more subjective experience of spectral balance shifting.

ABSTRACT

The focus of this equalizer plug-in is to offer the user an opportunity to think subjectively while equalizing in a mix. Terms in the plug-in such as “Warmth” and “Presence” are based on frequency ranges offered in Royez Izhaki’s Afting Audio, where he describes “[subjective terms we associate various frequency ranges with, and excess or deficiencies in these ranges.” The chart below highlights these subjective terms for frequency ranges in the audio spectrum and inspired me to create an equalizer using several of them.

EQUALIZER DESIGN

In terms of the Graphical User Interface (GUI), I decided to use softer yet vibrant colors reminiscent of the color schemes Apples iOS grew up using the Macintosh, and its presence in my life significantly helped me to fight against my limitations regarding my learning disability. For this reason, I wanted the colors in my GUI to reflect the macOS aesthetic.

In terms of the technical parameters of the design, the plug-in (shown below) features twelve peak filters, a high-pass filter, a low-pass filter, input and output gain, polarity inverter, a master bypass, and auto make-up gain. In terms of the device’s intrinsics, the twelve peak filters are all asymmetrical Proportional Q filters, meaning that Q, or quality factor, increases as gain decreases from 0 dB, and that the cut or gain reduction half of the Q function is narrower than that of the boot or gain enhancement section. Further, Q is narrower at higher frequencies and broader at lower frequencies. The high- and low-pass filters have a slope of 18 dB/octave, meaning that they are made of a 4 dB/octave filter and a 12 dB/octave filter strung together in series. For the purpose of high- and low-pass filtering, I believe 18 dB/octave filters have the optimal slope in the way that they compromise between characteristics of 12 and 24 dB/octave filters. The auto make-up gain switch in this design is limited to a change of ±6 dB. This allows the user to still push the gain of the device while keeping the overall balance in a reasonable range. This allows the user to make drastic changes to their sound while not worrying about clipping the output of the device based on the inherent changes one makes internally to the plug-in.

APPLICATION

For the creative element for my project, I used my plug-in to mix a song “Left Feet” by Maggie Aldridge which I produced at MTSU in the summer of 2019. My classmate Dustin Painter recorded “Left Feet” to Pro Tools, and I inserted it in Pro Tools exclusively. Currently, my plug-in is not available in the AAX Native format, the plug-in format Pro Tools uses to host processors and virtual instruments. As such I used ODIN’s Metapatch as a wrapper to host the VST plug-in in my Pro Tools Session. I found that my plug-in allows me to shape the spectral balance more efficiently, due to the intentional limitations of the device. I found that in using the tool I am not so absorbed in trying to control the device properly and can instead redirect my energy to the music and the mix.

REFERENCES

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