Microphone Effects

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Description:

Mixxx is a cool opensource Djing software, which can do most of of the jobs which are necessary to be used at any DJ concert, it has got some of very cool effects build in it like Flanger effect, Moog Filter etc. But the number of the effects are not enough as there are only 15 effects at the present and moreover except the Reverb effect there is no effect which can be used in recording from the microphone, it lacks in the necessary microphone effects like Acoustic Echo Cancellation(AEC), De-esser, Noise Gate/Noise Cancellation and also the Dynamic Range Compression. So for this summer it is expected that these necessary effects will be implemented in DJ Mixxx. The explanation for these effects is given under:

- Acoustic Echo Cancellation(AEC): When recording through a microphone, some amount of echo is produced, this is due to the bouncing of the sound from the environment to the microphone back if the distance between the reflecting object and the mic is more than 17m, so to ensure the high quality of the sound the deletion or cancellation of this echo is necessary, due to this the presence of this effect is a necessary. For Acoustic Echo Cancellation, I made a research on Internet, and I came across the following links where we can implement the AEC.

  These research articles here and here suggests an algorithm NLMS(Normalized Least Mean Square Algorithm) for AEC, the theory and explanation of the algorithm is given here well. And for the case of the implementation, NLMS is implemented at the GitHub in C/C++ programming language here and whose include file are found at here. So it would be helpful for us to implement this algorithm by reading and understanding the code.

- De-Esser(Here): Sibilance is a strange phenomenon with the human voice, when we speak ‘s’, ‘sh’ or ‘z’, some hissing voice is heard, this sound is a little bit annoying in hearing the music audios. So a de-esser effect is also necessary. By the research on Internet I did, I came to the site, which explains the theory and some sort of algorithm to avoid Sibilance and thank you github which provides the implementation of the effect in C programming language, and the code seems to be very well commented(at least the header file for that gives the description) so it is easy to understand the code. So De-Esser effect can be easily implemented too.

- Noise Gate(Here): Unwanted sound in the background during the recording of music is known as Noise. The cancellation of noise is necessary, so the Idea of the noise gate is proposed. The wiki describes how the noise gate works and implementation for the noise gate is given again on the github, the language used here is C++ and C#,

and for the sample a light weight noise gate is also available at source forge which is a jar file. This effect will be added to Mixxx's arsenal of effects in the summer.

- Dynamic Range Compression(Here): This is also a cool and necessary effect for Mixxx, compression reduces the louder sounds over a defined threshold and doesn't affect the quieter sounds(Downward Compression) or increases the loudness of the quieter sounds below a threshold without affecting the loud sounds. This makes user to record the sound with different ranges of sound frequencies in the mix of sound effectively. After my research, I found the theory here quite easy to understand, and also on Stackoverflow, the first and second answers are also quite helpful for the implementation of the compressor, and apart from that the research article also gives some clue about the Compression and the algorithm used for it.

Deliverables:

After the summer these following effects will be in the arsenal of effects of Mixxx:

- AEC
- De-Esser
- Noise Gate
- Dynamic Range Compression

Time line:

The time line for this summer is described as under:

- May 5, 2017 – May 30, 2017: This time is known as community bounding period, as I am a college student, my semester exams will be over after May 12, 2017, after that I will be ready for learning and for GSoC, I have thought about the community bonding as it tells, I will get to know about the my mentor and I also want to have a good connection between the other participants of GSoC in Mixxx and one most important thing, I will try to grasp the code for making effects though I read the wiki about it and I will also try to understand the physics, especially the signal theory(as I am a CSE student, I don't know much about signal theory except probability theory which was taught to us :-)). This signal theory will be easy for me to grasp I think so because I was good in physics from my high school and had very keen interest in the electrostatics and magnetism, I hope signal theory is similar to it. So with this pre-requistie, I think I will be able to understand the logic and implement the effects easily. But as soon as I got logic of Signal processing I will go with the coding then.
- May 30, 2017 – June 26, 2017: The first round, in this round I will implement the AEC effect and try to implement the De-esser too, I choose this work as AEC is seems to be

easy to implement and also it will first time I make a new effect so it will be a new experience.

- June 30, 2017 – July 28, 2017: In this time I would implement De-esser completely and also Noise gates will also expected to be implemented in this time.
- July 30, 2017 – August 21, 2017: In this time the last remaining effect Dynamic range compression will be implemented, it will be a small work at this level I think, as at that time I would have implemented 3 effects and I would be well versed with the signal theory and the code framework of the effects so it would be easy to implement it, I choose easy work at the end because, after July 27, 2017, my 5th semester will be started, with the college started, I would have to study in the college also, so I couldn't devote as much time to the GSoC at that time as I could do in the holidays, so I planned to implement this at that time.

This plan seems to be obvious, I assure that in this time the project will be completed, but if the project is completed early before the deadline, instead of wasting my time in summer, I would like to implement some other effects and will try to fix some more bugs, I found some interesting effects at here, I hope the mentor will find them cool, :-), so I think of implementing them if I would be able to implement the work I told.

Post GSoC Time:

After the GSoC is over I will be contributing to Mixxx as a regular contributer, as I think that this will help to fill my CV and will also good for my moral, to be contributing to such a big open source project. And the thing I try to implement is those cool effects I referred earlier, because I found them very cool and hope that the mentor will find them cool too.

About Me:

I am Nimit Bhardwaj, from Una, Himachal Pradesh, India, studying in the 2nd year of engineering CSE. I want to become a great coder, with competitive coding my special and favorite interest, I know C/C++, Python and PHP programming languages, I want to get selected in GSoC though Mixxx as I want to learn more in the world of computing and want to polish my CV, so that in future I could get a good job, and I choose Mixxx because it seems to be interesting to me, I first checked the Mixxx I found it nice program to play with sound which I liked from my childhood like to manipulate the sound, then I found it to be Djing application, which is quite interesting to me.
I also made some fixes to the bugs in which I got from the bug tracker of Mixxx at launchpad, this was a nice experience for me, where I got the chance to use and actually code on the github for the constructive purpose, this was a great deal of enjoy.

I hope that I would be selected in GSoC this year.