

SPECIAL EFFECTS TO AUDIO FILE



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ABSTRACT

Music is an art form and cultural activity whose medium is sound organised in time. In general, definitions of music will include common elements such as pitch, rhythm, dynamics, and the sonic qualities of timbre and textures. Music technology is the use of any device, mechanism, machine or tool by a musician or composer to make or perform music; to compose, notate, playback or record songs or pieces; or to analyse or edit music.

Technologies continued to influence music throughout the history of music, as it enabled new instruments and music notation reproduction systems to be used.

This project focuses on the same, ie. Understanding different effects available on the software and editing a song by implementing them. The software that has been used for this activity is Audacity. It is a free and open-source digital audio editor and recording application software, available for Windows, macOS/OS X and Unix-like operating systems. Here audacity has been used for post processing of an audio by adding effects such as fade in, tempo, amplifier, bass and treble, echo, reverb, speed, repeat, wahwah, phaser, paulstretch, equalisation, reverse, cross fade clips and fade out.

The main intent of the activity would be to understand the working and characteristics of the software used and to deal with various effects and their synchronization with the particular audio selected. The report therefore consists of a detailed, step-by-step analysis of how the activity has been worked upon.

INTRODUCTION

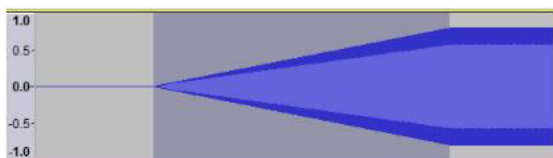
Talking about the etymology of music, it is derived from Old French *musique* and directly from Latin *musica*. Music is composed and performed for many purposes, ranging from aesthetic pleasure, religious or ceremonial purposes, or as an entertainment product for the marketplace. Music has many different fundamentals or elements depending on the definition of “element” being used, these can include: pitch, beat or pulse, tempo, rhythm, melody, harmony, texture, style, allocation of voices, timbre or colour, dynamics, expression, articulation, form and structure. Music can be divided into genres and genres can be further divided into subgenres. Different genres include rock, pop, country, rap, etc. and subgenres include country blues, pop country, etc.

Electronic or digital music technology is any device, such as a computer, an electronic effects unit or software, that is used by a musician or composer to help make or perform music. The term usually refers to the use of electronic devices, computer hardware and computer software that is used in the performance, playback, recording, composition, sound recording and reproduction, mixing, analysis and editing of music.

This activity uses an electronic software to edit the audio. The various editing effects, available on Audacity, that have been used to alter the audio in this particular activity are described as below:

1) FADE IN

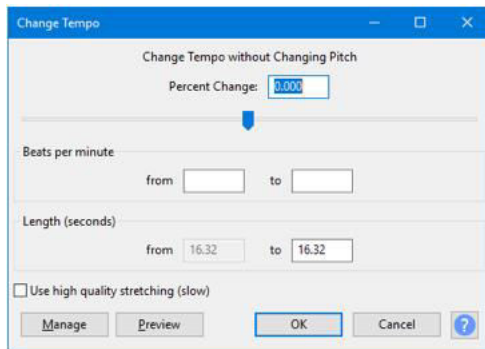
Accessed by: Effect – Fade In



A fade in is often applied over a very short audio selection (less than a second). You may get a more "musical" result by applying a linear fade in three times to the same audio selection.

2) CHANGE TEMPO

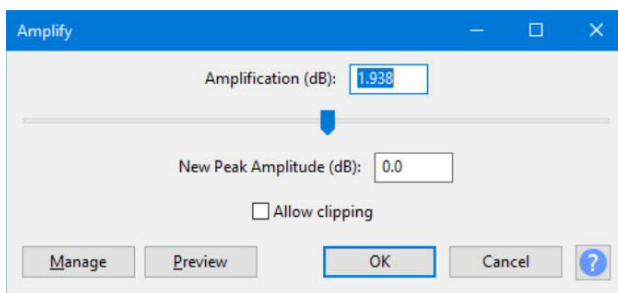
Accessed by: Effect – Change Tempo



Percentage change, beats per minute, length. Tempo is the rate of speed of a musical piece or passage indicated by one of a series of directions (such as largo, presto, or allegro) and often by an exact metronome marking.

3) AMPLIFY

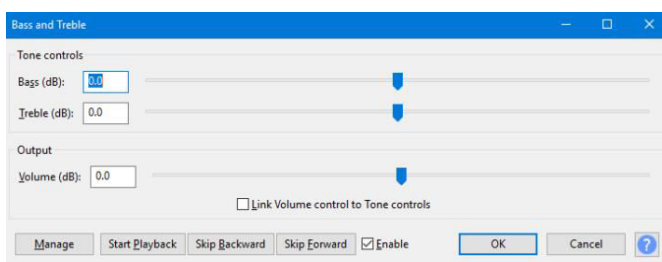
Accessed by: Effect – Amplify



Use the **Amplify** effect to change the volume of the selected audio track. It always preserves the relative volumes of the tracks and/or channels. You can also use the "Amplification" box in amplify as a quick check of the current peak level of the selection.

4) BASS AND TREBLE

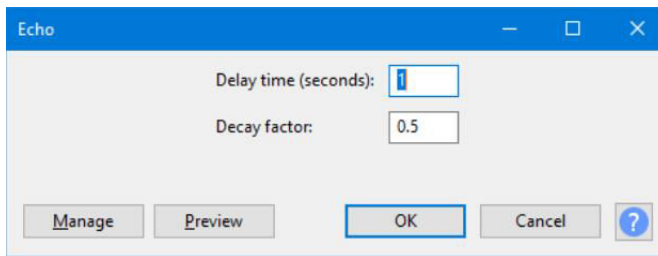
Accessed by: Effects – Bass and Treble



Treble refers to tones whose frequency or range is at the higher end of human hearing. In music this corresponds to "high notes". **Treble** sound is the counterpart to **bass** sound.

5) ECHO

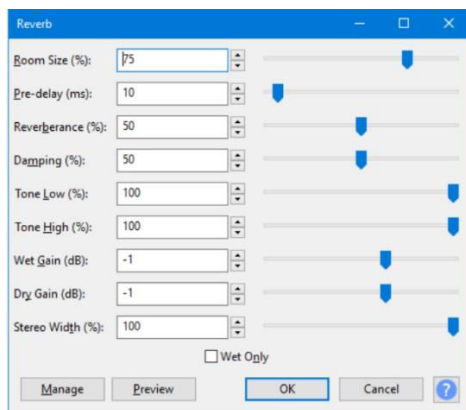
Accessed by: Effects – Echo



Echo, more commonly referred to as delay, is a very common effect used in sound editing. It works by repeating a specific sound multiple times, thereby delaying the time of the repeated sounds.

6) REVERB

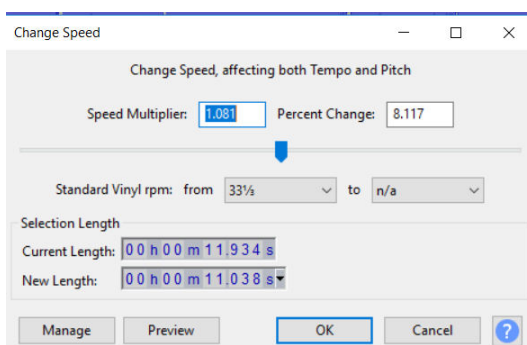
Accessed by: Effects – Reverb



Reverberation (or '**reverb**') effects are omnipresent, both in the real world and in production. Judicious use of reverb can make the difference between a professional recording and something that sounds like it was recorded in a bedroom, adding depth and fullness to the sound.

7) CHANGE SPEED

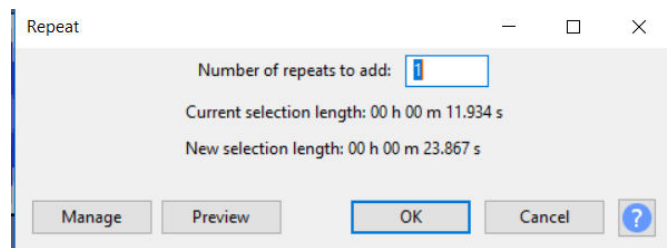
Accessed by: Effects – change speed



This can be used to substantially increase or decrease the pace at which a particular audio is being played. Speed can be changed using the percentage change option.

8) REPEAT

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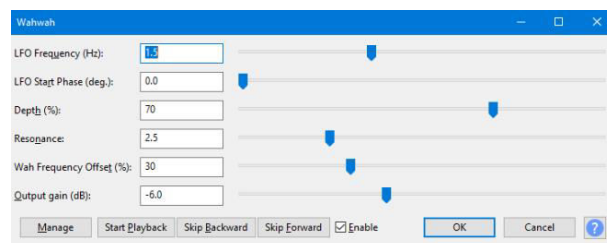


This effect allow you to repeat the selected path of an audio. Number of repeats can be added in order to alter the number of times the selected path should be repeated.

This usually increases the playing time if the audio.

9) WAHWAH

Accessed by: Effects – wahwah



Wah-wah (or **wa-wa**) is an imitative word for the sound of altering the resonance of musical notes to extend expressiveness, sounding much like a human voice saying the syllable *wah*. The wah-wah effect is a spectral guuide, a "modification of the vowel quality of a tone".

10) PHASER

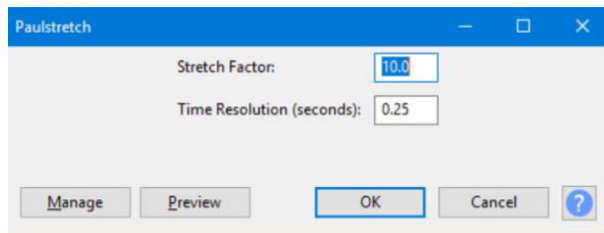
Accessed by: Effects – phaser



The Phaser effect consists of a series of filters that each produce a frequency-dependent delay. By mixing some of the original signal with the delayed signal, *phase cancellation* will occur at a particular frequency, creating a marked *notch*(reduction in level) at that frequency.

11) PAULSTRECH

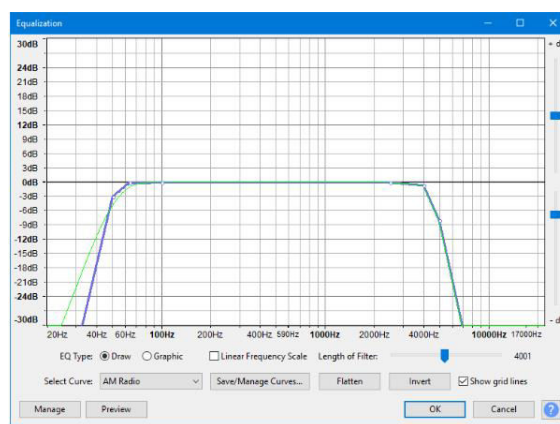
Accessed by: Effects – Paulstrech



This sets how much longer the processed sound will be relative to the original. For example, setting this to 10 will stretch 1 minute of audio into approximately 10 minutes of audio, somewhat less at higher Time Resolutions.

12) EQUALIZATION

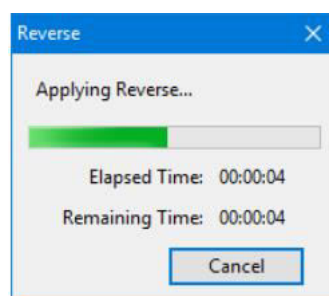
Accessed by: Effects – Equalization



Equalization is the process of adjusting the balance between frequency components within an electronic signal. In sound recording and reproduction, equalization is the process commonly used to alter the frequency response of an audio system using linear filters.

13) REVERSE

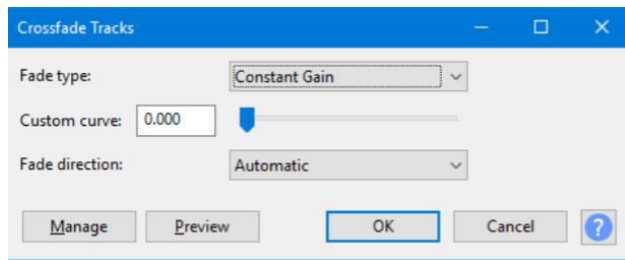
Accessed by: Effects – Reverse



Reverse tape effects are special effects created by recording sound onto magnetic tape and then physically reversing the tape so that when the tape is played back, the sounds recorded on it are heard in reverse.

14) CROSSFADE TRACKS

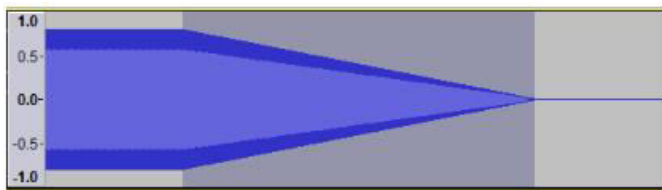
Accessed by: Effects – Crossfade tracks



Crossfading is a technique that creates a smooth transition from one sound to another. This audio effect works like a fader but in opposite directions, meaning the first source can fade out while the second fades in, and it all mixes together.

15) FADE OUT

Accessed by: Effects – Fade out



It refers to a effect where in the audio gradually decreases or disappears. It is generally used to end a particular audio.

LITERATURE REVIEW

The reasons behind listening to music in a study in the United Kingdom, 300 undergraduate students filled out a questionnaire to describe why they listen to music. The results showed that music was an important factor in the student's everyday life. **On average the participants reported that they spend around 3,66 hours per day listening to music.** For most participants, music is used to alleviate negative feelings and for mood enhancement. **Music is also used to identity development and to portray a social image to others.** Furthermore, music is used for social interaction, to relieve boredom and to pass time. Music also helps in gaining information about other things. Music can also be helpful as a distraction method. (Lonsdale & North 2011.)

In a second study, 117 psychology students filled out a questionnaire to help compare music to other leisure activities. The results showed that the participants regarded music as the most important of their leisure activities. **They also spend more time listening to music than for any other activity.** Music and TV were mostly used for distraction. (Lonsdale & North 2011.) In a third study, 189 psychology students wrote down in an open-ended questionnaire the reasons why they listened to music. The outcome was that most people used music for mood management and to manage their level of arousal. **Music is used to enhance or optimize people's emotional experiences.** Participants often reported to listen to music that was felt to match their emotions at that time. In other cases, music is used as a background noise to avoid uncomfortable silences. **Music also helps in reducing the feeling of loneliness and it enhances concentration.** In a few cases, people are actively participating in music, for example while dancing, singing, writing songs or learning to play an instrument. For some people music is used to retrieve the past and reflect on memories. Participants are also using music in social activities and for distraction. (Lonsdale & North 2011.)

In a cross-section study, it was discovered that music is particular important for adolescents and young adults and it is significantly less important for people over the age of 30. This can be explained by the change of priorities and responsibilities.

Adolescents are using music for diversion more often than any other age-group. This may be explained by the increase in technology that makes music more accessible nowadays. For example, **many adolescents have portable music players**, which make it possible to listen to music anywhere and at any time. Furthermore, in this study it was shown that women are more likely to use music as a means of managing their arousal. However, men are spending significantly more money on music every month than females. (Lonsdale & North 2011.) In a study conducted in Zürich with 1230 volunteers Thoma et al. (2012) discovered that the qualitative aspects of listening to music, for example the reasons are more important than the quantitative aspects like for example the duration. It was also reported that reducing loneliness was a major reason for listening to music. Furthermore, other reasons were to reduce aggression and to arouse and intensify specific feelings. **It is assumed for example, that individuals, who have negative emotions, also listen to music with the purpose to arouse or identify negative emotions.** Additionally, it is likely that the effects of music listening are influenced by variables such as personality factors. Biley (1999) reviewed several different literatures and found out about the effects music listening has on the patient wellbeing. He reported that in a study **20 patients who listened to relaxing classical music had a greater reduction in anxiety and in the heart rate.** A study performed in a post-anesthesia care unit also reported a reduction of anxiety because of music. In surgical settings, surgeons performed tasks more accurately and quickly on exposure to music. (Biley 1999, 670.)

In 1991, a study discovered that music could strengthen ego, increase socialization, decrease psychotic symptoms, increase activity, alter stimuli and be an intervention for people with a wide range of disorders. Studies consistently report that exposure to music leads to a lowering of psychological stress. However, some studies found no change on the physiological state with the exposure to music. (Biley 1999, 670 and 674.) Decreased labour pain is one of the positive effects of music. There are also many positive outcomes of music for the neonatal, such as increased weight gain, improved oxygen saturation, stabilized respirations, heart rate and blood pressure and reduced pain response behaviours which belong to the people's physical wellbeing. (Hollins Martin 2014.) Furthermore, if a mother listens regularly to music during late pregnancy, the fetus learns to recognize it. **Mother's singing voice and the songs which she has been singing regularly are known by the newborn.** Additionally, the singing voice has a soothing effect on a baby. (Huotilainen & Fellman 2009.)

The rhythm of music and tone can raise powerful feelings of existence for people in a way that it opens the connection to the main selfhood. Communication which is based on musical, rhythm and picture of sound is primitive in the biological evolution because already animal species use musical, acoustic messages between their communications. A wide content of psyche such as feelings, process of symbols and sense perceptions, phenomena which aren't present by themselves, are consisted by experience of music. (Leinonen 2003.) Furthermore, music can raise feelings which can be seen for example as a smile or tears or then it can affect to the mind without seeing any marks of emotion (Tervaniemi 2009). Ünal et al., (2013), studied the effects of music on driving and found out that music increases arousal and has a positive effect on performance in the car-following task. The study contained 47 participants, both men and women, and they were 19 to 25 years old. **They were asked to complete two drives in the simulator, first with music and second without music and during those drives their heart rate was recorded by electrocardiogram.** The participants were divided into two groups, one group received loud and the other group moderate volume of music. The playlist, which was played during the driving sessions, was created by the participants and according to their preferences. (Ünal et al. 2013.) Traffic setting in the simulator wasn't very complex and in the monotonous carfollowing task participants were asked to follow the lead car's speed changes and maintain a safe headway to it at the same time. Participants trained the carfollowing task and the use of the simulator five minutes before the actual driving sessions. One driving session lasted half an hour and after all of the sessions participants filled a self-report, which measured emotions like if the participants feel tired, bored, sleepy or energized after the simulated drive. Participants were able to mark after every description of emotion by using Likert Scale, if they for example strongly disagree=1 or strongly agree=7. Driving performance was monitored with the delay in response while following the lead car and its decelerations and accelerations in the car-following task. At the end when participants have driven with music, they were also able to complete a questionnaire, where they were asked if they liked the music or not. (Ünal et al. 2013.)

In a study in Hungary, Harmat et al. (2008) examined if music improves sleep quality in students. The study was a randomized control trial with three groups. Ninety-four students with sleep complaints were recruited at a university in Hungary. Three groups in each block received only one treatment, either listening to relaxing classical

music, listening to an audio book or no intervention. The participants listened to the music or the audio book for 45 minutes during 3 consecutive weeks, right before going to sleep. Members of the control group did not receive any intervention but they participated in the pre-and post intervention assessment. Further they were encouraged not to listen to music or an audio book at bedtime. (Harmat et al. 2008.) The results were gathered through a questionnaire, that all of the participants completed. The results showed that the improvement of sleep quality correlated statistically significantly with the decrease in depressive symptoms. **Additionally, listening to music resulted in improved sleep quality, shorter sleep latency, and longer sleep duration, better sleep efficiency, reduced sleep disturbances and less daytime dysfunction.** The results improved week by week. Nothing improved statistically significantly in the audio book group. The students who listened to relaxing classical music at bedtime had a better overall sleep quality especially in the second and third week, than those who did not. The improvement continued during the third week and was greater at the end of the study. (Harmat et al. 2008.) Castillo-Pérez et al. (2010) studied in Mexico the effects of music therapy on depression compared to psychotherapy. The music-therapy group was exposed to a selection of baroque and classical music. The music was listened to in single, self-administered 50 minutes session once a day at home and once a week in a group session at the hospital. The therapy was given over eight consecutive weeks. The results showed statistically-significantly that the music-therapy group had a better improvement in their symptoms than the psychotherapy group. (Castillo-Pérez et al. 2010.) Chan et al. (2009) examined in Hong Kong the effects of music on depression levels in older adults. The data was collected at the end of 2006. The chosen music included Chinese and Western slow rhythmic music. A digital monitor was used to collect systolic blood pressure, diastolic blood pressure, heart rate and respiratory rate. There was approximately one 30-minute session per week and it took place either at the day-care center or in the participant's homes. The participants used earphones and they could adjust the volume. They also decided on their choice of music. Furthermore, the participants were encouraged to listen to the same type of music for 30 minutes every night before going to sleep. In the control group, instead of listening to music they had a rest period. The results showed statistically significant reductions in systolic blood pressure, heart rate and respiratory rate in the experimental group. (Chan et al. 2009.) Chan et al. (2010) studied in Hong Kong how music effects on depression and

sleep quality in elderly people who were aged 60 or over. The sample was 42 people and they were divided into a control and experimental group. **Music for the study was decided by the researchers and the study instrument was divided into three parts: demographic variables, physiological parameters and psychological parameters. Demographic variables were age, gender, religion, marital status, educational level, previous experience of listening to music and medical history.** Physiological parameters were a digital monitor, which was used to collect systolic blood pressure, diastolic blood pressure and heart rate for each participant. Psychological parameters were sleep quality and depression level. The study showed that listening to music may act as an effective intervention when talking about improving sleep quality and reduce depression levels in a group of older people. (Chan et al. 2010.)

Additionally, it has been shown that music affects maternal mood, depression, anxiety and stress, and also labour pain and neonatal outcomes. Stress and anxiety levels decrease and maternal depression reduces because of music. Music also improves the relationship between the mother and the fetus. Other outcomes of the music are that it calms the mother and makes maternal mood better. (Hollins Martin 2014.)

Furthermore, the study of Esfandiari & Mansouri (2014) supports the idea that light and heavy music has an effect on depressed people. It was discovered that light and heavy music seemed to reduce the symptoms of depression in female students. Even though the sample of their study was small, it encourages psychiatric hospital and nurses to use music therapeutically. (Esfandiari & Mansouri 2014.)

Music therapy was used in this study and participants were diagnosed with depressive disorder, according to the Diagnostic and Statistical Manual of Mental disorder 4th edition, by the professionals in a psychiatric hospital in the city of Isfahan. Female students were divided into three groups, control-, first experimental- and second experimental groups and every group contained ten people. Two different styles of music were played by using an mp3 player attached to a speaker and the duration of listening time was 45 minutes. In this case, light music was Pop and heavy music was Rock and there weren't any lyrics.

Every group listened to different kinds of music or to no music at all. The first experimental group received light music and the second experimental group received heavy music. Decreased levels of depression were seen in people's conditions that were in the experimental groups. It has been shown that music also stimulates

beneficial feelings and can improve pleasure while doing daily activities. Music has also been used to treat for example schizophrenia and bipolar disorder. (Esfandiari & Mansouri 2014.) Maratos et al. (2009) reviewed five studies about music therapy. Participants across all studies suffered from clinical depression. The age of the participants varied across studies but three studies focused on older adults. All studies had small sample sizes. Four studies involved listening to pre-recorded music either in a group or individually. The duration of the sessions ranged from one hour to 90 minutes. Three self-rated scales were used to measure symptoms of depression. **Four studies reported clinically significant positive effects in reducing depressive symptoms.** However one study in which music therapy was used as a control treatment showed no effect. (Maratos et al. 2009.) Music therapy is associated at least in a short period of time, with improvements in mood that are more effective than those found with standard care alone. Based on the low dropout rates it also seems to be a well tolerated treatment. (Maratos et al. 2009.)

Moreover, Erkkilä et al. (2011) studied the effects of music therapy for depression. The sample of the study was 79 working-age adults with unipolar depression and the age ranged between 18 and 50 years. Most of the participants were women and their primary diagnosis was depression, which were also the inclusion criteria. The participants didn't need to have musical skills or any given musical background so that they would be able to take part in the study, but if they had, it wasn't an obstacle. The sample was recruited between February 2008 and April 2009 and gathered primarily from the Central Finland Health Care District's psychiatric health centres and the psychiatric polyclinics of Jyväskylä city. (Erkkilä et al. 2011.)

The sample was randomised into two groups, the first group received both music therapy and standard care and the other group received only standard care. The standard care contained a short-term psychotherapy intervention, with nurses, medication like antidepressants and psychiatric counselling. Music therapy, which the other group received, contained an interaction between free musical improvisation and a discussion. During the music sessions, participants produced music with instruments they chose, while trained music therapists supported their action by using similar instruments. The produced music was recorded in a way that later on, participants and therapists were able to listen and discuss about it. (Erkkilä et al. 2011.) An assessment procedure, related to the two groups, was carried out by conducting the baseline and a three- and six-month follow-up. The primary outcome

measure was the Montgomery –Åsberg Depression Rating Scale and the secondary outcome measures were the anxiety part of the Hospital Anxiety and Depression Scale, Global Assessment of Functioning and the use of exploratory regression analyses helped to find out the possible effect of severity of depression, antidepressant medication status and being self-described as a musician or singer. (Erkkilä et al. 2011.)

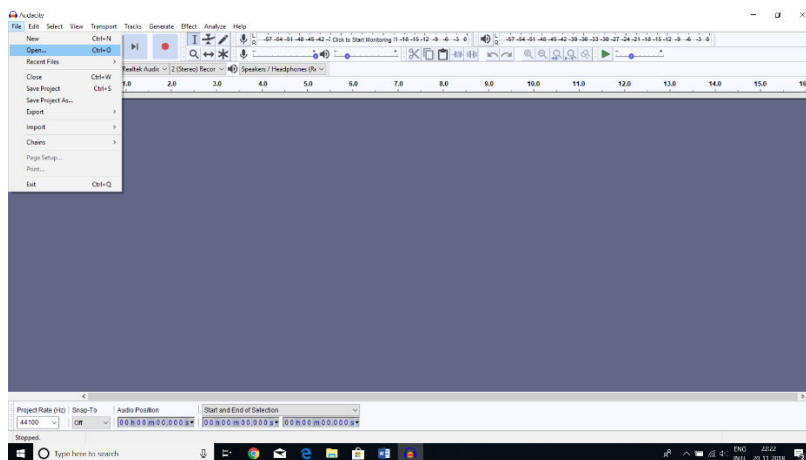
PROPOSED METHODOLOGY

The software that has been used for this activity is audacity. **Audacity** is a free and open source digital audio editor and recording application software, available for Windows, MacOS/OS X and Unix-like operating systems. Audacity was started in the fall of 1999 by Dominic Mazzoni and Roger Dannenberg at Carnegie Melon University and was released on May 28, 2000 as version 0.8.

As of October 10, 2011, it was the 11th most popular download from Source Forge, with 76.5 million downloads. Audacity won the SourceForge 2007 and 2009 Community Choice Award for Best Project for Multimedia. In March 2015 hosting was moved to Foss Hub and by September, 2018 it had exceeded 62.5 million downloads there.

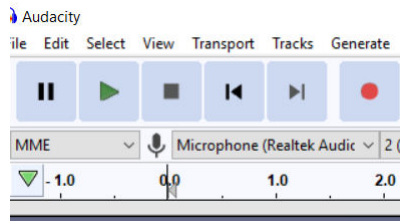
The following gives a detailed analysis and step-by-step procedure of how Audacity was used to add effects into the audio –

1) OPENING THE AUDIO TRACK



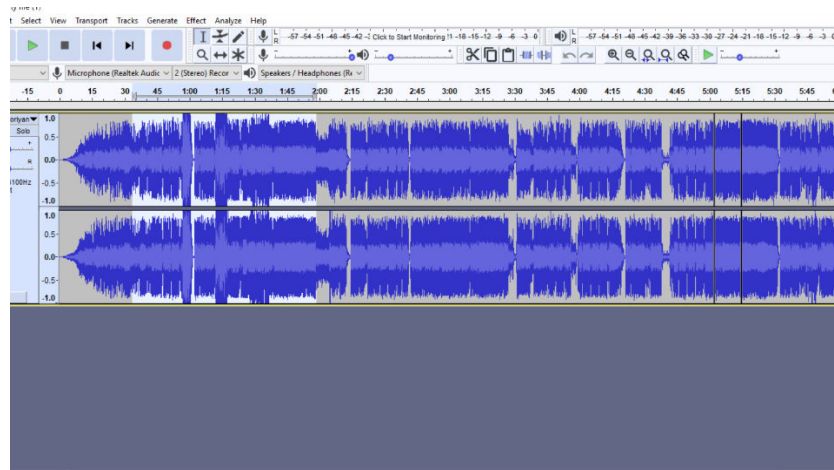
File – open. Then the audio file to be edited was chosen by navigating in the dialogue box. Once the file is selected it gets converted into an audacity project that can be edited and saved.

2) CONTROL BUTTONS



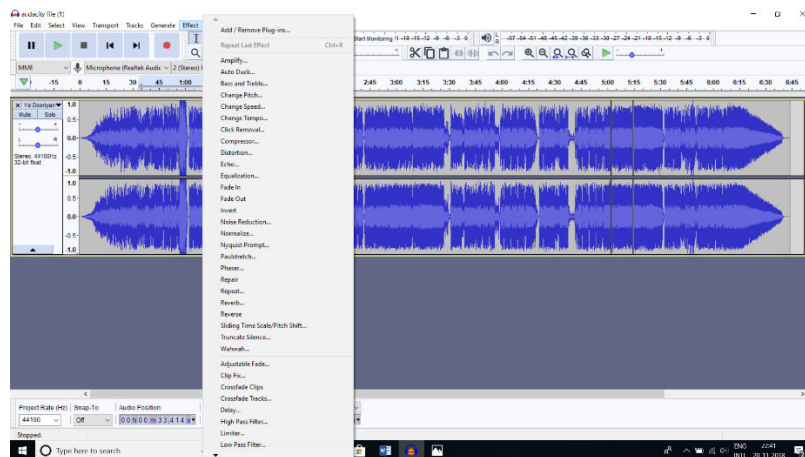
Once the audio file appears on the screen, it can be played, paused, skip to start and skipped to end using the respective control buttons provided by audacity.

3) SELECTING THE WORKING AREA



Prior to the addition of audio effects, a working area had to be selected which would incorporate the effect. An area was selected by clicking on a starting point and then dragging the cursor along the path that was to be edited until the path was traced till its end point. A highlight on the path was created, indicating that it was ready for editing.

4) ADDING THE EFFECTS



After selecting the working area, the effects could be added by going to EFFECTS – and choosing a particular effect.

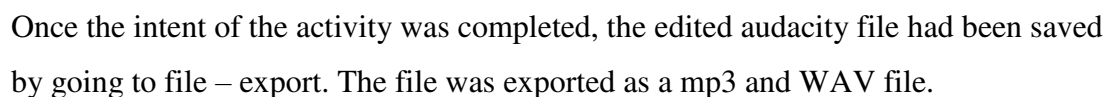
The effects that have been incorporated, at different points in the audio have been mentioned below-

(description of the effects have been mentioned in the introduction)

- The first effect that was used is FADE IN. It was used in the very beginning of the audio. This created a graduating effect into the song.
- The next effect used is TEMPO. The percentage change in tempo was 50% at 0.35 sec in the audio.
- AMPLIFICATION (db): 0.1 was also done. The starting point of the amplify was when the audio was at 1 min.
- BASS (db) AND TREBLE (db): 0.2. this was done 15 sec after the amplification, ie. at 1:15 mins.
- Delay time in the ECHO was 1 sec. This was added when the audio was at 1:30 mins.
- REVERB was added with dry gain (db): -1 and room size (%): 87. This effect was applied at 2:00 mins of the audio.
- Percentage increase in SPEED was 2%. This was added when the audio was at 2:25 mins.
- The number of REPETITIONS done was 1. This was added when the audio was at 3:05 mins.
- LFO frequency (Hz): 1 was applied while working with the WAHWAH sound effect. It was added at 3:25 mins in the audio.
- Dry/wet: 153, depth: 100, stages: 4 and LFO frequency (Hz): 0.8 was added while working with PHASER. It was added at 3:55 mins in the audio.
- Stretch factor of 2.0 was applied while working with the PAULSTRECH effect. It was added at 4:15 mins in the audio.
- EQUALIZATION was done at -9 db. It was added at 4:40 min into the audio clip.

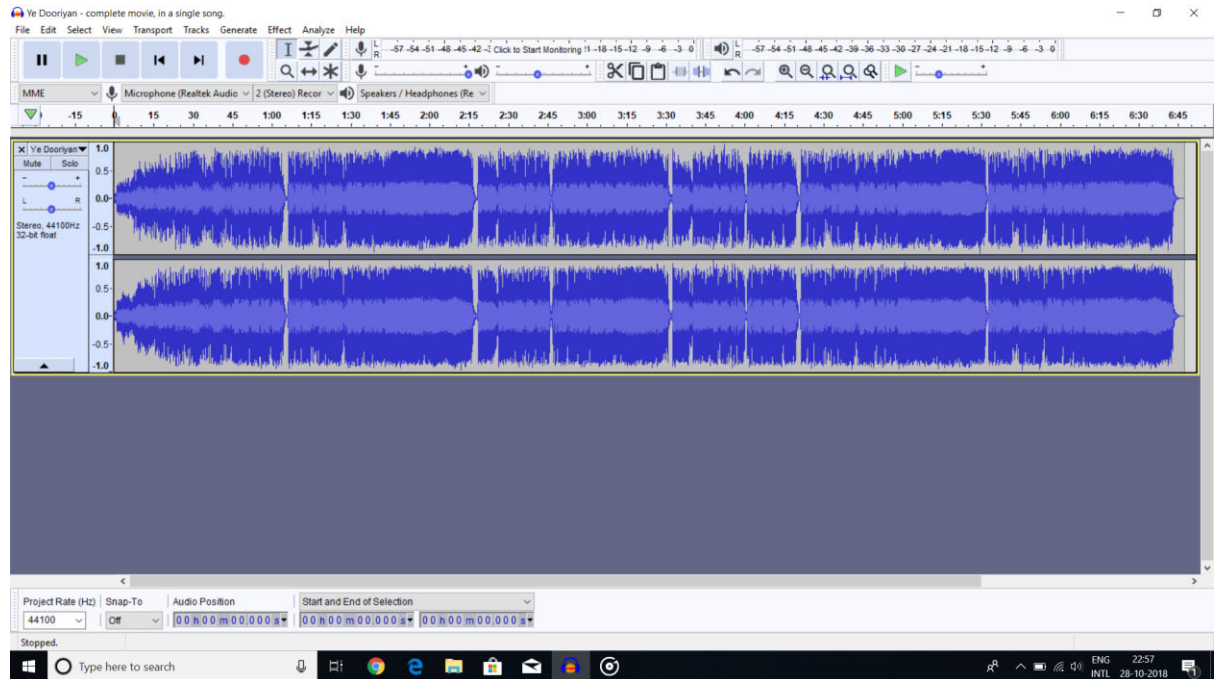
- ## 5) RECAP

6) SAVING THE FILE

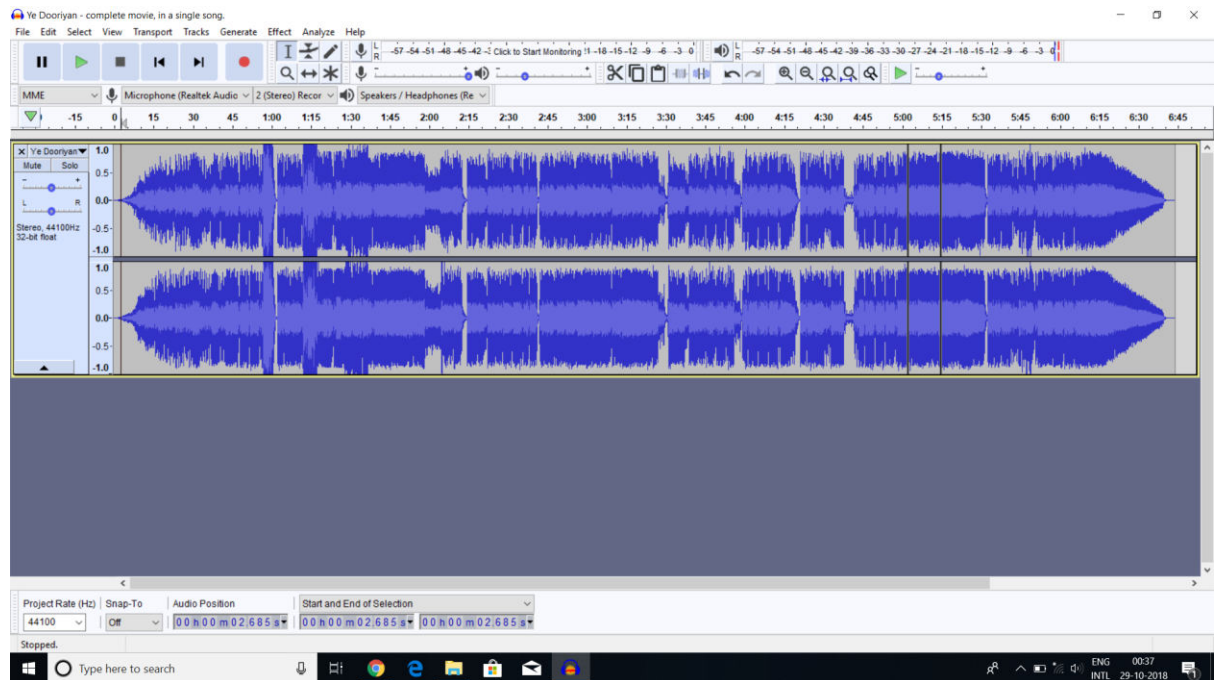


RESULT

The initial audio track is as follows-



The edited audio track is as follows-



RESULT ANALYSIS

The final edited audio track has a better sound quality than the previous one. Several special effects have been deeply analyzed and put into the original song.

The starting of the song has been put with a special effect fade in. This gives the song a professional feel and a more pleasant hearing. Similarly, toward the end the song has been put with a special effect of fade out.

The song also consists of several other features like reverse, equalization etc.

These effects have been incorporated keeping in mind the bass and the treble values.

Excessive bass and treble values increase the noise in the system. The song has also kept a limited value of dry and wet voice to improve the sound feedback and reduce noise.

Many other effects have been incorporated to make them stand out from the rest of the audio.

The remaining special effects include:-

- Stretch factor
- LFO
- Amplification
- Tempo

Thus, on an overall level the song has been improved to a great extent with all basic special effects.

Conclusion

The song has been successfully edited with 15 special effects.

Audacity software has proved the user a easy interface to feed some basic special effects into the song. The audio wave form has minimum distortion. The distortions caused by the high bass and treble have been kept into consideration.

The audio waveform has a very less amount of noise.

Certain segments of the audio have edited to show them out from the rest of the audio section.

Songs are an essential part of our daily life. They help to relax the mind and the body. Thus, editing songs can be them more appealing to the audience. Songs will continue to be an eternal part of our life.

Songs editing is a fun and an easy activity. It can act as a stress buster. This report will give the reader a complete understanding to edit another song.

References

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5. <https://en.wikipedia.org/wiki/Music>
6. This Is Your Brain on Music - Book by Daniel Levitin
7. How Music Works- book by David Byrne