

ANALOG AND DIGITAL AUDIO: WHAT'S THE DIFFERENCE?

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Annotation. The difference between digital and analog audio, their recording and playback are described. The advantages and disadvantages of both audio signals are indicated. It is emphasized that digital audio has higher quality and fidelity, can be easily edited and processed using a computer, while analog audio has a more natural sound, but less accurate and may be subjected to noise and distortion.

Keywords: analogue audio, digital audio, bandwidth, recording.

Introduction. It doesn't matter if you're recording a podcast, creating your own music, inspired to pursue a career as an audio engineer or sound designer, undertaking any other audio production endeavor, or you're an aspiring audiophile, it can sometimes help to understand the differences between analog and digital audio and their values in production. The difference between analog and digital sound is considered below.

Main part. Digital and analog audio are two different ways of recording and playing sound. Analog audio is sound that is transmitted as continuous waves that can be recorded on tape or vinyl. The process involves using a microphone to convert the original sound into electrical analog signals and recording them as a mechanical representation of sound waves on a medium such as a phonograph record. Digital audio, on the other hand, converts sound into a digital code that can be burned onto a CD or other digital media [1]. The difference between the signals is given below in Figure 1.

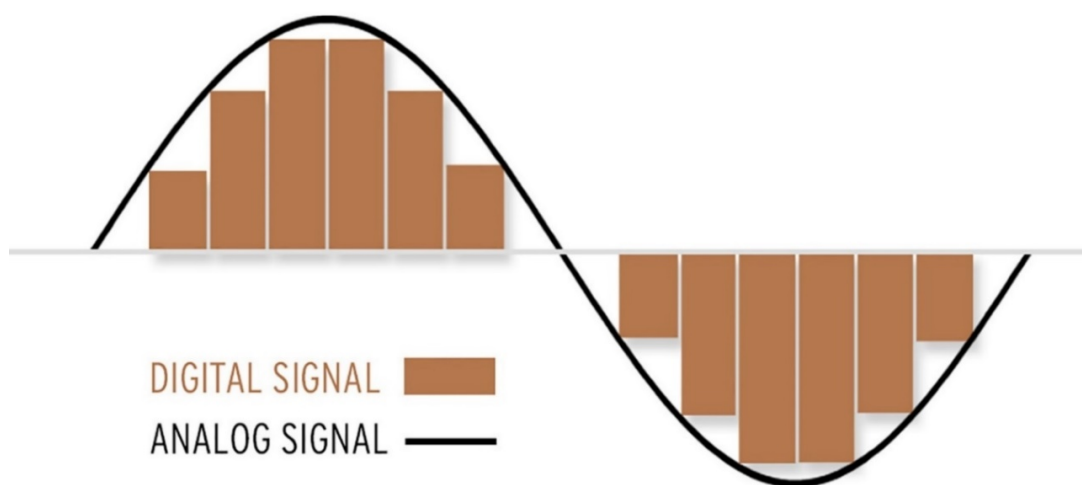


Figure 1 - Difference between the signals

The essence of the difference is that the analog signal is continuous in time, while the digital signal consists of a limited set of coordinates (Figure 2). If everything is reduced to coordinates, then any segment of an analog signal consists of an infinite number of coordinates.

For a digital signal, the coordinates along the horizontal axis are located at regular intervals, in accordance with the sampling frequency. In the common Audio-CD format, this is 44100 points per second. Vertically, the accuracy of the height of the coordinate corresponds to the bit depth of the digital signal, for 8 bits it is 256 levels, for 16 bits = 65536 and for 24 bits = 16777216 levels. The higher the bit depth (the number of levels), the closer the vertical coordinates are to the original wave [4].

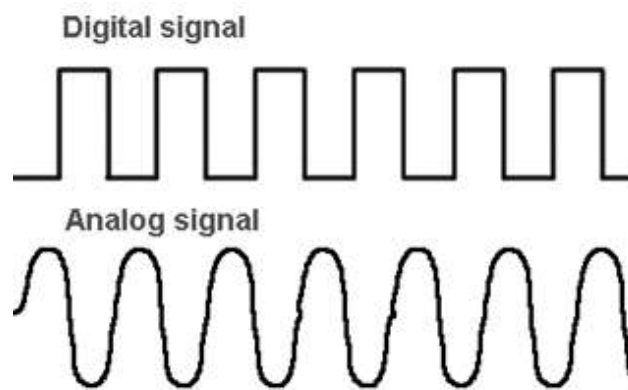


Figure 2 - Difference between the signals

One of the main advantages of digital audio is the higher sound quality. Digital audio is not affected by the noise that can occur when analog audio is recorded. In addition, digital audio can be easily processed and edited with a computer, making it more flexible and convenient [3]. Anyone with a smartphone has access to an incredibly vast catalog of music, entertainment, podcasts, and video right in their pocket. This is why digital audio is so popular. As the world becomes more and more “connected” digitally, audio trends move in the same direction. The percentage of digital audio listening in different countries is shown below in Figure 3:

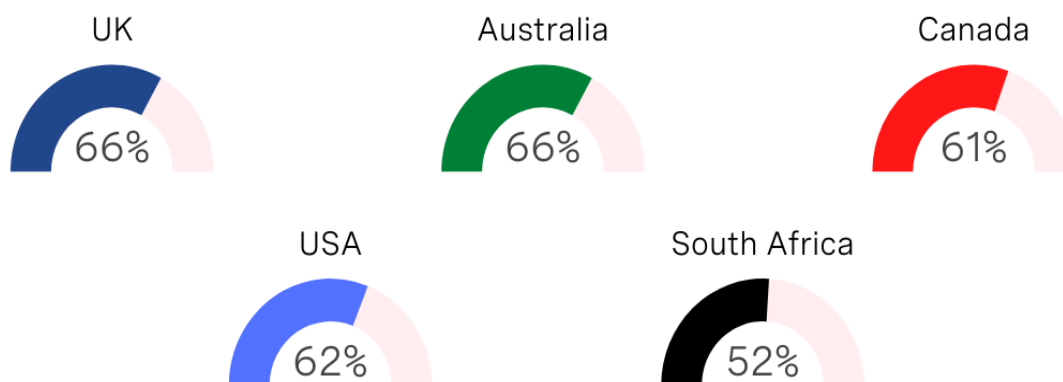


Figure 3 – Digital audio listening in different countries

Alongside, people prefer analog sound for its warmth and naturalness. Analog audio can also have a wider dynamic range, allowing for more detail and nuance in the sound, good depth, balanced bass and high notes. Analog audio can be moved to higher resolutions without compromising audio quality, whereas digital recording involves limiting and giving the audio recording a fixed bandwidth [2].

Conclusion. Having more bandwidth becomes critical when you want to increase the potential of your audio. In addition, vinyl records may have a unique sound that cannot be reproduced on digital media. However, analog audio has its drawbacks. It is subject to noise and distortion that can occur when recording and playing audio.

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