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WORKING WITH DIGITAL INFORMATION ON A COMPUTER

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Abstract:

In the article, we consider the coding of information, which is directly related to the development of digital technology. In modern educational institutions, the topic of information coding is studied as the most famous topic. Today, the basis of this process is the study of various properties of computers.

Keywords: Coding, Digitization, Coding Of Text Information, Coding Of Graphic Information, Coding Of Audio Information, Loudness, Frequency, Sound Children, Vibration Frequency, Intensity, Intensity Range, Sound Sampling.

It is known that each science has its own set of information, unconnected data, and methods or rules for processing it. These methods and rules are based on the goals and objectives of the subject, whilst the information and data depend on the main object of study.

We receive information in the form of various signals. The diversity of signals complicates the information processing stage. Therefore, in order to facilitate the collection, storage, and processing of information, they are formatted in the same way, that is, they represent the data in a way that is convenient for transmission and storage. This process is called information coding. The computer encodes text, graphics and audio information. Typically, in coding, each form is presented with a separate character. The computer can only process the information displayed in digital form. All other information (such as sound, image, instrument readings, etc.) must be described in digital form for processing on a computer. For example, in order to digitize a musical sound, the intensity of sound at a certain frequency can be measured over a short period of time, and the results of each measurement can be digitally represented. Computer programs can be used to change the received data, for example, to connect different sounds.

In an analogic way, a computer can process textual information. At the entrance to the computer, each letter is encoded with a certain number, and at the exit external devices (screen or printer) create an image of the letters from these numbers for human comprehension. The combination of letters and numbers is called character encoding. As a rule, on a computer, all numbers are represented by zeros and ones (no matter how much people are used to, not from the decimal number system). In other words, computers typically run on a binary computing system because processing on these devices is significantly easier. Even though a person is accustomed to entering numbers into a computer and reading them out in decimal form, all the necessary changes are made by computer programs[1].

In the following it is described how to encode voice information. The sound we know from a physics course is a mechanical wave with a continuously varying amplitude (intensity) and frequency that propagates through air, water, or any other medium. The sound wave is divided into horizontal and vertical lines. Horizontal lines are volumes that measure sound, and vertical lines are volumes that measure volume at -1 second (1 second is 1 hertz or frequency sampling). The higher the amplitude, the louder the sound; the lower the frequency, the lower the tone. The tone of voice is determined by the frequency (or wavelength) of the sound wave. The volume depends on the frequency. The higher the frequency, the louder the sound. Sound frequency is measured in hertz (Gs) or kilohertz (KGs). 1Gs = 1 / s, i.e. the oscillation period at 1Gs corresponds to a wave equal to 1s.

Volume is measured in decibels (DB). This unit of measurement is named after Alexander Graham Bell.

Humans can receive sounds with a frequency of 20,000 vibrations per second, that is, sounds with an intensity range of 10^{14} times (one hundred thousand billion) times the maximum intensity of the minimum intensity.

Volume is the power level that is proportional to the intensity of the sound.

Temporal sound sampling. A continuous sound wave is divided into separate small temporal parts. The sampling frequency range of sound measured in 1 second is 8000-48000.

[1] A.A.Abduqodirov, A.G.Hayitov, R.R.Shodiyev.Information technologies. Workbook. T.: “O’qituvchi”, 2002 y. pp. 67-71.

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Therefore, when transmitting continuous audio signals to a computer, they must be digitized, and conversely, digital signals must be converted to a continuous audio signal to output sound on the computer.

To do this, use a special device UROQ (device for continuous conversion to digital), RUOQ (device for conversion from digital to continuous).

The sampling frequency of a sound is equal to the number of sound measurements per second.

Sound encoding. If the volume level is considered to be a set of possible conditions **(N),** then a certain amount of information called encoding depth **(i)** is needed to encode the sound. That is,

N = 2^{i} (amount of **N**-sound levels, **i**-encoding depth).

For example, when the encoding depth is 16, the lower limit of the sound in the binary is 0000000000000000 and the upper limit is 1111111111111111.

Problem: If the depth of sound encoding is 16, then the volume level equals to:

N = 2^{i} = 2^{16} = 65536.

Digital sound quality. The higher the depth and frequency of the discrete sound, the better the quality of the digitalized sound. For the lowest quality, single sound corridor monotonous telephone communication with a bit rate of 8 bits per second and a frequency of 8000 bits per second; For the highest quality, we can get an audio CD (stereo) recorded on two audio tracks and with a bit rate of 16 bits per second and a frequency of 48,000[2].

For example: To estimate the amount of information in digital stereo audio files consisting of medium quality sound (16 bits 24000 measurements per second) heard in one second

16 bit * 24000 * 2 = 768000 bit

= (768000: 8) bytes = 96000 bytes = (96000: 1024) Kbytes = 93.75 Kbytes executed.

Standard formats for audio files: WAV (Windows Wave), MP3 (MPEG I, layer 3). There are also formats used: ogg, wma, etc. If we need to convert the wave format to mp3, the sound quality will remain high, but the amount of information will be reduced by 10 times, because mp3 will be 10 times less informative than the Wave format (using a special compression algorithm)[3].

Sound editors perform processes such as recording, playing, editing, mixing (stacking audio tracks), applying sound effects (EXO, reverse playback, etc.).

The quality of the sound depends on how we perceive it as subjective. A computer encodes encoded human-like voice data for storage and subsequent listening. The difference between a computer and a human voice memory is that the process of storing it depends on the person's emotions. So the computer stores the sound and the person stores the Music[4].

Man-made devices include those that work with analog information as well as those that work with discrete information. The most common of the discrete information is digital information, i.e. the continuous representation of information expressed in numbers. Devices that work with analog signals are called analog devices, devices that work with digital information are called digital devices. Information coding has been used by humanity not only to make things easier to perform, but also to keep information confidential. This type of encoding is called encryption.

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