УДК 519.7

COMPUTER MODELING OF PROCESS OF REFLECTION OF PLANE WAVE FROM RIGID WALL IN THE ELASTIC MEDIA

Искежанов И. А.[1], Старинова О. Л.[2], Алипова Б. Н.[1]

[1]International Information Technology University, Almaty, Kazakhstan

[2]Самарский национальный исследовательский университет
имени академика С. П. Королёва

Computer simulation is one of effective methods of studying complex systems. Computer models are easier and more convenient to explore because of their ability to pursue the so-called computational experiments, in cases where real experiments are difficult due to financial or physical barriers, or may give unpredictable results. Logic and formalization of computer models allow to identify the main factors that determine the properties of the studied object or to investigate the response of the simulated physical system to changes of its parameters and initial conditions.

The use of fiber optic links in the development of computing devices allows not only to provide higher technical characteristics of computer systems, but also to provide a high level of security (the absence of radiation into the external environment, the high technical complexity of cutting into the communication line, the ability to encode information that is resistant to decoding by codes and provides the required data transfer rate.

When a plane electromagnetic wave is incident on the interface between two media the reflected wave appears and in other cases a refracted wave appears.

The plane of incidence is a plane passing through between the media and the direction of incidence of the wave.

The vector of the electric field strength of a plane wave is perpendicular to the propagation direction of the wave, and can be oriented arbitrarily with respect to the plane of incidence. However, we can confine ourselves to two orientations of the vector. The vector is perpendicular to the plane of incidence of the wave. is called a parallel polarization. This consideration of the electromagnetic wave is obvious, because A wave with any orientation of the vector can always be represented as a superposition of two waves, one of which is normally polarized, and the other is parallel to the polarized one.

The first is essentially the cause, the second consequence, while the first concept of sound is objective, the second is subjective. In the first case, the sound is really a flow of energy. Sound can change the environment through which it passes, and itself changes it. In the second case, by sound we mean the sensations that a listener has when a sound wave is transmitted through the hearing aid to the brain. Sensing a sound, a person can experience different feelings. The most diverse emotions cause in us that type of sounds, which we call music. Sounds form the basis of speech, which serves as the main means of communication in human society. And, finally, there is such a form of sound as noise. The analysis of sound from the position of subjective perception is more complicated than with an objective evaluation.

When a sound wave reaches a point in space, particles of matter that before did not perform ordered movements begin to oscillate. Any moving body, including a vibrating body, is capable of doing work, it means that it has energy. Consequently, the propagation of a sound wave is accompanied by the propagation of energy. The source of this energy is a vibrating body, which emits energy into the surrounding space (matter).

Human hearing organs are able to sense oscillations with a frequency of 15 Hz to 20 kHz. Mechanical vibrations with the indicated frequencies are called sound or acoustic (acoustics - the doctrine of sound). The sound is a wave oscillatory process, occurring in an elastic medium and causing an auditory sensation. However, the susceptibility of a person to sounds is selective, so we are talking about audible and inaudible sounds. The totality of those and others in general resembles the spectrum of sun rays, in which there is a visible area - from red to violet and invisible to human eyes are infrared and ultraviolet waves. To find out what the loudness of the sound depends on, let's return to the experience. To one branch of the tuning fork, a small ball hanging on the thread is brought close to each other, and on the other, they are struck with a hammer. Both branches of the tuning fork come into oscillatory motion. A soft sound is heard. The ball bounces off from the vibrating branch a short distance. Then the tuning fork is muffled and struck again, but much stronger than the first time. Now the tuning fork sounds louder, and the ball bounces to a greater distance, which indicates a greater amplitude of vibrations of the branches. This and many other experiments allow us to conclude that the loudness of the sound depends on the amplitude of the oscillations: the larger the amplitude of the oscillations, the louder the sound. In the considered experiment, the frequencies of oscillations of both sounds - quiet and loud - are the same, since their source is the same tuning fork. But if we compared the sounds of different frequencies, then in addition to the amplitude of the oscillations, we would have to take into account one more factor that affects the loudness. The fact is that the sensitivity of the human ear to sounds of different frequencies is different. At the same amplitudes as the more loud, we perceive sounds whose frequencies lie in the range from 1000 Hz to 5000 Hz. Therefore, for example, a high female voice with a frequency of 1000 Hz will be sound louder than a low masculine with a frequency of 200 Hz to human, even if the amplitudes of oscillations of the vocal cords in both cases are the same. The volume of sound depends also on its duration and on the individual characteristics of the listener. The volume of sound is a subjective quality of the auditory sensation, which makes it possible to arrange all sounds on a scale from quiet to loud.

References

1. Alexeeva L. A., Kupesova (Alipova) B. N, Method of generalized functions for boundary problems of coupled thermoelastodynamics // Journal of Applied Mathematics and Mechanics (of Russian Academy of Sciences), V.65, N 2, 2001, pp. 334-345

2. Alipova B. N. Method of Boundary integral equations (BIEM) and generalized solutions of transient problems of thermoelastodynamics. ICNPAA 2012, 9-15 July, AIP Conference Proceedings, 1493, 39(2012); doi: 10.1063/1.4765466, American Institute of Physics, Vien, Austria, http://dx.doi.org/10.1063/1.4765466, pp.39-46 http://www.scimagojr.com/journalsearch.php?q=26916&tip=sid&clean=0

3. Aytaliev Sh. M., L. A. Alexeyeva, Sh. A. Dildabayev, N. B. Zhanbyrbaev. Method of boundary integral equations.

4. Dortman N. B. (1984). Physical properties of rocks and minerals

5. Kupradze V. D, Gegelia T. G., Bashelishvili M. O., Burchuladze T. V. (1976). Three-dimensional problems Mathematical theory of elasticity and thermoelasticity. - M.: "Science".

6. Novacki V. (1975). Theory of elasticity. "MIR". Moscow.