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Analysis of the Effect of Frequency on Wavelength and Sound Size in Sound Generator Experiments

Rafirda Fitri Muawani[1], Nita Amelia[2], Riris Arisa[3], Syifa Ullayla[4], Yanto[5], Adam Malik[6]
[1] Physics Education Study Program, Sunan Gunung Djati State Islamic University, Bandung, Indonesia
* Corresponding Author

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ABSTRACT

Waves are one of the abstract physics materials in the world of physics and will be a separate problem in studying them. The wave superposition experiment was carried out using software using Vlab. The aim of this research is to analyze the effect of frequency changes on wave length and sound. The method used is to prepare tools and materials, namely PCs/laptops with frequencies of 100 Hz, 500 Hz, 1000 Hz, 1500 Hz and 2000 Hz. This is done for different audio frequencies as well. Then the results of the merger were opened with Audacity and then analyzed and compared with the initial wave. So that a superposition is produced that the effect of frequency on wavelength is inversely proportional, the greater the frequency issued, the smaller the resulting wavelength, while the effect of frequency on sound waves is

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1. INTRODUCTION

In the field of physics, waves are one of the most abstract concepts, and understanding them presents a unique set of challenges [1]. Often, available references only reveal the existence of waves without revealing their exact form [2]. Due to the scarcity of materials and tools and the high cost of these tools, the wave explanation process only focuses on established concepts without being balanced with real experience [3]. If there is no movement of matter, wave motion can be thought of as the transfer of energy and momentum from one point in space to another [4]. Another way to think of waves is as vibrations (oscillations) that pass through a medium or do not move through a medium without being accompanied by movement of its parts [5].

In a medium, vibrations propagate in the form of waves [6]. In order for wave propagation to transport energy from one location to another, the wave must have a vibration source that is always moving [7]. Transverse waves and longitudinal waves are two different types of waves [8]. Longitudinal waves have the same direction of propagation as the direction of propagation, while transverse waves have a direction of propagation that is perpendicular to the direction of vibration [9]. Transverse waves are a type of wave on a string. In other words, when the rope is raised and lowered, it will be perpendicular to the direction of wave motion [10].

Vibrations are the cause of waves [11]. Waves are traveling vibrations. The speed of any moving object determines it [12]. The characteristics of the medium through which the wave passes affect its speed [13]. Waves on a stretched string and waves on a string move at different speeds depending on the tension and density of the string [9], [10], [14]–[17].

In transverse waves, the length can be calculated as the separation between the crest of a wave and the crest of the next wave, or its trough and the next trough [18]. The figure shows that the wavelength from B to F is considered as one wavelength, or that the wavelength from D to H can also be considered as one wavelength [15], [19]. Oscillations, often known as vibrations, are a distinctive type of movement of objects. An object vibrates as it swings back and forth through its equilibrium point along a predetermined path. The time required to perform one back and forth movement is the period, denoted by T and measured in seconds (s). This maximum displacement is called the vibration amplitude [14], [20].

Beyond this point, an object will begin to oscillate back and forth when force is applied. Oscillatory motion is exemplified by a straight pendulum. A slight change in the path of the pendulum will cause it to oscillate past its equilibrium point. The pendulum will swing back and forth with periodicity [21], [22]. The period determines the frequency of vibrations that occur per second as well as the length of time required for one complete vibration to occur. The length of the string affects the period of the simple pendulum [23], [24].

The repetitive movement of an object through its equilibrium point over a predetermined period of time is known as oscillation. In everyday life, oscillations occur when a vertically suspended spring is loaded, for example. The system will regularly move to the equilibrium point when a load of mass m is applied to the end of the spring and then released; This motion is called simple harmonic motion.

Sound waves are a form of wave because they are often encountered in everyday life. Mechanical waves such as sound can propagate through all types of materials, both solid and liquid. When an object vibrates mechanically, the vibrations turn into waves which may take the form of transverse or longitudinal waves. Since they take the form of density and strain, sound waves are longitudinal waves [22], [23], [25]–[30].

In general, sound waves also exhibit wave-like characteristics; they can be reflected, deflected, mixed, or interfered with. when there is interference There is a process, and it is called superposition of waves. Wave superposition is the superposition of waves of the same frequency and waves of different frequencies, among other phenomena. There will be a combined wave resulting from the superposition of waves that have both beneficial and detrimental properties. It is beneficial if the alloy waves reinforce each other, and harmful if they cancel each other out.

A physical property called frequency states the number of waves in a unit of time. An inverse correlation exists between wavelength and frequency. Frequency decreases as wavelength increases. The frequency increases as the wavelength becomes smaller.

The software program that can be used as a tool for experiments is called Vlab. Researchers chose this program for an online practicum that includes research findings and experimental analysis to ascertain how changes in frequency to wavelength in this Vab program are analyzed.

2. METHODS

This research uses a software-based experimental method. Experiments were carried out in the form of experiments using Vlab software. Another instrument used to support this research is an analysis data sheet to determine the effect of amplitude (A), frequency (f), and voltage on wavelength (λ), wave number (k), angular frequency (ω), speed (v) , and period (T). The research variable used to determine the effect of frequency (f) on the wavelength.

In this method, the amplitude of the sound signal determines its loudness, and the frequency determines its pitch. if we change the frequency of a sound, we automatically change its wavelength. The equation that connects wavelength frequency and sound speed is Speed = frequency x wavelength. The frequencies used are 100 Hz, 500 Hz, 1000 Hz, 1500 Hz and 2000 Hz. The speed of sound in air is approximately equal to 300 ms-1, but depends on temperature, pressure and humidity. change the signal frequency using the slider on the far left side. (note the wave changes automatically).

3. RESULTS AND DISCUSSION

The results of experiments in this Virtual Laboratory are recorded in a table below

Table 1. Experiment on the effect of changing frequency on wavelength

Test	Frequensy (Hz)	Wavelength (m)
1	100	3,29
2	500	0,66
3	1000	0,33
4	1500	0,22
5	2000	0,17

The table above was obtained from an experiment carried out using VLan with the data below

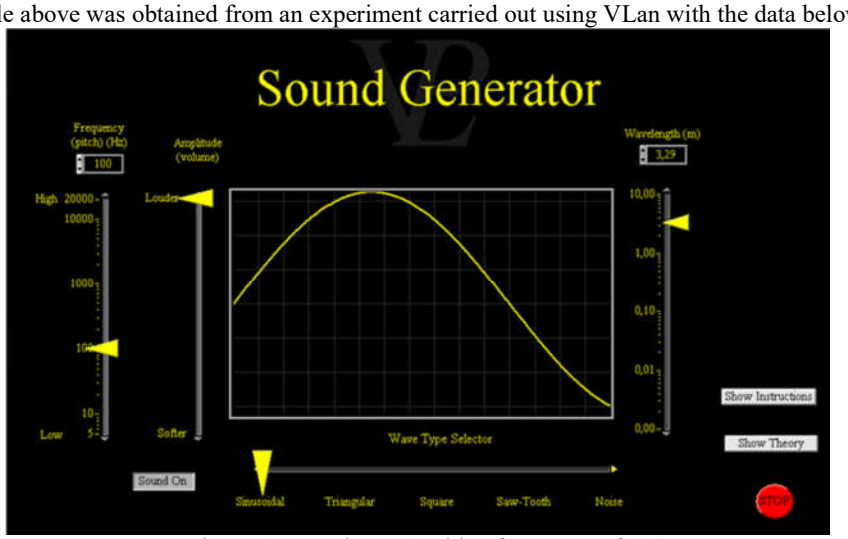

Figure 1. Experiment 1 with a frequency of 100 Hz

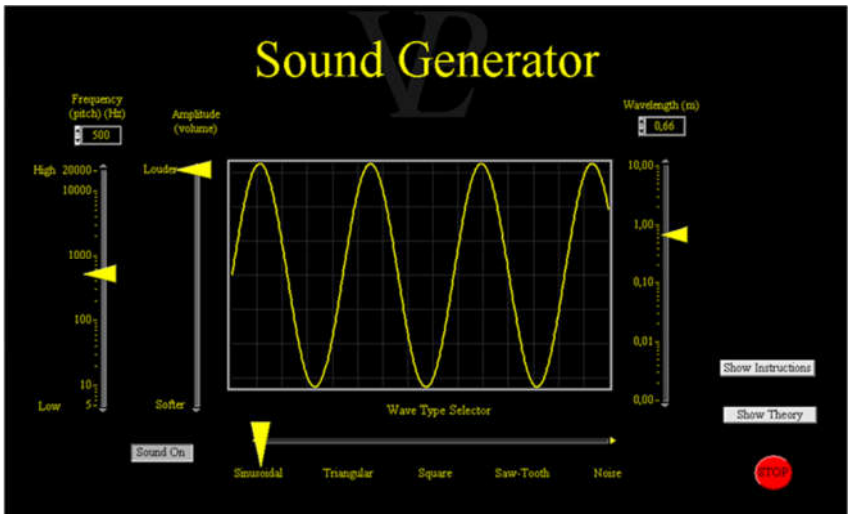

Figure 2. Experiment 2 with a frequency of 500 Hz

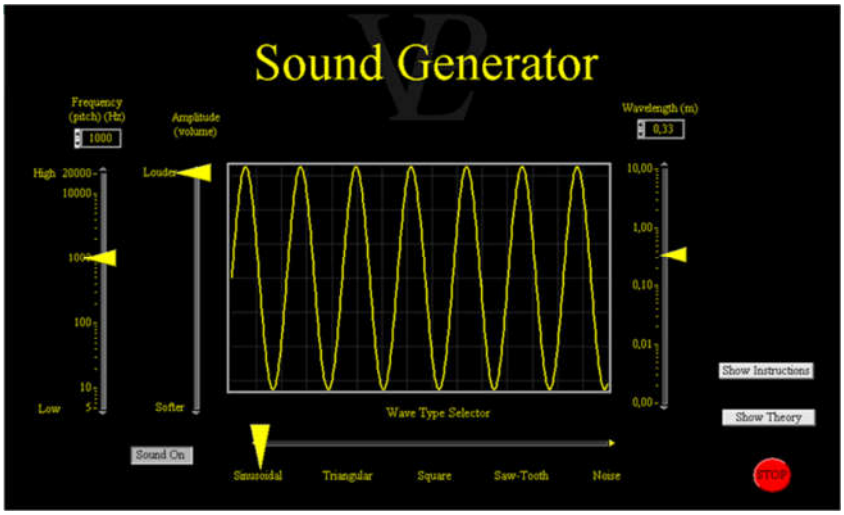

Figure 3. Experiment 3 with a frequency of 1000 Hz

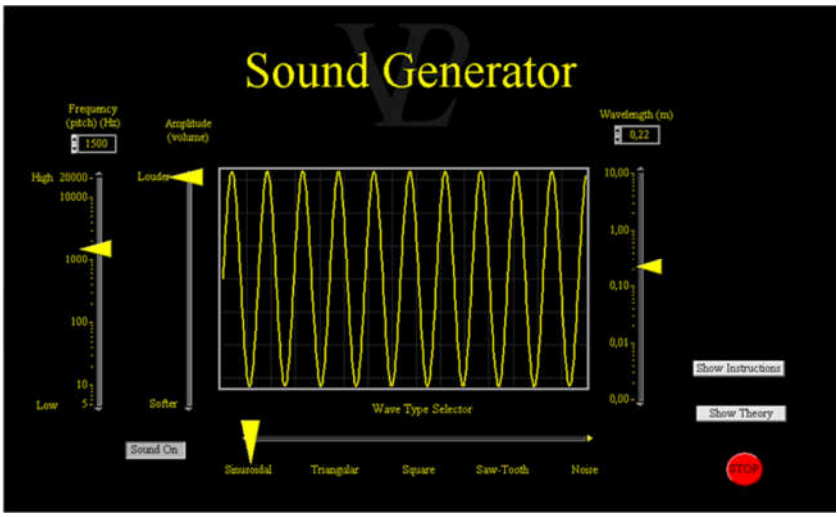

Figure 4. Experiment 4 with a frequency of 1500 Hz

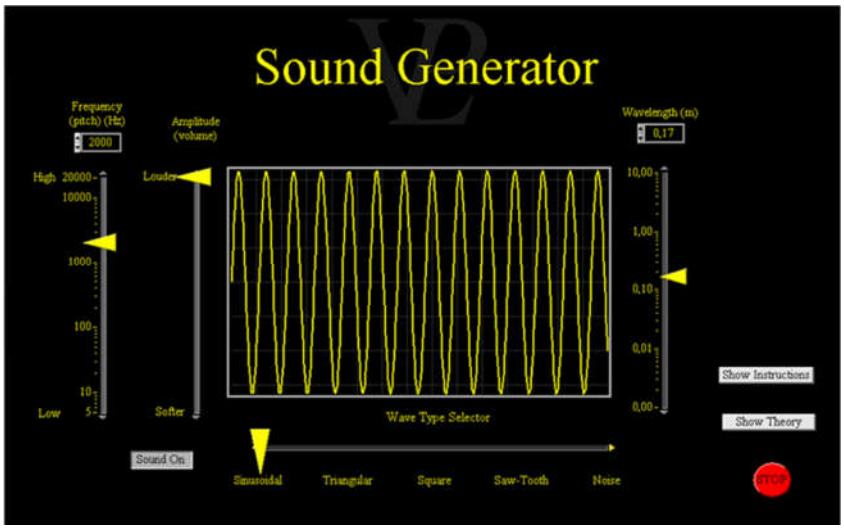

Figure 5. Experiment 5 with a frequency of 2000 Hz. Type equation here

After conducting experiments using VLab, data is produced that will be processed, to see the effect of frequency on wavelength. The data is processed in the form of a relationship graph to make it easier to draw conclusions from research results using Vlab.

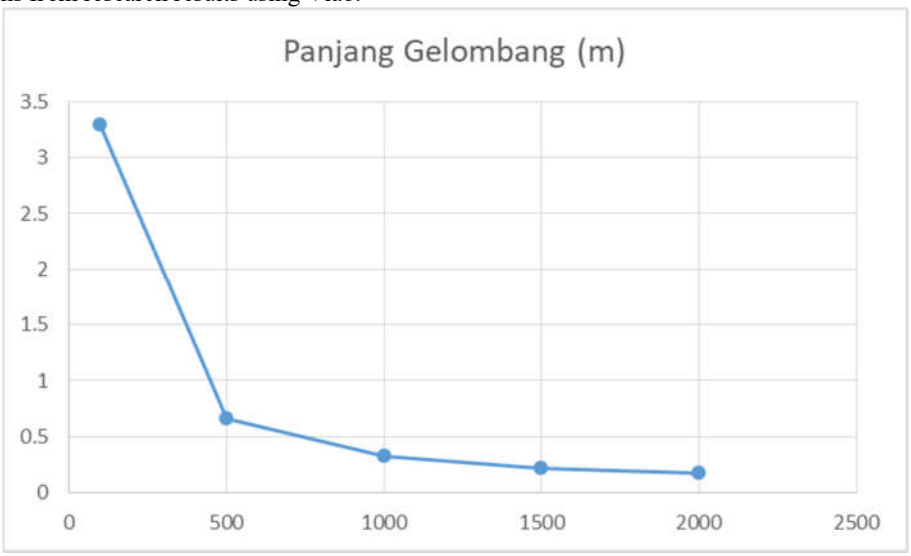

Figure 6. Experimental Results

In the graph above, a superposition is produced that the effect of frequency on wavelength is inversely proportional, the greater the frequency emitted, the smaller the wavelength produced, while the effect of frequency on sound waves is directly proportional, because the greater the frequency emitted, the greater it will be. also the sound that is emitted.

4. CONCLUSION

The conclusion from the experiment above is that by carrying out experiments using a virtual laboratory, the effect of frequency on wavelength, the resulting effect of frequency on wavelength is inversely proportional, the greater the frequency produced, the smaller the wavelength produced, while the effect of frequency on sound waves is proportional straight, because the greater the frequency emitted, the greater the sound emitted.

DECLARATION

Author Contribution

This research uses a software-based experimental method.

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Conflict of Interest

Declare conflicts of interest or state “The authors declare no conflict of interest.”

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