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Sound Waves

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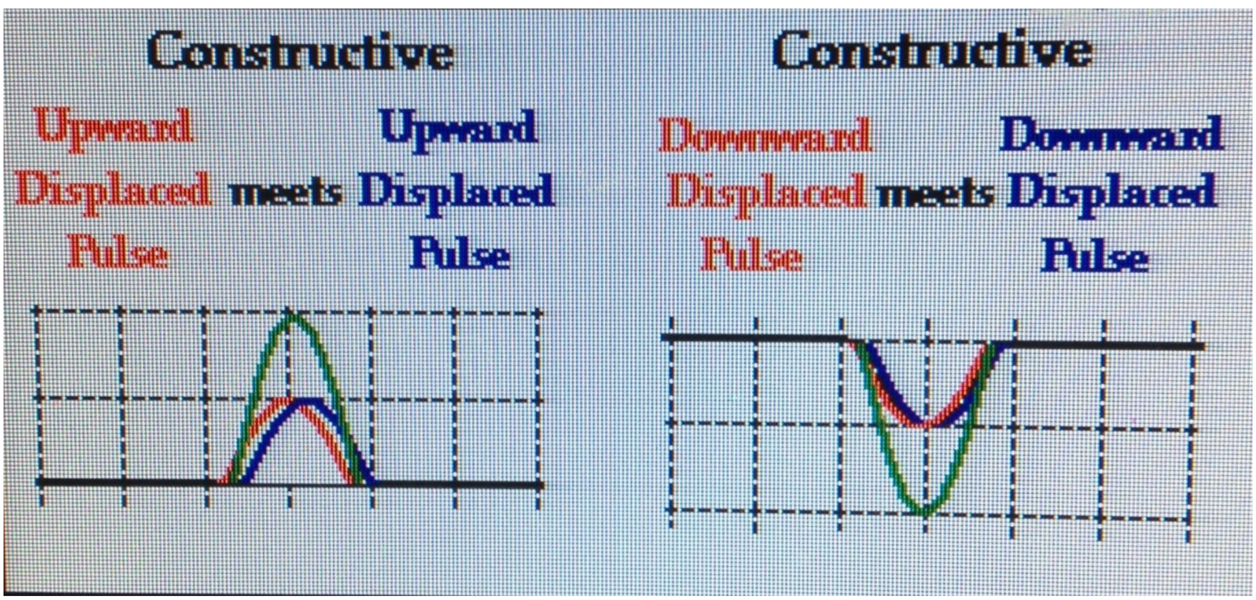
Why is it that when we walk towards a speaker we can hear music, but other times we cannot?

Constructive interference:

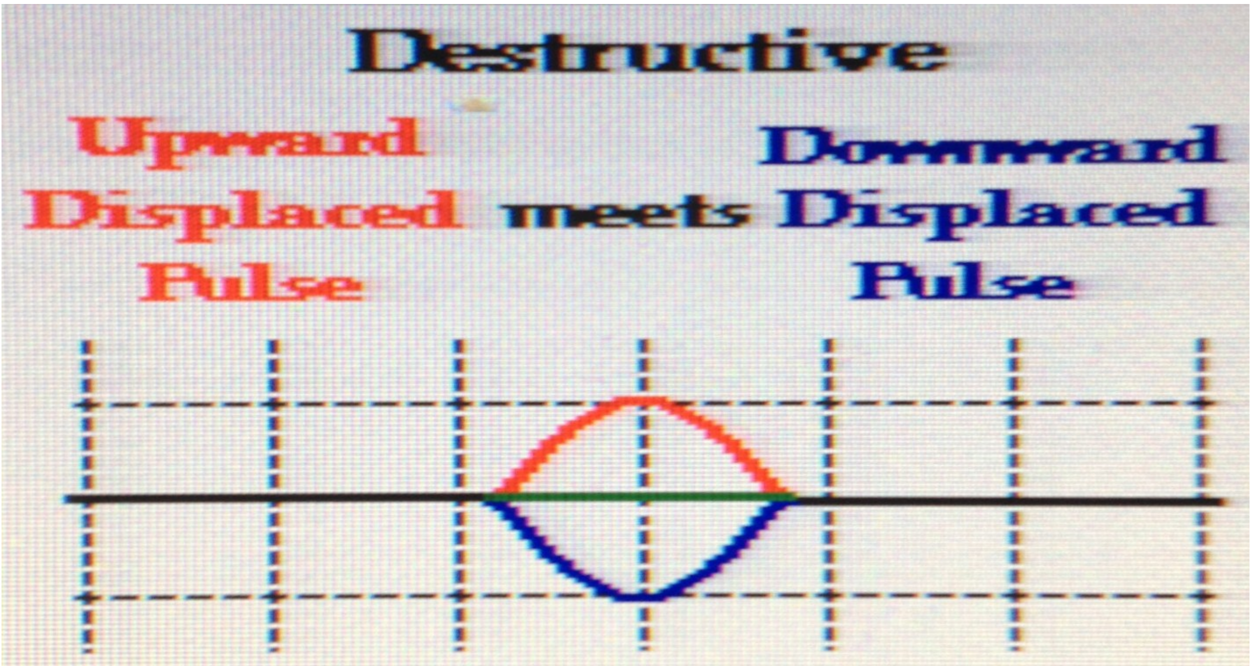
When there are two pulse waves both moving in opposite directions in a medium they eventually meet. When they meet they will form a shape that is twice the amplitude of the original waves.



(C. Shoaf)

Destructive interference:

When there are two pulse waves both moving in opposite directions in a medium they eventually meet, however if the phase change is (π) then the resultant amplitude will be a flat line.



(C. Shoaf)

What happens is when we walk toward one speaker and we come across constructive interference the amplitudes add up, however when we come across destructive interference the waves end up canceling each other and we hear nothing. To find where these instances occur, we may calculate the distance.

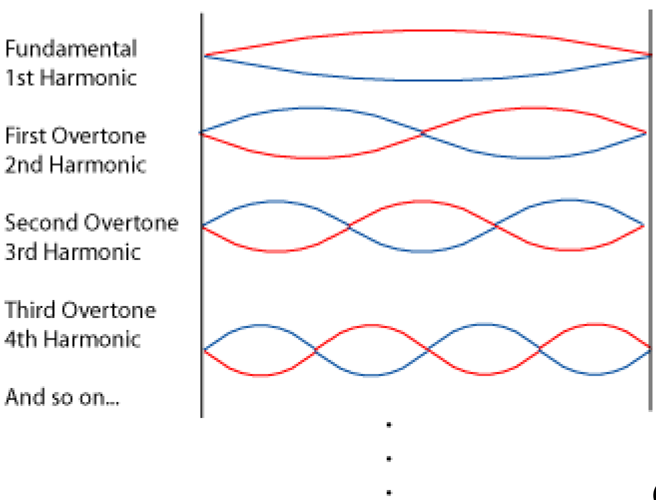
Destructive interference	Constructive interference
$L_2 - L_1 = (m+.5)\lambda$	$L_2 - L_1 = m\lambda$
$L_2 + L_1 =$ total distance	$L_2 + L_1 =$ total distance

With destructive interference we start with m=0

It is important to note that this only works with monotones, because of the wide frequencies in music (Shoaf Curtis).

Guitar strings

According to, The Physics Classroom, when a guitar string vibrates at its natural frequency the frequency is then known as the harmonic. It must be noted that when the string vibrates we are not hearing its note in its purest form, we are also hearing several overtones.



(C. Shoaf)

When we vibrate the string and the frequency is too low we must increase the strings tension. If we wanted the string to vibrate at a certain frequency, we can calculate what the tension should be to get the desired frequency.

$\lambda = 2L/n$ $v=\lambda f$ $v=\text{sqrt}(TL/m)$

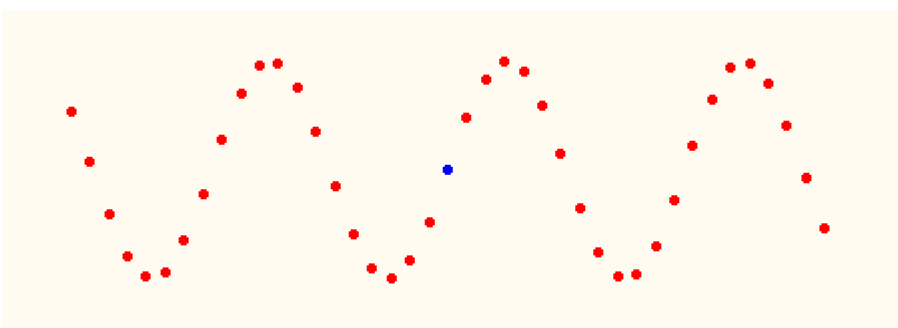
We solve for the wavelength (λ) then set the velocities (v) equal to each other and solve for tension (T). The length of the string is represented by (L) and the mass by (m), the antinodes by (n).

Waves

Sound waves are often represented as transverse waves, meaning an up and down wave. However, this is not the case, sound waves are actually longitudinal waves. The medium oscillates in the same direction as the wave is moving (Shoaf Curtis.)

(C. Shoaf)

Longitudinal


(C. Shoaf)

(Transverse)

(Not the shape of Sound Waves)

The speed of a wave is not the speed of a particle of the medium (Colleta Vincent), it is the speed at which the wave is moving through the medium.

The frequency of a wave is the inverse of the time it takes to complete an oscillation. An important thing to note is that frequency does not change when the medium does. For instance, moving through air then water, the frequency remains the same!

Speed of sound:

The speed of sound travels faster the more solid the object

Medium:	Speed (m/s):
Air	343
Helium	972

Water	1500
Steel	5600

Work Cited

- "Guitar Strings." *Guitar Strings*. N.p., n.d. Web. 18 Nov. 2014.
- Coletta, Vincent P. *Physics Fundamentals*. N.p.: n.p., 2010.
- Shoaf, Curtis Associate Professor, *Physics 121* Parkland college 2014