Characteristics of Sound Waves

Spoken Tutorial Project
http://spoken-tutorial.org
National Mission on Education through ICT
http://sakshat.ac.in

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Learning Objectives

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- **How to generate a sound wave**

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- **How to generate a sound wave**
- **Frequency response of a sound source**

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- How to generate a sound wave
- Frequency response of a sound source
- How to calculate velocity of sound

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- How to generate a sound wave
- Frequency response of a sound source
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- Interference & Beats of sound waves

Learning Objectives

- How to generate a sound wave
- Frequency response of a sound source
- How to calculate velocity of sound
- Interference & Beats of sound waves
- Forced oscillations of a sound source

Learning Objectives

Learning Objectives

Show

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Show

- **Xmgrace plots**

Learning Objectives

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- **Fourier Transforms**

Learning Objectives

Show

- **Xmgrace plots**
- **Fourier Transforms**
- **Circuit diagrams**

System Requirement

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- **ExpEYES v 3.1.0**

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- **Ubuntu Linux OS v 14.10**

Pre-requisites

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- **ExpEYES Junior interface**

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- **For relevant tutorials, visit our website**
  www.spoken-tutorial.org

Definition of Sound

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- **Sound is a vibration that propagates as audible mechanical wave of pressure & displacement**

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- **Sound** is a vibration that propagates as audible mechanical wave of pressure & displacement
- It requires a medium to propagate
- Air, water or any metal surface

Characteristics of sound

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- **Carry out various experiments to show characteristics of sound**

Frequency of sound

Frequency of sound

- **Experiment to show frequency of sound**

Frequency response

Frequency response

- **Demonstrate frequency response of** `Piezo buzzer`

Velocity of Sound

Velocity of Sound

- **Measure velocity of the source of sound**

Measure Phase

Measure Phase

Various Phase values we will use,

- **178deg & 106deg to calculate velocity of sound**

Measure Phase

Measure Phase

- **We can obtain these values when Piezo is kept close & 2cm away from MIC**

Note

Note

- **Ensure that `MIC` and `Piezo buzzer` are placed on the same axis**

Velocity of Sound

Velocity of Sound

Formula:

Velocity of Sound

Formula:

- $v = f * (360 * \Delta D/X)$
- $v = 3500(360 * 2)/(178 - 106)$
- $v = 35000 cm/sec$
- $v = 350 m/sec$

Assignment

As an assignment,

1. **calculate the value of wavelength of sound**
2. **Formula:** $\lambda = v/f$

Sound Waves

Sound Waves

- **Interference**
- **Beats**
- **Xmgrace plot**
- **Fourier Transform**

Grace plots

Grace plots

- **python-imaging-tk**
- **grace**
- **scipy**
- **python-pygrace**

Fourier Transform

Fourier Transform

- **Fourier Transform please visit this web page**

  http : //en.wikipedia.org/wiki/Fourier_transform

Sound Waves

Sound Waves

- **Experiment to show low frequency sound wave**

Summary

- How to generate a sound wave
- Frequency response of a sound source
- How to calculate velocity of sound
- Interference and Beat pattern of sound waves
- Forced oscillations of sound source

Summary (cont.)

- **Xmgrace plots**
- **Fourier Transforms**
- **Circuit diagrams**

Assignment

1. **Capture a sound burst**
2. **Hint: A bell or a clap can be used as source of sound**

About the Spoken Tutorial Project

- **Watch the video available at http://spoken-tutorial.org /What_is_a_Spoken_Tutorial**
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Spoken Tutorial Workshops

The Spoken Tutorial Project Team

- **Conducts workshops using spoken tutorials**
- **Gives certificates to those who pass an online test**
- **For more details, please write to contact@spoken-tutorial.org**

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- More information on this Mission is available at http://spoken-tutorial.org/NMEICT-Intro