TRIGONOMETRY IN MUSIC THEORY

ROLE OF SINE IN PERFECT PITCH

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INTRODUCTION: PURPOSE

To analyze the role of sound waves in music, and more specifically, the role of sine in perfect pitch.

- Perfect Pitch – a person’s ability to identify or recreate a given musical note without the benefit of a reference tone.

Why do some sounds create euphonious and harmonious pitch relationships while others sound unpleasant and harsh?
SOUND WAVES AND FREQUENCY

SOUND WAVES

- When energy moves through a substance, a wave is formed.
- Sound – the energy released from the vibration of the object
- Regularity of vibration distinguishes musical and non-musical sounds.

Door being slammed:

Guitar string plucked:

FREQUENCY

- Frequency – speed of the vibration. In music, this is known as pitch.
- Measured in Hertz (Hz)
- **Faster** frequency = higher-pitched sounds.
- **Slower** frequency = lower-pitched sounds.
SINE IN A NOTE / CHORD

NOTE

• A singular note can be modeled with a sine wave: \( \sin(2\pi f x) \)
• 'A' has a frequency of 440Hz (pitch standard)
• C# is for semitones (half-steps) from A. Its frequency is 554.37

As the notes (semitones) increases, they get higher in pitch, resulting in skinnier sine graphs.

CHORD

• Modeled with multiple sine waves.
• Produces a pleasant and harmonious sound
• No longer a sine curve but a pattern
FLATS AND SHARPS

- **Flat** = **lower** in pitch
- **Sharp** = **higher** in pitch
- If a singer is sharp or flat, they are singing a note 'in key' but not 'in tune' with the correct note.

D minor key: D, E, F, G, A, B, C, D
- If a singer sings an F#, it's not in key, so they are 'out of tune'

- Pitch correction software such as autotune.
Absolute Pitch vs. Perfect Pitch

- Both: ability to recognize a note or produce any given note upon hearing it

- Perfect pitch – broader range of pitch-related abilities.
  - Ex: identify intervals, chords, and musical keys

- Use: make adjustments to their pitch/tuning
ANALYSIS I.
USE OF SINE IN PERFECT PITCH

- flats/sharps: sine wave is above or below the correct sine wave

Methods to strengthen:
- **Pitch matching**: match own pitch to reference pitch (sine wave): understanding of distinct sound characteristics
- **Pitch reference tools**: precision (how your note should sound): reference points to recognize/produce pitches

Everyday Life:
- Advertisements: attracting/maintaining customers (Windows update/McDonalds theme)
- Companies learn what pitches to avoid (negative feelings)
ANALYSIS II.
DEVELOPMENTS TO ADVANCE PERFECT PITCH

• VR (virtual reality) and AR (augmented reality): interact with musical stimuli in an engaging and realistic environment.

• Advancements in neuroscience: more research on brain plasticity – training methodologies / interventions (enhance/accelerate development)

• Education: apart of curriculum
  - strengthen decision-making skills, improve cognitive function, higher academic performance

🌟 Deeper understanding and appreciation for music
WORKS CITED


