

Psychoacoustics

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Module 6 Homework (Timbre)

Student Name: _____

1) (60pts) **Indicate whether the statement is true or false by printing T or F .**

_____ According to D. Huron, timbre's main purposes are source identification and obtaining state cues about the world around us.

_____ Musical instruments tend to have the same relative spectrum (*i.e.* spectral envelope) throughout their playing range (*i.e.* regardless of what note is being played).

_____ Timbre plays an important role in speech recognition, communication, and simulation.

_____ Spectral distribution of signals is the only important physical correlate in timbre perception.

_____ When it comes to timbre perception, regardless of the type of signal, the attack is the most important portion of a signal's envelope.

_____ For continuous (as opposed to impulse) signals, the steady state portion of the signal envelope contains most of the signal's energy.

_____ Sound-morphing perceptual experiments provide evidence for categorical, rather than continuous timbre perception.

_____ Timbre perception depends not only on physics and physiology considerations but also on stimulus presentation context.

- _____ The degree of perceived beating/roughness of a signal depends on the frequency and amplitude relationships among spectral components occupying the same critical band(s).
- _____ “Sensory consonance” and “consonance” refer to the same phenomenon.
- _____ Time-variant spectral information is important to the perceived naturalness of sound signals.
- _____ How rough a signal will sound depends only on its spectral distribution and on the physiology of the ear.
- _____ How pleasant a given amount of roughness in a sound will be depends on the corresponding signal’s spectral distribution and on the physiology of the ear.
- _____ Mijwiz is a type of singing common in Bosnia and Ganga is an instrument common in the Middle East.
- _____ There are examples from several musical traditions suggesting that consonance and dissonance are culture-dependent concepts.

2) (5pts) Sensory dissonance is a term describing

- a) the degree of unpleasantness or “unfittingness” a sound.
- b) the degree of perceptual roughness associated with a sound.
- c) the degree of non-blending between two simultaneous sounds.
- d) the main perceptual manifestation of spectral distribution, in terms of timbre.

3) (5pts) Time-variant characteristics of spectra can be displayed in the form of

- a) signal envelopes and long-term average spectral distributions.
- b) long-term average spectral distributions and equal loudness contours.
- c) long-term average spectral distributions and neural tuning curves.
- d) sonograms and short-term amplitude/frequency envelopes of spectral components.

4) (5pts) The timbre studies addressed in class can be broadly classified into

- a) psychoacoustic (Helmholtz/Schaeffer), perceptual (Grey), and cognitive (Huron/Kendall).
- b) pitch-based (Zwicker), loudness-based (Plomp), and spectral-based (Helmholtz).
- c) spectral-based (Helmholtz, Kendall), envelope-based (Grey), and context-based (Huron).
- d) attack-based (Grey), steady-state based (Helmholtz), and decay-based (Kendall).

- 5) (5pts) **One of the criticisms to Helmholtz's timbre studies is that**
- a) he only focused on German instruments.
 - b) he only focused on the attack portion of signals.
 - c) he only focused on the steady state portion of harmonic signals.
 - d) he only focused on the contribution of the low-frequency spectral components.
- 6) (5pts) **According to P. Schaeffer, all of a signal's acoustic characteristics that are relevant to timbre perception can be described on the three following "planes":**
- a) dynamic, melodic, and chromatic.
 - b) simple, complex, and mixed.
 - c) melodic, dynamic, and harmonic.
 - d) temporal, spectral, and contextual
- 7) (5pts) **According to many timbre studies, the physical correlates corresponding to the two most important timbre perception cues are**
- a) spectral density and decay spectral content.
 - b) the resonant characteristics of the source and the nonlinear response of the ear.
 - c) spectral centroid and onset (attack) transient spectral content.
 - d) spectral centroid and temporal envelope differences among spectral components.
- 8) (5pts) **Approaches to the understanding of consonance/dissonance can be broadly divided into**
- a) tonal, atonal, and contextual.
 - b) early, intermediate, and contemporary.
 - c) physical modeling based, additive synthesis based, and perception based.
 - d) acoustic, psychoacoustic, cognitive, and cultural (contextual).
- 9) (5pts) **Studies by Grey, Kendall, McAdams, etc.**
- a) attempt to infer the main perceptual dimensions of timbre through similarity rating experiments.
 - b) attempt to infer the main perceptual dimensions of timbre through similarity rating experiments, and link them to some spectral and/or signal variable.
 - c) attempt to infer how timbre perception is influenced by cultural background and how it relates to listening context.
 - d) attempt to infer the main physical dimensions of timbre through various forms of spectral analysis.