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EXERCISES AND TASKS

ELECTROACOUSTIC SOUND SYNTHESIS

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SLEZSKÁ UNIVERZITA V OPAVĚ

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FILOZOFICKO-PŘÍRODOVĚDECKÁ FAKULTA V OPAVĚ

1. EVOLUTION OF ORGANIZED SOUND

EXERCISES:

1. Who was one of the dominant influences on the music of the twentieth century?
2. Who coined the term "organized sound" during first half of the twentieth century?
3. What is I Ching and who used it for experimental audio compositions?
4. What a term "Concrete music " stands for? Name at least one composer?
5. Who composed "IN C"? Describe its composition and presentation technique.

TASKS:

Choose one experimental composition of the first half of the twentieth century, listen to it, analyze and present and describe.

2. THE DAWN OF MODERN TECHNOLOGY

EXERCISES:

1. Based on a legend who was the first czech inventor of electro-acoustic instrument?
2. Who invented the gramophone as we konw it today?
3. What was the first electromechanical synthesizer?
4. What is Theremin?
5. Describe a Moog Synthesizer structure.
6.

TASKS:

Find and present at least three experimental, electronic or rock composition, where the Moog synthesizer was used.

3. ELECTROACOUSTIC AND ELECTRONIC STUDIOS

EXERCISES:

1. What was Electroacoustic and electronic studios good for after second world war?

2. Name at least one Electroacoustic studio and describe it.

4. TAPE RECORDER EVOLUTION

EXERCISES:

1. What was used for recording before a tape recorders?
2. When the first commercial magnetic tape recorder got available?

5. COMPUTER MUSIC

EXERCISES:

1. What for and when the first computer ENIAC was used?
2. What was the first modern synthesizer?
3. What is MAX good for in sound synthesis and experimental music?

6. SOUND AND WAVEFORM

EXERCISES:

1. Suppose you see a flash of lightning and then hear the sound of its thunder 5 s later. Assuming a speed of light equals 3 10 8 m/s and a speed of sound equal to 340 m/s:
   (a) Estimate the distance between you and the lightning flash.
   (b) How long did it take for the light of the lightning flash to travel to you?

2. A simple harmonic oscillator (SHO) has a period of 0:002273s. What is the frequency of the oscillator?
3. Find the wavelength of a sound wave in water (with a wave velocity of 1,400 m/s) that has a frequency of 10 kHz.
4. Find the frequency of a light wave in vacuum that has a wavelength of 0.5 m
5. What is special about the Fourier frequency spectrum of a periodic wave?
6. What is Partial?
7. Describe Fourier analysis
8. Draw and desribe basic envelope of a wave
9. What Is Helmholtz resonator?

7. ACOUSTICS

EXERCISES:

1. Can we hear sound in Space?
2. What is the “sound pressure”?
3. Find the mass and weight (in kg) of the volume of air in a room with the dimensions 4x 5x6 m.
4. The ear is most sensitive to sinusoidal sounds (“pure toner”) having a frequency of about 3,000 Hz. Calculate the wavelength of a sound wave with this frequency if the wave is traveling in air with a sound velocity of 340 m/s. Calculate the wavelength if the sound wave is traveling in water with a speed of 1,400m/s.

8. ROOM ACOUSTICS

EXERCISES:

1. Can we hear sound in Space?
2. Descreibe ROOM MODES AND STANDING WAVES
3. What would you use for absorbing Bass frequencies?
4. How can we use the Helmholtz resonator in acoustics?

TASKS:

1. Measure your room dimension and calculate first free room modes. Test by listening.

9. PSYCHOACOUSTICS

EXERCISES:

1. Mechanical vibrations are transformed to nerve impulses in the:
   a. Middle ear
   b. Eustachian tube
   c. Auditory canal
   d. Semicircular canals
   e. Cochlea
2. The correct order in which mechanical vibrations pass through the parts of the ear is:
   a. Eardrum, cochlea, hammer, stirrup, and oval window
   b. Eardrum, hammer, anvil, stirrup, and cochlea
   c. Eardrum, Eustachian tube, oval window, and round window
   d. Eardrum, anvil, Eustachian tube, and organ of Corti
   e. Eardrum, cochlea, basilar membrane, and middle ear
3. What is the function of the ossicles of the ear?
4. What are the two theoretical mechanisms for pitch discrimination provided by the ear? Describe them in detail.

TASKS:

1. Listen to recording in various level and observe changing color of sound.

10. CAPTURING SOUND

EXERCISES:

1. Name types of microphones and describe it's properties.
2. What is 3:1 rule good for?
3. What is Phase problem?

TASKS:

1. Make recordings of your voice with various microphones and compare soud of the recordings.

11. SOUND ENGINEERING AND FOH BASICS

EXERCISES:

1. Describe the Signal flow in recording oricess.
2. What is gain staging?
3. What a regular mixing desk consist of?
4. What is the difference between analog and digital reference level?
5. How to avoid audio feedback during a audio performance?
6. Describe optimum placement of the stage personal monitors.
7. Name some basic sound devices and processors used in sound studio for manipulating sound.

TASKS:

1. Plug microphone into a mixing desk and practice gain staging so that the output level of mixing desk is in optimum volume.

1. SOUND SYNTHESIS

EXERCISES:

1. What was the first sound-synthesis synthesizer?
2. What is the difference between Addtive and Subtractive Synthesis?
3. How frequency modulation works?
4. What is Wavetable
5. Does Sampling work only in digital domain?
6. What is Physical modelling?
7. Describe synth modularity and its parameters.
8. Name and present at least three software / hardware solutions for sound synthesis.

TASKS:

1. Choose one analog and one digital synthesizer model and describe it's types of synthesis and analyze Synth structure and functionality.

2. MIDI PROTOCOL AND CONTROLLERS

EXERCISES:

2. What is MIDI and how it works.
3. What is necessary for connecting a keyboard to computer and to control software musical instrument?
4. What is Program Change good for?
5. What do we mostly use Modulation Wheel / Strip for?
6. What kind of MIDI controllers do exist?

TASKS:

1. Create all necessary connections and adjustments to be able to record MIDI in your DAW.
2. Play with your software synthesizer settings and features and with help of external MIDI controller perform automation of various synthesizer parameters. Record final results.
3. Propose / realize, if possible, some designs of converting real sounds like "wind in the trees, water drops, river / stream flow, footsteps on the sidewalk" into sound composition or a happenings. Utilise all the gained knowledge about acoustics, MIDI, microphones, analog to MIDI triggers, sound recording and DAW manipulation, hardware or software synthesizers and software graphical modular sound design environments.