_f0

*a tuning_*

f0 is an archival and sound informed project considering acoustics, instrumentalism and site

based on the act of an instrumental tuning with the acoustical resonances of a space, ***f0***
regards the musical performer a field researcher, negotiating his surroundings by means of a singular sound action, to draw information and response accordingly and perform a ritual of measurement

a score
describes a simplified procedure to measure the resonance frequencies of a space/site of choice
and a consecutive musical exercise based on those frequencies to be executed
in the space

the performance is to be captured in both sound and image

documentation will be embedded in an online archive;
an imposed, virtual space proposing relationships of content and tracing out a topography of acoustic histories and musical readings of site

performers are invited to do the exercise independently
and submit their results to the archive

thank you

f0 *was commissioned by SugarJar,*
conceived by Martijn Tellinga,
developed in close collaboration with Gerard Altaió

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this score
instructs to locate and tune
with a resonant frequency of a space

choose a closed/semi-closed space or number of spaces to work in.
Emptier spaces and reflective surfaces generally create a stronger response

ambient sound in or around a space should not be muffling its acoustical workings

use as your instrument any sound generating device that is able
to produce a pitched sound and, preferably, is
not too limited in range

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determine the fundamental resonance
frequencies of the space(s) using the given instructions

choose 1 pitch that resonates strongly or is the most variable
in its resonance at any of the resonance frequencies or their harmonics.
Finetune your instrument to approach the resonance frequency as closely as possible

before starting the exercise announce the measurements that provided you the chosen pitch;

"*length/width/height = .. meter* (mention only the distance that gave the fundamental resonance frequency you are going to use), *f0 = .. Hz, the .. th harmonic = .. Hz*, *the pitch you play* (middle C being C4), *possible finetunings you are using*"

over 10 minutes -excluding the announcement- play a slow pattern of tones only at the chosen pitch. Tones are played with little attack, sustained for variably long duration and with slow decay. Tones are separated by a variably sized rest though never disrupting the continuity of the pattern. Listen to the space . Start the pattern quietly, crescendo towards a dynamic peak halftime, gradually decrescendo to end the exercise quietly

while sounding, actively explore the pick up, sustaining, extension and
dissolving of resonance using loudness variations, shifts in
timbre, balancing of direct and indirect sound,
aiming of your instrument.

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document
your exercise
-wholly and uncut-
in both sound and image
include ample pre- and post-roll

use static points for both microphone and camera.
Better not use the internal mic in your camera

audio 44.1 Khz 16bit or more, no mp3
video in mp4 or MOV format,
resolution 1920 * 1080

please send the
material to or
contact to
upload

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_f0, Martijn Tellinga

Resonance is the ***tendency of a system to oscillate with greater amplitude at some frequencies than at others***. Frequencies at which the system's responses are greatest are known as ***resonance frequencies***. Resonance occurs with all types of waves: mechanical resonance, electromagnetic resonance, nuclear magnetic resonance, acoustic resonance, etc.

Acoustic resonance is the ***tendency of an*** **acoustic system** ***to oscillate strongest at a frequency that matches or approaches one of its own resonance frequencies***. An acoustic system usually has more than one resonance frequency, especially at harmonics of the strongest resonance

Acoustic resonances in spaces occur when sound waves ***propagate between two opposing surfaces***. As waves are reflected, they meet with waves traveling in the opposite direction. At resonance frequencies, related to the distance between the opposing surfaces, the sound waves combine in such a way that a stationary, or ***standing wave***, is created. ***A standing wave is thus a wave that is reinforced by its own reflection***

As an acoustic system, ***every space has a unique set of natural resonance frequencies,*** including both harmonic and non-harmonic resonances. These are defined by a.o. the architectural form of the space, ambient air temperature/ pressure/humidity and materials present in that space. When a musical note is played with the same pitch as a resonance frequency of that space, ***that note will sound louder and have a longer reverb time*** than other notes

Instructions

to determine the resonant frequencies of a space

1. Measure or estimate as precisely as possible the dimensions (length, width, height) of the space in either meters or feet

2. Double the longest dimension of the space

For example, if the longest dimension is 4.6 meter, double that would be 9.2 meter

3. Divide 345 meter per second, which is the speed of sound, by the figure from step 2. This will give you the fundamental for the resonant frequency *'f0'* (9.2 meter in the example = 37.5 Hz)

! When measuring in feet, make sure to use the speed of sound expressed in feet (1130 feet per second)!

4. Calculate multiples of the fundamental until you have reached the tenth harmonic

For example, if 37.5 Hz is the fundamental, multiples would be 75, 112.5, 150, 187.5 Hz, etc. In this case, f0 = 37.5 Hz, 1st harmonic = 75 Hz, etc.

All of these harmonic frequencies will also resonate though less loud the higher the harmonic

5. Make the same calculation for the other, shorter dimensions of the space, so that you will have three sets of resonance frequencies and their harmonics

6. look up which notes (equal tempered tuning) correspond to the resonant frequencies in the table next page

Table is created using A4 = 440 Hz ('middle C' = C4) Speed of sound = 345 meter p/second = 1130 feet p/second

Note	Hz	Note	Hz	Note	Hz	Note	Hz	Note	Hz	Note	Hz	Note	Hz
C1	32.7	C2	65.4	C3	130.8	C4	261.6	C5	523.3	C6	1046.5	C7	2093.0
C#1	34.6	C#2	69.3	C#3	138.6	C#4	277.2	C#5	554.4	C#6	1108.7	C#7	2217.5
D1	36.7	D2	73.4	D3	146.8	D4	293.7	D5	587.3	D6	1174.7	D7	2349.3
D#1	38.9	D#2	77.8	D#3	155.6	D#4	311.1	D#5	622.3	D#6	1244.5	D#7	2489.0
E1	41.2	E2	82.4	E3	164.8	E4	329.6	E5	659.3	E6	1318.5	E7	2637.0
F1	43.7	F2	87.3	F3	174.6	F4	349.2	F5	698.5	F6	1396.9	F7	2793.8
F#1	46.2	F#2	92.5	F#3	185.0	F#4	370.0	F#5	740.0	F#6	1480.0	F#7	2960.0
G1	49.0	G2	98.0	G3	196.0	G4	392.0	G5	784.0	G6	1568.0	G7	3136.0
G#1	51.9	G#2	103.8	G#3	207.7	G#4	415.3	G#5	830.6	G#6	1661.2	G#7	3322.4
A1	55.0	A2	110.0	A3	220.0	A4	440.0	A5	880.0	A6	1760.0	A7	3520.0
A#1	58.3	A#2	116.5	A#3	233.1	A#4	466.2	A#5	932.3	A#6	1864.7	A#7	3729.3
B1	61.7	B2	123.5	B3	246.9	B4	493.9	B5	987.8	B6	1975.5	B7	3951.1