Inspiration for Resonance

Resonance :
A resonant frequency is a natural frequency of vibration determined by the physical parameters of the vibrating object. This same basic idea of physically determined natural frequencies applies throughout physics in mechanics, electricity and magnetism, and even throughout the realm of modern physics.
(http://hyperphysics.phy-astr.gsu.edu/hbase/Sound/reson.html#resdef)

https://vimeo.com/388630911

The resonance frequency test, 08. 07. 2019, minidom, ZKM
material - 23 channel PCM speakers and 1channel GENELEC subwoofer

ZKM | Institute for Music and Acoustics Hertz - Lab
ZKM | Zentrum für Kunst und Medien Karlsruhe

The modeling of THR resonator

THR resonator :
The transcendental resonance discerns from the multivariate Gaussian distribution of the function space of Helmholtz resonator.

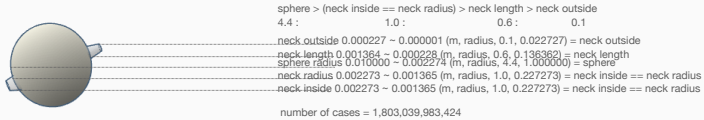
$$\text{FREQUENCY} = \frac{\text{SOUND SPEED}}{2\pi}\sqrt{\frac{\text{AREA}}{\text{VOLUME x LENGTH}}}$$

Formula of Cavity Resonance
An air cavity will exhibit a single resonant frequency. If extra air is pushed into the volume and then released, the pressure will drive it out. But, acting somewhat like a mass on a spring which is pulled down and then released, it will overshoot and produce a slight vacuum in the cavity. The air will oscillate into and out of the container for a few cycles at a natural frequency.
Actually the frequency depends upon the square root of these factors and also upon the speed of sound, as you can see in the actual calculation of the frequency.
(http://hyperphysics.phy-astr.gsu.edu/hbase/hframe.html)

The range of the resonance frequency:

from **1038.277963Hz** to **19813.884923Hz**

the lowest frequency of 1-909-909-1-1 the highest frequency of 7726-909-1-1136-226, as the components of the resonator.



Data archive

e^ix, It's necessary(2019) GRAYCODE, jiiiiin(Taebok Cho, Jinhee Jung)

Sphere > (Neck Inside == Neck Radius) > Neck Length > Neck Outside) <4.4 :1.0 : 0.6 : 0.1>

0.010000 ~ 0.002274 (m, radius, 4.4, 1.000000) = Sphere

0.002273 ~ 0.001365 (m, radius, 1.0, 0.227273) = Neck Inside == Neck Radius

0.001364 ~ 0.000228 (m, radius, 0.6, 0.136362) = Neck Length

0.000227 ~ 0.000001 (m, radius, 0.1, 0.022727) = Neck Outside

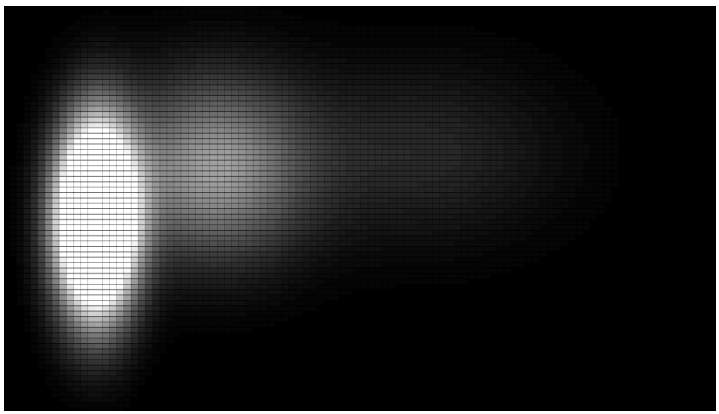
	sphere	***neck inside***	***neck radius***	***neck length***	***neck outside***	***0.010000***	***0.002273***	***0.002273***	***0.001364***	***0.000227***	***flatten***	***resonance***
e^ix	***1.000000***	***0.227273***	***0.227273***	***0.000228***	***0.000001***	***~ 0.002274***	***~ 0.001365***	***~ 0.001365***	***~ 0.000228***	***~ 0.000001***	***+***	***.000000 Hz***
1	0.009793	0.001704	0.001987	0.000453	0.000008	0.946408	-0.253304	-0.253304	-0.603524	-0.937778	-1.101502	1786.674061
2	0.004491	0.002171	0.001704	0.00117	0.000121	-0.426019	0.77533	0.77533	0.65815	0.057778	1.840569	5796.687646
3	0.009793	0.001441	0.002171	0.00036	0.000191	0.946408	-0.832599	-0.832599	-0.767401	0.68	-0.806191	1575.258284
4	0.006449	0.001614	0.001441	0.001293	0.000124	0.080647	-0.451542	-0.451542	0.87489	0.084444	0.136898	2677.042445
5	0.00377	0.002265	0.001614	0.000647	0.000072	-0.612686	0.982379	0.982379	-0.261674	-0.368889	0.721509	8467.847567
6	0.007734	0.002047	0.002265	0.000582	0.000012	0.413333	0.502203	0.502203	-0.376211	-0.902222	0.139305	2768.993781
7	0.005404	0.00224	0.002047	0.000783	0.000199	-0.189644	0.927313	0.927313	-0.022026	0.751111	2.394066	4696.111231
8	0.007824	0.001544	0.00224	0.001209	0.00008	0.436634	-0.605727	-0.605727	0.726872	-0.297778	-0.345725	1981.925382
9	0.002422	0.002011	0.001544	0.000584	0.000164	-0.961683	0.422907	0.422907	-0.372687	0.44	-0.048555	15186.816799
10	0.004725	0.001776	0.002011	0.001032	0.000148	-0.365437	-0.094714	-0.094714	0.414978	0.297778	0.157892	4755.444463
11	0.00595	0.00203	0.001776	0.000728	0.000161	-0.048285	0.464758	0.464758	-0.118943	0.413333	1.175621	3870.25908
12	0.008034	0.001419	0.00203	0.000627	0.000029	0.491003	-0.881057	-0.881057	-0.296916	-0.751111	-2.319139	2045.248007
13	0.008543	0.001723	0.001419	0.000454	0.000137	0.622783	-0.211454	-0.211454	-0.601762	0.2	-0.201886	2144.967758
14	0.00838	0.001585	0.001723	0.000805	0.000025	0.580583	-0.515419	-0.515419	0.014978	-0.786667	-1.221943	1988.177771
15	0.007855	0.001533	0.001585	0.000538	0.000178	0.44466	-0.629956	-0.629956	-0.453744	0.564444	-0.704552	2195.56031
16	0.009874	0.001767	0.001533	0.000622	0.00001	0.967379	-0.114537	-0.114537	-0.305727	-0.92	-0.487423	1738.390428
17	0.007286	0.001923	0.001767	0.001009	0.00003	0.297346	0.229075	0.229075	0.374449	-0.742222	0.387723	2686.565571
18	0.004355	0.00163	0.001923	0.00031	0.000154	-0.46123	-0.4163	-0.4163	-0.855507	0.351111	-1.798224	5860.06496
19	0.005328	0.001483	0.00163	0.000289	0.000065	-0.20932	-0.740088	-0.740088	-0.892511	-0.431111	-3.013119	4205.82777
20	0.002422	0.00174	0.001483	0.001109	0.000161	-0.961683	-0.174009	-0.174009	0.550661	0.413333	-0.345706	12581.619764
21	0.006502	0.001462	0.00174	0.000798	0.000158	0.094369	-0.786344	-0.786344	0.002643	0.386667	-1.089008	2682.044786
22	0.004335	0.001367	0.001462	0.001183	0.000135	-0.466408	-0.995595	-0.995595	0.681057	0.182222	-1.594318	4370.369329
23	0.009198	0.001534	0.001367	0.000744	0.000223	0.792362	-0.627753	-0.627753	-0.090749	0.964444	0.410551	1643.983207
24	0.003821	0.001872	0.001534	0.000495	0.000222	-0.599482	0.11674	0.11674	-0.529515	0.955556	0.060038	7364.135982
25	0.004553	0.00224	0.001872	0.001075	0.000211	-0.409968	0.927313	0.927313	0.490749	0.857778	2.793185	5805.475339
26	0.005591	0.001955	0.00224	0.000304	0.000161	-0.14123	0.299559	0.299559	-0.866079	0.413333	0.005143	4494.430502
27	0.009013	0.00166	0.001955	0.001125	0.000004	0.744466	-0.35022	-0.35022	0.578855	-0.973333	-0.350453	1737.016366
28	0.007071	0.002243	0.00166	0.000429	0.000064	0.241683	0.933921	0.933921	-0.645815	-0.44	1.023709	3409.951268
29	0.009398	0.002198	0.002243	0.000747	0.000111	0.844142	0.834802	0.834802	-0.085463	-0.022222	2.406061	2063.172678
30	0.002772	0.001493	0.002198	0.000893	0.000123	-0.871068	-0.718062	-0.718062	0.170044	0.075556	-2.061592	9657.839077
31	0.002345	0.002184	0.001493	0.000443	0.000178	-0.981618	0.803965	0.803965	-0.621145	0.564444	0.56961	17170.032451
32	0.009102	0.002171	0.002184	0.000772	0.000185	0.767508	0.77533	0.77533	-0.04141	0.626667	2.903426	2113.531645
33	0.002605	0.001923	0.002171	0.001269	0.00011	-0.914304	0.229075	0.229075	0.832599	-0.031111	0.345334	11899.854049
34	0.005498	0.001821	0.001923	0.001062	0.000121	-0.165307	0.004405	0.004405	0.467841	0.057778	0.369122	3853.508036
35	0.006774	0.001806	0.001821	0.001238	0.000193	0.16479	-0.028634	-0.028634	0.777974	0.697778	1.583272	2692.377161
36	0.007748	0.001778	0.001806	0.000717	0.000002	0.416958	-0.090308	-0.090308	-0.138326	-0.991111	-0.893096	2466.745089
37	0.008234	0.001752	0.001778	0.000458	0.000048	0.542783	-0.147577	-0.147577	-0.594714	-0.582222	-0.929307	2333.102919
38	0.00999	0.001392	0.001752	0.001037	0.000125	0.997411	-0.940529	-0.940529	0.423789	0.093333	-0.366524	1304.497445
39	0.002831	0.001605	0.001392	0.00087	0.000073	-0.855793	-0.471366	-0.471366	0.129515	-0.36	-2.029009	9980.637786
40	0.004946	0.001949	0.001605	0.001303	0.000072	-0.30822	0.286344	0.286344	0.892511	-0.368889	0.788089	4594.48723
41	0.004572	0.002087	0.001949	0.000533	0.000118	-0.405049	0.590308	0.590308	-0.462555	0.031111	0.344124	6099.871177
42	0.004367	0.002037	0.002087	0.000726	0.000207	-0.458123	0.480176	0.480176	-0.122467	0.822222	1.201985	6123.103005
43	0.00601	0.001911	0.002037	0.001015	0.000051	-0.032751	0.202643	0.202643	0.385022	-0.555556	0.202002	3553.96303

Machine learning classification

Compiled dataset is fed into an data clustering algorithm, Gaussian Mixture Model.

GMM :
A Gaussian mixture model is a probabilistic model that assumes all the data points are generated from a mixture of a finite number of Gaussian distributions with unknown parameters.

GAUSSIAN #0 : prior (0.545282), mean (129.379, 418.448), standard deviation (38.7298, 91.9504)
GAUSSIAN #1 : prior (0.320439), mean (295.578, 346.925), standard deviation (91.4166, 89.2962)
GAUSSIAN #2 : prior (0.134279), mean (591.123, 325.449), standard deviation (138.897, 89.386)

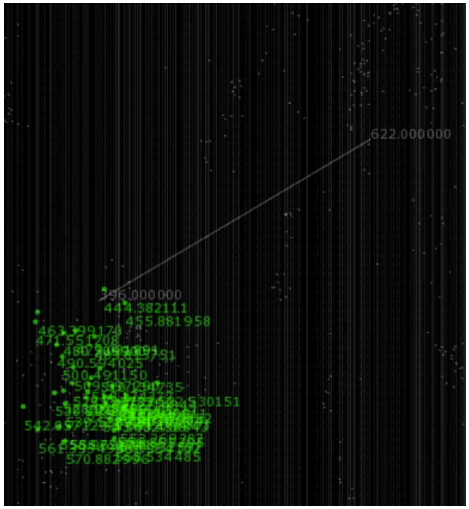


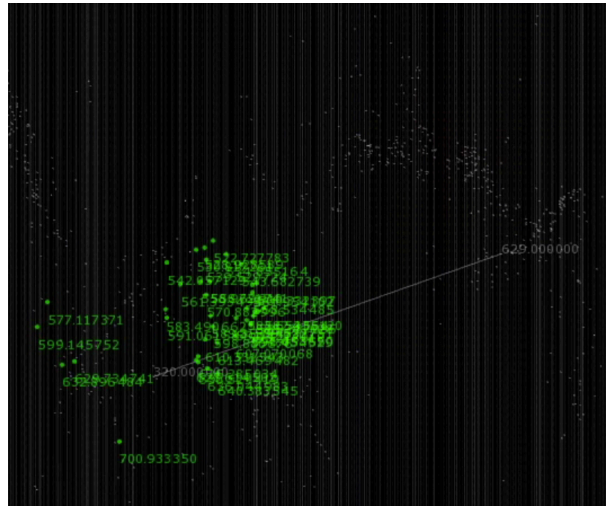
GMM modeling test for e^ix, 21. 07. 2019

openFrameworks library from @genekogan https://github.com/genekogan/ofxGMM

Arbitrary point predicted

Based on the *GMM* probabilistic model, make a prediction the resonance of an arbitrary point.





e^ix, 17. 10. 2019

Nearest Neighbour algorithm:
NN is a simple algorithm that stores all the available cases and classifies the new data or case based on a similarity measure. It is mostly used to classifies a data point based on how its neighbours are classified.

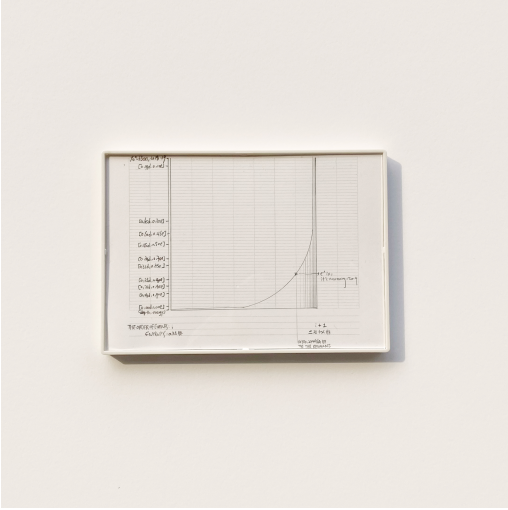
openFrameworks library from @neilmendoza https://github.com/neilmendoza/ofxNearestNeighbour

e^ix, it's necessary
nov.2019, @ZKM
data composition + performance

Artist statement

"We are drowning in information while starving for wisdom" - E. O. Wilson

The countless information within enormous bounds and the extremely fast speed of changing world are not only story in a media but our existing world. Based on the current consideration, how does our perception affect to our lives? Conceivably, our awareness be may surrounded by the massive noises. Throughout this work, we will discover the insight of our life, wisdom, under the noise in which the sound and its information, that's generated by AI technology, which describes the advanced technology and information of the future. The title , <e^ix, it's necessary>, indicates the arbitrary point of the cycle, which was borrowed from Euler's formula. Clear perception of a arbitrary point, e^ix, supply an attitude that distinguishes the signal from the noise, and perhaps this might be the only way to distinguish between information and wisdom.



The notation of e^ix, pencil drawing

GRAYCODE, jiiiiin

As electronic music composers, Taebok Cho (KR, 1984-, GRAYCODE) and Jinhee Jung (KR, 1988-, jiiiiin) have been collaborating in the field of sound and new media. These two artists manage various media in the form of sound, video, installation and sculpture through their individual work, and also have been succeeding as a collaboration, 'GRAYCODE, jiiiiin'. The language of their work has been boldly borrowing the methodology of physics. 'GRAYCODE, jiiiiin' inherited the legacy of the German scientist Heinrich Hertz, using algorithms to interpret vibrations and creating their own electronic signals that can be effectively visualized. The expectation on their artwork connotes to a sensory experience and a higher level of quivering beyond the sampling frequency of human senses.

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