UNIVERSE

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SC spatial additive synthesis

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<u>Tone degrees</u>: ton_galaxy, ton_sun

<u>VBAP and phase</u>: coordinate_cosmos as VBAP,
                 coordinate_cosmos+coordinate_galaxy+coordinate_sun as phases

<u>Tonal choice</u>: a location is chosen from the given object 'Spherical(mag, az, el)'.
            Magnitude represents the tonal degree of the respective object as
            unrounded float, and azimuth, elevation the location on VBAP. This means
            points closer to the origin have a lower tonal degree and higher amplitude.
            Every object has a min. tone degree of 0, thus a fundamental multiplier of 1,
            therefore the min. (eg. in the case of sun or galaxy, 'black hole') frequency of
            each object corresponds to the relevant band.

<u>Frequency bands</u>: 12Hz, 56Hz, 992Hz, 16256Hz
                6Hz   28Hz 496Hz 8128Hz   (Nikomachus, arithmetics, perfect
                number sequence

<u>Fundamental frequency overall</u>: 1Hz

<u>Sawtooth</u>: m; m bank dependent on location magnitude as rounded intervals eg.
          mag=bank=28

<u>Osc freq</u>: (fundamental*ton_cosmos*ton_galaxy*ton_sun) *m

<u>Osc: amp</u>: as above .reciprocal

<u>Aperiodic nature</u>: Osc is an aperiodic wave, either through fm classic, or fm via additive
               synthesis (see tonal_fm.scd file). All diferent object arrays, different suns,
               different galaxies, different cosmoi, have standard properties and
               structure abut are different point and modulation phases each time, thus
               array creation, relevant envelopes also aperiodic.

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Control layers:

- Pattern: sets control parameters on all Routines and SynthDef, each event under \dur is represented as a new cosmos, therefore each event is a cosmos envelope with total duration in which and according to its state through time, the corresponding nested envelopes for galaxy and sun.
- Routine A: sets a choice of galaxy from the possible locations in the cosmos array. 'nest0'
- Routine B: sets a choice (eg. three choices per galaxy) of sun from the possible locations in the galaxy array. (note at the early stages of the cosmos the galaxies are super-suns and after their collapse they develop to galaxies, hosting suns), 'nest1'
- Routine C: sets a choice of area on the sun from the possible locations in the sun array, time eg. four choices per sun.

Figure 1: By Andrey Kravtsov (the University of Chicago) and Anatoly Klypin (New Mexico State University) - http://cosmicweb.uchicago.edu/filaments.html, CC BY 3.0 us, https://commons.wikimedia.org/w/index.php? curid=10471335

- Cosmos: points are disperse, forming no object, as the universe expands points start to form super-suns(ss) , then galaxies from the ss black holes and other suns and solar systems (Figure1). If we suppose the universe ha no origin (point of origin as spatial property of the object is to be more correctly understood geometrically as temporal not spatial), then its object, if a cube, starts with a 'bing bang' where all points are completely dispersed and close to each other forming only their total group. As time passes (away from origin), points form groups, which in turn form bigger distances to each other gradually, than the individual points (monads) used to have. As time progresses even further the groups from ss turn to galaxies (first sun deaths), and other suns clump as groups in the galaxies, forming thus a final grouping and distribution of point as galaxies (Figure1, 9th state). Further in time as more suns die and become one with the center of galaxy supermassive black holes, and more and more supermassive black holes and galaxies fuse together and collide, distances become bigger further still and the gravitation of single groups even larger. When all points have clumped to a n number of ss black holes , (eg. because of cube model: 8 points), remaining groups have such large amount of gravitation that locations collapse even further the largest distance of 2 points and diagonal of the cube. During this state the two super groups collapse to each other forming one clump which in turn collapses to itself as spacetime itself. The result of this collapse is a big bang and a new cosmos again same in structure and timeline but different in character and duration, (aperiodic oscillation and aperiodic envelope).

- SS, super suns, are the first suns that form which when collapse form a supermassive black hole which groups other later suns to galaxies.
- Suns are created by the gradual grouping, (vortex, see Viktor Schauberger research on water vortexes), of points until they form a core. This core indicates a gravitational field which draws even further points to itself, the sun becomes larger to some extent and engages in fusion. When the fusion collapses, the sun collapses and turns to a black hole.
- The tonal development starts in band1, then with ss band2 is added times the sawtooth of ss and tone_galaxy as coordinates on ss, then coordinates on ss become suns as ss turns to galaxy, thus band2 has sawtooth bank of 1, and band 3 is added along with sawtooth of s(sun) and tonal location on the sun.

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<u>Choice structure</u>: choice of location on different objects sets the tonal properties of the oscillator, as described above. There is no instance where the emptiness of space is choice on whatever layer, the lowest frequency is also a 1x multiple of the corresponding object frequency band fundamental. In the layer of cosmos where there is an instance, at the beginning of its timeline envelope, where there are no suns whatsoever, and in general as this object is considered have no center property, as it expands to itself, as it is spacetime itself (no -1 layer), the coordinates although having an imaginary spherical point of origin (that of the cube case) and thus different magnitudes, and state in the timeline is from the state of monads up to the formation of the first suns from monad vortexes these monads (points in cosmos layer) set the tonal property of the ss/ galaxy (n_cosmos), not to be understood as spatial correspondent to frequency, but temporal (n_cosmos spacetime itself). This essentially means that the ss/ galaxy location for the most part of the timeline envelope, (Figure 1, states 1 to 9), as monads form suns and then galaxies, does not describe tonal properties of the Osc frequency as such, but only phase and VBAP location. Azimuth and elevation. In the case of localization properties of VBAP, according to cosmos coordinates in terms of magnitude, magnitude (as from imaginary origin point) sets the echo amount. That is if listener location considered at the center of the speaker setup, points further from the listener are wet and saturated and points closer dry and clear. More or less the sweet spot of the setup is the imaginary point of origin.

Before the creation of the first suns (monad state), the frequency components of Osc are just the (descriptive, not actual formulas follow) :

(fundamental*frequency_band1)

, as first suns appear, the frequency components gradually become:

((fundamental*frequency_band1)+
(fundamental*frequency_band2*sawtooth_ss*ton_galaxy))

, as later suns develop (galactic groupings) frequency components become:
((fundamental*frequency_band1)+
(fundamental*frequency_band2*sawtooth_ss(1)*ton_galaxy)+
(fundamental*frequency_band3))

and finally as the frequency components are shaped according to the sun object (final perception):

((fundamental*frequency_band1)+ (fundamental*frequency_band2*sawtooth_ss)+
(fundamental*frequency_band3)+(fundamental*frequency_band4*sawtooth_s*ton_sun))

Accordingly the corresponding routine chooses a location for ton_galaxy as points on the ss suns, and later points on the galaxy, and later a location for ton_sun as points on the sun.

<u>Frequency bands</u>: each band is a different sawtooth oscillator and all together form the entire spectrum. Cosmos is the first band with 6-28Hz, ss/galaxy is the second band with 28-496Hz, locations on the galaxy as suns is the third band with 496-8128Hz, and location on the sun is the fourth band with 8128-limit(16256)_Hz.

This structures as follows:

- Band1, osc1, fundamental0 basic wave, additive synthesis of 6,8,9,12,16,18,24Hz (6 sub oscillators) .
- Band2, osc2, fundamental1=28Hz wave, sawtooth with max 17 partials and tone one octave $ton\_ss=2^{(n/56)}$, max freq 952Hz, 28Hz when supermassive black hole.
- Band3, osc3, fundamental2=496Hz wave, tone one octave $ton\_galaxy=2^{(n/992)}$, max freq 8128Hz
- Band4, osc3, (pseudo band), fundamental2=496Hz, sawtooth with max 17 partials, tone one octave $ton\_sun=2^{(n/16256)}$, max freq 16864Hz, 496Hz when black hole.

<u>Routing</u>:

- ☐ RoutineA sets the location of the ss/galaxy in the cosmos array; VBAP.
- ☐ RoutineB sets the location of the point in the ss/galaxy array;
- ☐ RoutineC sets the location of the point on the sun(sun=point in galaxy).

<u>Ambisonic modulation and orders</u>:

- ► Cosmos: after big bang at total cubic distribution of all points, minimal distances, order max, as distances expand and groups are created, order decreases towards min, with order 3 at cubic 8 points toward 1 order diagonal, to 0 order collapse and big bang. Optional: Spread(harmonic bubble shape and width) is max after big bang and towards min to diagonal.
- ► SS/galaxy: from monad vortex state to ss state elevation not confined and order max decreasing towards collapse. At collapse galaxy starts to form, elevation confined, and order again max towards 0 collapse of galaxy. Spread min at vortex state towards max before ss collapse, then again min towards max.
- ► Sun: order max towards 0 at sun collapse, spread min towards max.

<u>Tonal areas and VBAP</u>: as the VBAP location is a point in the cosmos array, a tonal area is defined by expanding this location circularly with more nearby points which correspond to the individual suns of the galaxy selected(cosmos location). This means that each location of RoutineA also contains very close proximity points defined by RoutineB and C.

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<u>Geometric consideration on speaker setup and symbolisms</u>:

the three basic astral objects described above can be expresses and represented aesthetically via dual compound polytopes. That is, two joint tetrahedra form the cosmos with a cube hull and an octahedral core, a cube and octahedron joint form the ss suns and galaxies with a rhombic dodecahedron hull and a cuboctahedral core, and finally the suns (and potentially planets) represented by a joint of an icosahedron and dodecahedron, with a rhombic triacontahedron hull and an icosidodecahedral core.

	Cube	Octahedron
	Rhombic dodecahedron	Cuboctahedron
	Rhombic triacontahedron	Icosidodecahedron

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