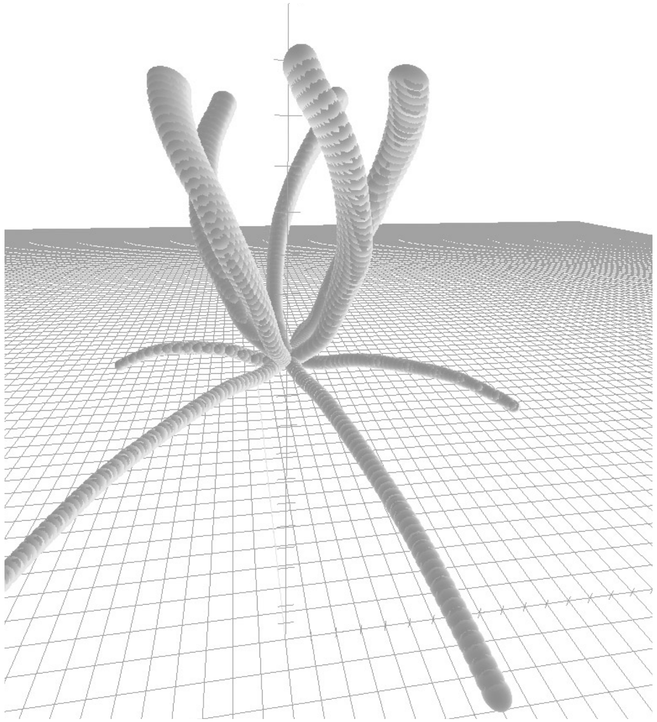
What to optimize?

While there are many free or commercial tools to render 3d animations and to define complex scripts in one way or another, we'd rather use something that works like a modular object tree with rich math functionality and allowence for every parameter or function to modulate everything else in the scene.
on the other hand, graphical effects and render techniques are developed to an extent where photorealistic rendering of almost everything is only a question of (computation) time.
we think, the same could be true for sound rendering. the software we used for this clip is this large scale parametrical modulation monster described above with opengl preview and the ability to export graphic scene scripts and audio tracks of virtual microphones and sound sources.



Cyma originates from the greek word „Kyma" that means „wave" or „billow" and is a theogonic prefix for some ancient godesses - within the Nereides - specifically known to be associaed with waves.

Cymatics is known to be the science of the form-giving behaviour of complex mechanical waves within physical media. Sonics are known to be mechanical waves within air: Sound.

Defining Cymatics as the general morphic laws of complex-harmonical integrated waves - **CymaSonics** is the advancement of cymatical laws on sonic waves to create spatial soundfields.

Scientific Art in Light & Sound

Beeing a small team of complex detail loving musically inspired enthusiasts we use many different programming & design platforms to create & to perform audio-visual arts synchronous and in space.

We specified in the creation of scientific art content in live-shows, workshops, studio sessions as well as in music productions

Cont@ct InFormation

TEN ART COMMUNICATIONS
Jan Zehn & Stefan Berke
Spitzweidenweg 28
07743 Jena

E-Mail: hello@cymatrix.org

www.cymatrix.org

EN

CymaSonics

MATRIX OPTIMIZER

v 1.0.1

Fulldome audio-animated video clip
by
Jan Zehn & Stefan Berke
Ten Art Communications

@ Fulldome Festival Jena 2010

CymaSonics

Grand Harmonical Matrix

the **first scene** demonstrates the from giving method we simply call CymaSonics using axial projections of three sine functions to define a single curve in space.
for simplicity this process is demonstrated here in two dimensions (fig 1). consider two sine functions where the second one is phase shifted 90^o. one period of the two sines projected onto the x,y plane forms a circle. if we double the frequency of the x function an 'eight' (fig 2) emerges. while doubling the frequency of the y function - whose phase is shifted, we get (fig 3).

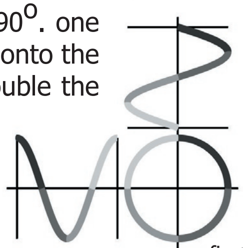
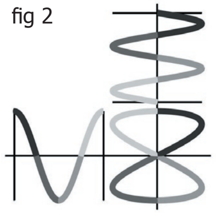


fig 1

fig 2



the figures in the film where calculated using three dimensions and by freely changing frequency ratios and phaseshifts. while the graphics simply represent one period of the function, the result of using the calculated coordinates to position a sound in time is a **continous movement**. this can be archived through spatial sound panning and phase adjustment for a distinct speaker setup and lets one explore the shape universe acoustically.

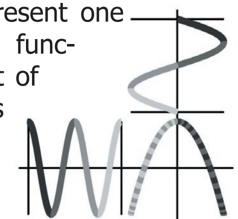


fig 3

of'course we are not limited to a certain number of underlying sine functions. for example (fig 4) shows cymasonic shapes resulting from a modulation of the amplitude of x and y functions with an arbitrary frequency.

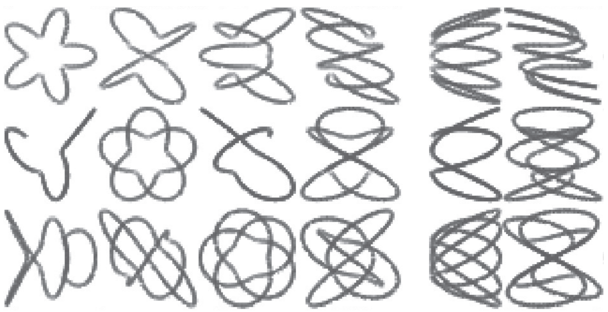


fig 4

the **second scene** starts off with 10 such cymasonic shapes, their parameters choosen to form the word CYMASONICS.
while the camera moves along, one can hear that each figure's sound is a single note of a d#maj7 chord. to demonstrate their movement acoustically the figures begin to move **around** the camera / listener for a couple of seconds.
later we span a 2d grid of cymasonic forms (as described before, y=90^o phase shifted) and set their frequency ratios to their x and y positions in the grid. below you see the kind of forms that emerge from this setting for range 1 to 17. bottom-left is the now familiar circle with 1:1, right to it the 'eight' with 2:1, aso...

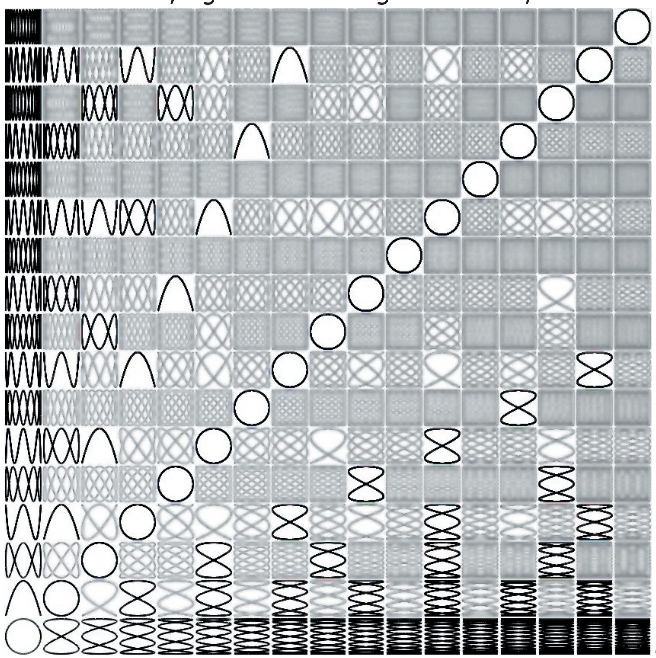
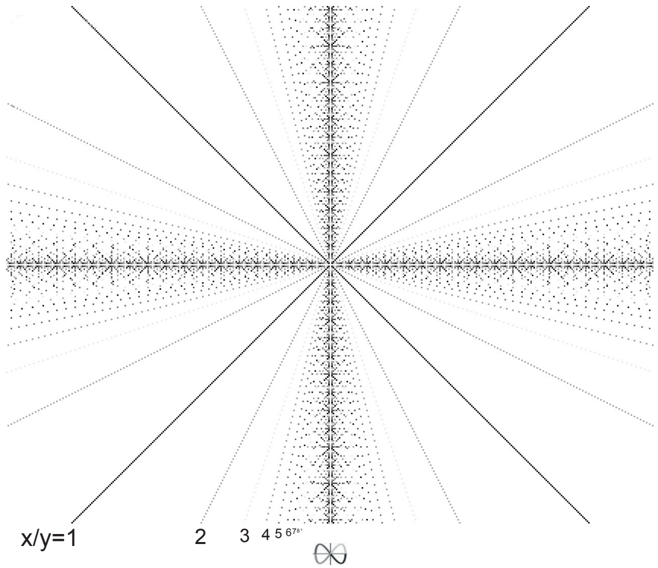


fig 5

the black figures are those for which the term x/y or y/x results in a natural number (example: 6/3, 8/4, 7/1, aso.) whereas the gray shaded figures have non-natural quotients. this model of constraints leads us right to the ↗

the **third scene** demonstrates the realm of numbers in a three dimensional integer grid where every sphere represents a 'harmonic', integer quotient for the term x/y/z (or any other combination like y/x/z).



the harmonical matrix (here in two dimensions (426x341)) seems like an infinitely large look-up table for natural arithmetics. for example, consider the complexity and unsolved questions about the nature of prime numbers. the above image looks like a simple model of axes with fading gradient, but at integer resolution as depicted in (fig 5) one can intuitively understand why a prime is actually prime, just by looking at it.
the matrix in our clip expands 24 units in all three directions, leading to 1496 locations for sound sources which in turn reflect the result of x/y/z in terms of the note pitch of a nice phase modulated sine wave, with 3.14159265... notes per octave.
we move the listener once right through this sound object and back into space below the glittering stars of the matrix of harmony for which we used the beta term and some modulations to bend it around the dome.