Effluvium at the New Media Lab

Sound is produced by a vibrating source and transmitted, via sympathetic vibrations in the molecules of the air, to our ears. We interpret the quality, or timbre, of a sound by its specific vibration pattern. This complex pattern, called the waveform, can be understood as a combination of many simple waves, called partials that unite to create an overall impression of the sound. There are an infinite number of possible mathematical relationships between the constituent partials of the total waveform. One such relationship occurs when the frequencies of the partials are all multiples of a single, lower frequency. Under these conditions, the partials are said to be harmonic partials, and their common denominator is called the fundamental. An interesting property of harmonic partials is that if a group of partials is sounded, even in the absence of their fundamental source vibration, they cause the fluid of the ear to vibrate as if the fundamental HAD been sounded. Furthermore, our ears will not perceive the individual partials, but only the fundamental frequency, which exists only as a ghostly result of these higher frequencies.

In the world of computer synthesis, it is possible to construct complex sounds by manipulating individual partials. One of my recent projects was designed to explore the fuzzy boundary between individual partial perception, and fundamental perception. This phenomenon, sometimes called effluvium, occurs when a listener's ear mechanism transitions between interpreting its input as several higher frequencies and a single low frequency. My piece, called Effluvium, is a musical exploration of the phenomenon.

At the Mew Media Lab, my aim is to reconstruct Effluvium with dynamic video using MAX/MSP/Jitter. The frequency, spatial location and amplitude of each of 32 partials will be visually represented in real-time using three-dimensional modeling. The new multimedia work will supply the perceiver with the added dimension of sight, allowing for a more thorough experience of this wonderful sonic event.

Effluvium (Original Conception)

Effluvium, as referenced by the title, refers to the point at which the listener begins to perceive a fundamental instead of the individual partials, or vice versa. The principal concept behind this piece is to explore this point, and to elaborate the relationship between overtones and fundamental. Density of partials, relative spacing of partials, diffusion of partials, and envelope of partials are all important points of investigation. In the first section, individual partials are brought in slowly, but fade away just as a hint of the fundamental can be heard. As the section progresses, the fundamentals eventually emerge and the texture gives way to a passage of low notes, whose partials undulate from within. A section of bell-like tones follows, in which the listener can readily perceive certain melodic properties of the overtone series. Increasing density of texture sparks a climactic section characterized by the rapid jiggling of each partial at different rates (I call this "overtone jello") and the eventual breaking apart of the fundamental into its constituent thirty-two partials.