# A Sound You Can Touch

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**ABSTRACT**

This paper describes the on going tech-tile project: an exploration of visual and sonic texture enabled by a mapping of textile images into sound and virtual patterns. This is performed live and 'translated' into new forms of material research through the jacquard process, itself a functioning conceptual machine within the analogous mechanism of the loom. The version of Swarm Tech-Tiles presented here differs from previous versions. A much larger swarm is used, and the sonifications follows a different scheme. The dynamics of the large swarm relates more closely to the notion of insect swarms. The assimilation of the image by the swarm is accomplished by erasing a small amount of texture at each rendering. As the texture diminishes, particles find it increasingly hard to deposit attractions, until the pattern is completely washed from the image and the particles fly endlessly over the barren landscape.

**Introduction**
In ' A Sound you Can Touch", Blackwell and Jefferies explore visual and sonic texture. A mapping of textile images into sound enables this. The images are scanned from complex weaving patterns generated by the jacquard loom. Multi-stranded, coloured textures are digitally represented and are translated into sonic experience. As audience we can engage in an unrestricted play of associations that are called into consciousness and can run riot there. What do we sense? What is to be touched as the sound touches us? What do we attend to and how do we hear?
The audience is invited to interact with 'A Sound you Can Touch'. There are several simultaneous performances. Firstly, the audience can experience the virtual warp and weft as new textile patterns emerge and mutate into new threaded textures, secondly, the swarm and sounds that move over the texture of the virtual surface are played with and improvised in live performance. These effects permeate the sounding posture of mobile bodies in time and in space. Outside of the body, vibration is also operative as the prioceptive sense connects to the body's surface and to the sonic textures produced.

**Swarm Tech-Tiles**
Swarm Tech-Tiles is responsible both for weaving sound and the sonification of weaves. Incoming sound is mapped to a textile pattern by weaving, as warp and weft, two linear sequences of audio samples (left and right channels). A simple re-scaling converts samples to pixel values. The sonic texture, which is one dimensional and temporal, is therefore related to a two dimensional visual texture. Micro-textures can be explored by clicking the mouse at various points on the pattern, causing a small tile of image texture to unweave into a grain of sonic texture, which is immediately heard.
It would appear that the time domain is lost in woven sound, frozen in a static image. However our shifting attention reconstructs a narrative from pictures and images. In our model of attention, a viewer's gaze moves between regions of strong micro-texture, sometimes returning to local areas of interest, sometimes exploring more dilute textures, until the pattern as a whole is assimilated. This model is implemented with a swarm of tiny particles, flying over, and interacting stigmergetically with, the image.

The swarm as a whole is seeking areas of high micro-texture, as defined by a mathematical function. Each particle assess texture at a small tile centered at each location it visits. If the micro-texture is larger than any previously being exploited by the swarm, an attractor (depicted as a green disc on the simulation) is deposited at this site. In an analogy with the biological process of stigmergy [1], other particles flying within the disc will be drawn towards the attractor (food source). However, the attractor's resources are partially consumed at each particle visit until the attractor vanishes and the captured sub-swarm scatters, to begin searching again. The consumption of the attractor followed by re-exploration of the image models (and, in this instance, drives) the shifting nature of our attention. And, of course, new attractors might be placed at previously visited sites. According to the unpredictable configuration and history of the swarm, there might be periods when no attractors are present, and the swarm wanders aimlessly over the image. Momentarily we are unable to find anywhere to hold our attention. When this happens, attractors will eventually be created, even if the local textures are comparatively weak.
The version of Swarm Tech-Tiles presented here differs from previous versions of the program [2, 3] in a number of respects. A much larger swarm is used, and the sonification follows a different scheme. The dynamics of the large swarm relates more closely to the motion of insect swarms. Additionally, the rendering of image micro-texture to sound utilizes "self-organized criticality" [4] to define sonic events. Previously, every location visited by a particle was rendered into a tiny sound grain: a stream of texture is produced by the continuous motion of the swarm.
In the current implementation, sound only emanates from the regions of interest, as defined by the attractors. Each particle, replenished after visiting an attractor, has an increased desire to render any good texture it may later discover as a sonic micro-event. This desire grows with each attractor visit, until the particle becomes 'critical'. At the next visit, the particle will certainly produce sound, and in doing so will pass on some of its criticality to other neighboring particles. These other particles may then become critical, more texture is rendered, criticality is passed to other neighbors, and the avalanche continues until no neighbor is critical. This model departs form the normal form of self-organized criticality by the use of a social rather than a spatial neighborhood (although a social neighborhood might also be spatially confined), allowing micro-events from different attractors to constitute a single macro-event. The assimilation of the image by the swarm is accomplished by erasing a small amount of texture at each rendering. As the texture diminishes, particles find it increasingly hard to deposit attractors, until the pattern is completely washed form the image and the particles fly endlessly over the barren landscape.

**Jacquard and new material research**
What has been described has, in part, been an example of the translation of one aesthetic practice into another via a computer-media process. In citing initial production via the jacquard loom, one can arguably trace the genealogy of the computer from the first patterns of weaves to the fabric of communication; images comprised of pixels. The

jacquard loom has been described as exhibiting “the selective powers of the human brain and the dexterity of living fingers” (Blum 1970: 4). An aesthetic conception is transposed into a language, which the analogue machine can read.In her Notes by the Translator written to clarify the work Sketch of the Analytical Engine Invented by Charles Babbage, Ada Lovelace emphasises the word ‘translator’ in her title, which could be applied to the translations of woven texture into sonic output. Lovelace’s work with Babbage’s Analytical Engine in the 1880s explored the manifestation of symbolic logic via the encoding of the punched cards as used, then, in the jacquard process. The punched cards of the Analytical Engine function as a ‘translation, just as the new software programme Pointcarre ‘translates’ sketches and the structures of satin and twill weaves into readable code for the modern jacquard looms.’ This might be described as an aspect of contemporary computer-art practice and a generative process. There is a direct analogy to punch cards functioning as “conceptual machines” within the analogue mechanism of the loom, to the software/hardware paradigm in computers. Code functions as a creative vehicle of the translated aesthetic and perfomative conceptions of the artists.
Out of the sonic translations that unfold in ‘A Sound you Can Touch, new material research is being produced. Whilst sonic variables are activated via live performance and the potential interactivity of the user, the generated virtual, textile patterns are ‘captured’ and worked into new jacquard cloth. The re-interpretation of sound into the image and woven material references Blackwell’s 18th March 2005 performance and the retinal charge (assimilated into the textural and tactile) of Mondrian’s Broadway Boogie-Woogie (1942-43). Touch has performed sound and sound generated new rhythmic pulses and vibrations ‘translated’ into further haptic/tactile readings.

**References:**

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