Sonik Spring™
Real-Time Sculpting of Sound and Video

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The Sonik Spring™ is a handheld wireless controller, designed for electronic music performance, real-time sound and video processing, DJing and video-DJing. It is a tangible interface built on a 15-inch metallic spring that can be compressed, expanded, twisted, shaken or bent in any direction, prompting the user to combine different types of intricate manipulation. The interface tracks and maps changes in the spring's shape and motion into sonic and visual parameters, and uses a computer for real-time synthesis and processing of audio and video data.

The Sonik Spring™ was created as an interface to make the performer feel as if they were sculpting and touching sound and visual data in real-time. Using hand, wrist and arm motions, the performer directly translates discernible actions into a strongly grounded sonic-visual narrative. [1]

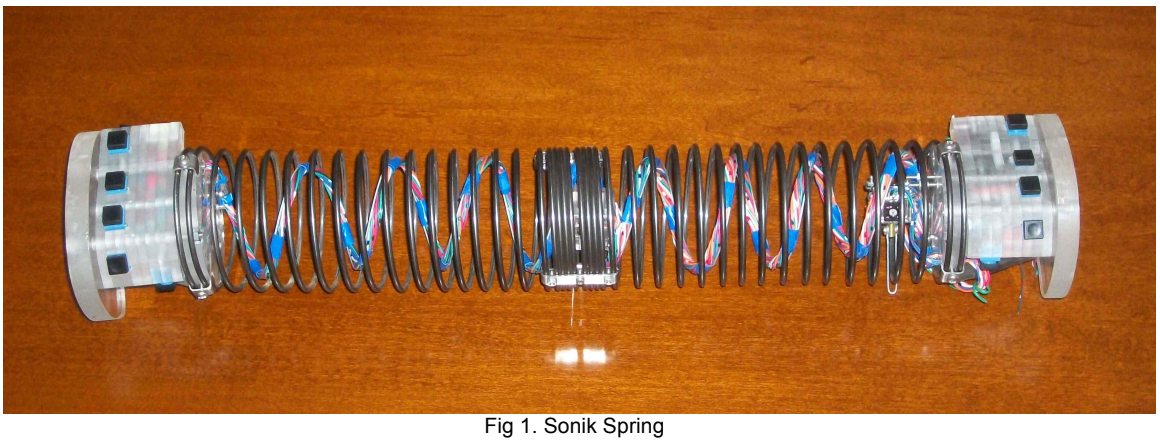

Fig 1. Sonik Spring

In addition, the Sonik Spring™ leverages its 3D-spatial manipulation with force feedback, as changes in the spring's shape, length and position are felt as a result of the coils' resistance. The interface is highly responsive and capable of delivering a wide-range of expressive content with great fluidity [2].

Previous controllers, such as the Sonic Banana [3], the G-Spring [4], and the Accordiatron [5], have approached the issue of extensible, or bendable interfaces. The Sonik Spring™ is an innovative and powerful alternative as a performance controller, as it adds force feedback and offers greater variety of motion.

The Sonik Spring™ uses accelerometers and gyroscopes to measure complex spatial motion and tracks the distance between adjacent coils to determine changes in the spring's length. The interface is portable, wireless, and comfortably played using both hands, allowing a high degree of control. These characteristics make it look and feel like a friendly, performable, “human-scaled” instrument.

The Sonik Spring™ has an unstrained length of 15-inches and a diameter of 3-inches. Overall length varies from 7.5-inches to 30-inches, a 4:1 ratio that is uniquely intuitive for applying mapping algorithms. The spring is attached to hand controllers which house orientation sensors and multi-purpose switch buttons. A wireless transmitter is housed within the right hand controller and collects information from ten analog sensors and ten switch buttons [6]. This information is sent to a computer running the Max software application, which processes all the data. The Sonik Spring™ can synthesize audio and video on the fly. To play and modify pre-recorded audio, it uses a granular synthesis software engine.

Fig 2. Fully compressing the Sonik Spring

Fig 3. Expanding the interface

The Sonik Spring™ is optimized as a tool for sound processing. A vocabulary of performance motions and shapes exerted on the spring have been identified that gives consistency to the relationship between the visual 'cues' created by the performer's actions, and the nature of the resulting audio. These include bending the spring up and down (creating the 'U' and inverted 'U' shapes); twisting the spring with both hands, or with one hand at a time; shaking the spring; and extreme expansion and full compression of the length of the spring. These gestural actions are particularly useful as cues for the selection, looping and immediate real-time modification of sounds and music that contain elements which can be easily separated. Elements such as short melodic motives, rhythmic ‘hooks,’ sound bites that contain features that make them sonically interesting, etc. Vocal and speech sounds are particularly well suited for live processing with the Sonik Spring™. One can isolate from small chunks of speech to individual syllables and minute utterances, and apply sound processing algorithms to those self-contained sound-units. Because the Sonik Spring™

uses a granular synthesis engine to assemble sound, 'cloud-based' speech effects can be generated using splicing and reshuffling of small fragments of sound.

Varying the spring's length is the most immediate and intuitive way to process or generate sound. For instance, mapping length changes to classic pitch transposition, where both pitch and tempo are simultaneously altered, is highly effective. Other mappings of the spring's length include changes in loudness, scrubbing effects when freezing sound playback, and vocoding effects.

Mappings of the accelerometer data include independent control of a sound's pitch and playback speed. Gyroscopes are used to perform panning changes, ring modulation, and filtering effects. The five buttons of the right hand serve to trigger sounds, control the sounds' time direction, implement looping effects with variable loop-start and end points, and perform beat grinding effects. The buttons of the left hand controller are used to reassign the mappings of the sensor data. Up to four different audio files can be processed and mixed in real-time, providing the means to create an interesting sonic canvas.

Algorithms for live video processing are currently being tested and include crossfading, mixing, color remapping, image distortion, etc. The testing focuses on the use of seven basic physical motions, easily allowed by the interface: squeeze, pull, bend, twist, shake, roll and turn.

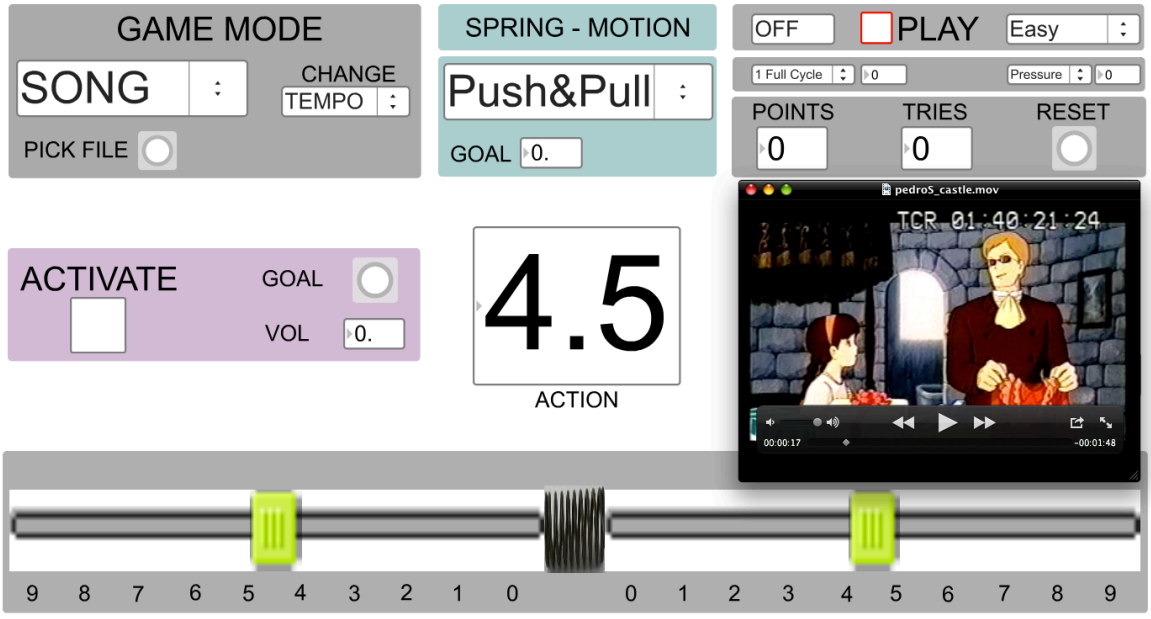

Fig 4. Video processing within a game-like environment

First experiments have included the manipulation of video data within a game-like environment where the user is able to change playback speed, impose color and image distortion, and mix two video streams.

Software to use the Sonik Spring™ as a tool for real time video-DJing is currently under development to explore the unique combination of real time processing of sound and video within an EDM environment. Because the interface is wireless, it allows DJ's and video-DJ's the freedom to untether themselves from their onstage gear and move freely within the audience.

The Sonik Spring™ is a patented technology where the combination of 3D motion in tandem with force feedback and a lexicon of visual cues makes for a highly compelling interface to process audio and video in real-time.

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[3] Singer, E. *Sonic Banana*: *A novel bend-sensor-based MIDI controller.* In Proc. NIME 2003, (2003), 85-88
[4] Lebel, D., Malloch, J. *The G-Spring Controller*. In Proc. NIME 2006, (2006), 220-221
[5] Gurevich, M., Muhelen, S. *The Accordiatron*: *A MIDI Controller for Interactive Music*. In Proc. NIME 2001, (2001), 1-3
[6] MIDItron Wireless Interface, http://www.miditron.com