

# TACTOSONIX: METAPHORS AND INNOVATIVE USER INTERFACES FOR MULTI-TOUCH AUDIO CONTROL

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## Introduction

The majority of touch-enabled musical applications tend to use established metaphors (an effects rack or a keyboard, for instance) or simply use single-finger input as a computer mouse. We identify a need for musical software that benefits from novel Graphical User Interface (GUI) elements and implements alternative metaphors to provide control over pre-recorded music, by taking into account multi-touch technology from the earliest stage of the design process. We hypothesize that this approach will lead to new interfaces for musical expression with the potential to facilitate DJ tasks.

Multi-touch technology offers the promise of going beyond traditional mouse-based user interfaces, and is particular in that it provides full embodiment: “the output device *is* the input device” [4]. This change in paradigm has implications in software design, not yet fully understood in tools for musical expression.

## Previous Work

Three different analyses of a Mozart sonata are presented by Zbikowski to highlight “the role played by conceptual models in theories of music” [12]. Metaphor (“the way we conceptualize one mental domain in terms of another” [8]) is a fundamental part of the human thought process that facilitates the process of cross-domain mapping [12] and exists as both conceptual and image mappings [8]. In music, Duignan et al. [3] identified and compared metaphors in two popular music production applications, *Reason* and *Live*.

While metaphor gives a conceptual direction to software design, GUI elements help implement the actual software. Innovative controls with potential in multi-touch software include stacked half-pie menus [6] for the convenient browsing of hierarchical data (e.g., file systems) and border crossing [5] to trigger sounds as when plucking strings. To select pixel-sized locations in a cursor-based environment, Benko et al. [1] propose dual-finger gestures including offsetting the cursor by an amount determined by the second finger, placing the cursor midway between the two, zooming in, invoking a circular menu, and slowing down the cursor with a virtual slider. Mouse-like clicking can be simulated with Simpress [1] on systems sensing the contact area of a finger.

Finally, several taxonomies exist for input devices in general [11] and tangible interfaces [4], although none has so far been developed for multi-touch devices. Kammer et al. [7] developed a taxonomy for multi-touch frameworks, but not for multi-touch systems. Similarly, no review of metaphors in multi-touch applications for musical expression exists, to the best of our knowledge.

## Proposed Research/Methodology

Our research will establish a context for multi-touch interaction by presenting the history of multi-touch devices, asking the question *Why multi-touch?* and presenting the limitations of such interaction. This will also include a review of metaphors in multi-touch devices for musical expression and a section that will categorize multi-touch musical applications based on the field of music

technology that they explore (i.e., music exploration, music control/sequencers, synthesis, and editing). Innovative GUI controls not necessarily used in musical applications will be presented along with other software considerations (modular software, code libraries, selection strategies, choice of gestures).

A taxonomy of existing multi-touch devices will be established to provide a method of classifying such installations based on two orthogonal axes: its first axis will be related to the technology used in providing multi-touch capability, while its second one will refer to the visual feedback provided by the device. We will also identify approaches for designing a multi-touch system for musical expression by exploring possible design spaces [2][11][9] and features that must be taken into account (multi-user, latency, and discrete vs continuous controls) when designing such an interface.

The thesis will present the result of such exploration in the form of a suite of software applications for musical expression on multi-touch devices, taking advantage of the benefits of metaphor as well as using innovative GUI elements. Taking as example the metaphor of MAKING MUSIC IS COOKING (used in Sound Kitchen [10] as an applied chemistry setup, but never in multi-touch applications), we will allow the selection of samples using stacked half-pie menus [6], the mixing of elements using border crossing [5] (i.e., the tipping point when pouring liquids), and the precise selection of quantities using the dual-finger midway technique [1]. In terms of conceptual models, half-pie menus to select available samples can be implemented in a chain-of-being hierarchy (e.g., section of the piece, tonality, sample) or in an atomistic hierarchy (“each level represents a conformance class”) [12]. Activating the buttons of an oven or stove will be simulated using Simpress [1]. We illustrate the link between DJing and cooking<sup>1,2</sup> by pointing at DJ/hip-hop terms such as *blend*, *mix*, *fresh*, and *cut*, much as Lakoff identified metaphor in fields as varied as mythology and foreign policy [8]. The use of explicit metaphors is also related to video games, an industry that brings music-enabled applications to the general public<sup>3</sup>.

A qualitative study will be performed on people with and without experience of touch devices, in order to assess which DJ tasks were facilitated by our choice of controls and metaphors, as well as tell us which metaphors were identified by the users. This approach will test our hypothesis and help identify top matches between novel controls and DJ tasks.

## Contributions

Our suggested taxonomy will provide a basis for the classification of multi-touch devices, a missing element in that field of research.

We argue that a wise choice of metaphors improves current practices in computer music by making interfaces simple (unlike *Reason*’s [3], which requires the duplication of modules if minor variations are required, due to a hardware-based metaphor), while the use of innovative controls can minimize the time and effort of repetitive tasks, as well as break down barriers between the audience and the performer. Although our research will focus on musical software, the related discussions can be extendable to other domains already exploring multi-touch interaction, such as newscasting and gaming. Finally, the wise choice of a development framework will allow the straightforward port of our source code to popular multi-touch devices such as mobile phones and tablets, providing a wide community with tools for musical expression.

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<sup>1</sup>[http://www.omelette.net.au/release/gourmet\\_savenger](http://www.omelette.net.au/release/gourmet_savenger), accessed 2011/02/20

<sup>2</sup><http://www.allmusic.com/album/pass-the-peas-the-best-of-the-jbs-r486032>, accessed 2011/02/20

<sup>3</sup><http://us.playstation.com/games-and-media/games/beat-sketcher-ps3.html>, accessed 2011/02/20

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