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Vox Tactum Meets Chorus Digitalis: Seven Years of Singing Surfaces

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ABSTRACT

The proposed performance features six musicians coming from two ensembles: *Chorus Digitalis* (Paris) and *Vox Tactum* (Vancouver, Mons). These two ensembles have grown separately from a common seed research on expressive gestural control of speech and singing synthesis, started in 2005. Several musical instruments have emerged from this research, such as *Cantor Digitalis*, *HandSketch* and *Choir-Mob*. As six of us are planning to attend NIME'13 with scientific papers, we would like to take this unique chance to gather on stage in Daejeon. By this mean, we hope to perform as one choir, just made of synthetic voices and fully operated by control surfaces. The performance will contain "scenes" that will reveal our various usages of tablets for the expressive production of artificial speech and singing.

Keywords

singing synthesis, laptop orchestra, tablet, touch surface

1. PERFORMANCE DESCRIPTION

In this section, we start with giving a bit of the background behind the idea of gathering two ensembles – *Vox Tactum* and *Chorus Digitalis* – at NIME 2013. Then we describe the idea of the performance and discuss its feasibility.

Background

In the history of NIMEs, there is definitely a "before" and an "after" the appearance of touch screen devices on the mass market. As a result, we observed the "touchification" – i.e. replacement by their touch equivalent – of many of those controllers in the field of realtime-performed electronic music. However it is interesting to highlight that the graphic tablet – particularly Wacom products – has always been able to capitalize on its input accuracy and reinvent itself as a multipurpose high-end controller. The accuracy, expressivity and cultural reference of the pen input results in a constant adoption of the graphic tablet by computer musicians, as described in M. Zbyszynski's paper [2].

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In 2005, we saw the unique potential of the graphic tablet to address a long-term issue in computer music: the expressive control of speech and singing synthesis. Indeed speech and singing synthesis communities were then both in search of new ways to overcome the lack of expressivity of their unit-based synthesis techniques. At NIME'06, we described a new singing synthesis algorithm designed specially for the tablet input [1] and performed a "virtual soprano + real organ" baroque duet in the *Saint-Elisabeth* church in Paris. From there, C. d'Alessandro and N. d'Alessandro went back in their respective labs and realized further research on new speaking/singing instruments. They also both created a musical ensemble, respectively *Chorus Digitalis* in Paris and *Vox Tactum*, started in Vancouver, extended in Mons.

A First Gathering

Together, these two orchestras supervise more than twenty-five researchers and musicians, enabling a dense activity of software development, research experimentation, paper writing, music writing and participation to various conferences, concerts and demonstrations. However, after nearly seven years of existence, our two groups have never formally performed together. We have shared some stages, playing one after the other, but we have never performed as one band. This year, we have submitted enough scientific material to possibly have six performers in Daejeon. We think this is a unique chance to realize this gathering.

Six Tablets, Six Voices

Chorus Digitalis and *Vox Tactum* are among the first choirs in the world entirely composed of synthetic voices and operated in realtime by control surfaces. *Chorus Digitalis* has been created in 2010 by the *Audio and Acoustic* team of the LIMSI-CNRS and is typically composed from two to seven musicians. The ensemble uses a vocal instrument called *Cantor Digitalis*. This instrument is based on an improved formant synthesizer, featuring source-filter interactions such as formant adaptation to pitch and voice strength, perturbation of glottal source, and a good-quality glottal source model – called RT-CALM – allowing a large range of voice qualities. The sung vowels are carefully set to make traditional voice types: bass, tenor, alto, soprano. Unusual voice types are also available, playing on the glottal source and the length of the vocal tract. Each synthesized voice sounds through an individual loudspeaker located behind each musician in order to spatialize the voices like in a real choir and allow the musicians to better hear their own sound.



Figure 1: Samples of Vox Tactum and Chorus Digitalis ensembles respective concerts, from left to right: solo HandSketch, 3 ChoirMob mobile devices + 1 Vuzik interactive display, choir of 6 Cantor Digitalis.

N. d'Alessandro has first started to do solo performances with his vertical augmented tablet, called the *HandSketch*, developed at the numediart institute. This instrument can similarly control formant-based synthesis and effects, using the SELF glottal source model. *HandSketch* has also been used with a specific PSOLA-based granulation algorithm, enabling realtime recording of voices and expressive transposed playback. In 2011, the *Vox Tactum* ensemble is born from two wishes: firstly, merging *HandSketch* technologies with the *DiVA* system developed at MAGIC and secondly, extending the musical experience of solo instruments to a more social situation, involving ubiquitous computing and mobile devices. *Vox Tactum* performances involve up to ten musicians and three major instruments have been played: *HandSketch* (tablet), *ChoirMob* (mobile) and *Vuzik* (interactive display). This ensemble also uses localized loudspeakers on stage, as a reference to the singers.

The proposed performance will gather three *Chorus Digitalis* plus three *Vox Tactum* performers, forming a six-musician tablet-controlled digital choir. Both ensembles have developed the ability to interpret the classical repertoire, foreign music and contemporary compositions, as well as improvising in a wide range of musical styles (the original 2006 performance was a baroque improvisation). Although the NIME'13 gathering will be a premiere, we are confident in being able to create a rich and constructed musical performance, based on these past experiences. Particularly, the common vocal background allows the two ensembles to share some musical vocabulary that will ease the collaboration: guttural droning and diphonic singing, baroque and classical choirs, interjections such as in *musique concrète* or acousmatic, vocoder effects, etc. We think we can put together a 20-minute improvised performance with "scenes" that will show various usages of six singing tablets.

Feasibility

In order to demonstrate the feasibility of the proposed performance, we list various past concerts and demonstrations in which we have deployed similar setups and have played similar kinds of music. As mentioned above, the real gathering of three *Chorus Digitalis* plus three *Vox Tactum* performers would be a premiere at NIME'13:

Chorus Digitalis

- In March 2011, during the *International Workshop on Performative Speech and Singing Synthesis*, Vancouver, BC: an improvisation, the medieval piece *Alta Trinita Beata* (anonymous), and the baroque Opera *Wie Schön leuchtet der Morgenstern* (J.-S. Bach).

- In May 2012, a diversified 45-minute program was set up for the *Printemps de la Culture* Festival, Orsay, France. It featured the minimalist piece *Polar Star* (P. Glass) accompanied by harpsichord, the contemporary choir piece *Valse* (from B. Lécossais), the experimental piece *Ocean* (Bjork and Dirty Projector), and the composition *Canticum Novum*:
http://youtu.be/9-9_YCJRe-4
- In October 2012, they played a 15-minute Indian classical *Raga Miyan Ki Malhar* accompanied by tablas, during *Science et Musique*, Rennes, France:
<http://youtu.be/l6gPCitX07c>

Vox Tactum

- In February 2012, during the *Fourth Margaret Guthman Musical Instrument Competition*, Georgia Tech, Atlanta, GA. The original quartet has played Aura Pon's piece *Intertwine* for four singing mobile devices and one interactive display, respectively showcasing the *ChoirMob* and *Vuzik* instruments:
<http://youtu.be/BNzV71vgJjI>
- In May 2012, a 25-minute piece called *Metastasis#2* (N. d'Alessandro) has been performed during the *Journées d'Informatique Musicale*, Mons, Belgium. It featured N. d'Alessandro playing *HandSketch* and Jean-Paul Dessy playing an augmented cello:
<http://vimeo.com/45080127>
- In September 2012, Aura Pon has premiered her second piece for *ChoirMob* mobile devices and one *Vuzik* interactive display, called *Concordia Discors*, during the *International Computer Music Conference*, Ljubljana, Slovenia. It featured a much richer interaction between sound and visuals as well as much more complex singing techniques on the touch screens:
<http://youtu.be/Jm-U9mLuyCs>

2. TECHNICAL REQUIREMENTS

The complete stage map is given in Figure 2. It accommodates six performers: three *Cantor Digitalis* setups, two *HandSketch* setups and one *ChoirMob* setup. There is a need of a reasonably large table per pair of musicians, in order to put two laptops, two sound cards and two *Cantor Digitalis* tablets per table. Each of the six performers will require the following items: a seat, one XLR connection to the mixer, coming out of the performer's sound card (one channel), one loudspeaker standing at about 1.5m high behind the performer (one channel), enough light and

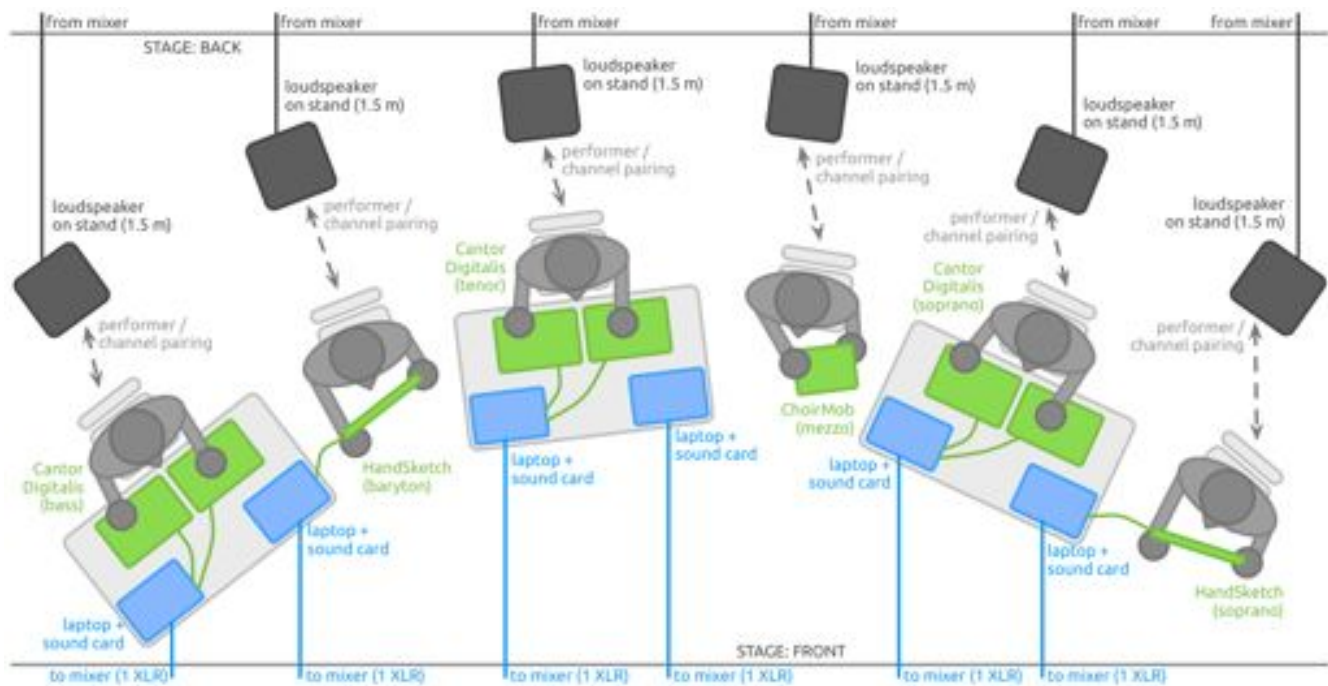


Figure 2: Complete stage map of the performance: 3 Cantor Digitalis, 2 HandSketchs, 1 ChoirMob.

two power plugs (loudspeaker and light not included). The mixer needs to map the performer's mono sound to its closest loudspeaker. These six loudspeakers also serve for the audience, there is no need for front speakers.

3. BIOS AND DETAILS

Here follows the list of bio and details:

Nicolas d'Alessandro

N. d'Alessandro is a postdoctoral researcher at the numediart institute. Since 2004, he has been exploring the gestural control of speech and singing, through 3 musical instruments: *HandSketch*, *DiVA* and *ChoirMob*. Today he also supervises the *MAGE* project. He is also a guitarist.

Christophe d'Alessandro

C. d'Alessandro is a senior scientist, CNRS research director and the Head of the Audio and Acoustics group at LIMSI-CNRS. The unifying theme of his research is a multidisciplinary approach of music, sound, gesture and language, including analysis and synthesis. He is also an organist and composer, titular organist of Saint-Elisabeth church.

Lionel Feugère

L. Feugère is a PhD student at LIMSI-CNRS / UPMC (C. d'Alessandro). His research interests are singing voice and design of digital musical instruments. He is the main developer of *Cantor Digitalis* and the current leader of *Chorus Digitalis* since 2010. He also plays drums and tabla.

Maria Astrinaki

M. Astrinaki is a PhD student at the numediart institute (N. d'Alessandro). Her research interests are expressive control of speech synthesis and interactive software design. She is the main developer of the *MAGE* HMM-based speech synthesizer and also worked on the *HandSketch*.

Johnty Wang

J. Wang has graduated in ECE from the University of British Columbia in 2011. His research interests are hardware hacking, hardware-software integration, speech synthesis and musical experience design. He is the co-creator of *ChoirMob* (N. d'Alessandro) and the main developer of *DiVA*.

Olivier Perrotin

O. Perrotin is a PhD student at LIMSI-CNRS / Paris XI University, in the department of HCI, as part of the Audio and Acoustics group. After a degree in Signal Processing at GIPSA-Lab / UMich, he joined the research group on gestural control of speech synthesis and *Chorus Digitalis*.

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Additional authors: Aura Pon (iLab, University of Calgary, email: aapon@ucalgary.ca) and Boris Doval (Pierre and Marie Curie University, email: boris.doval@upmc.fr).

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