About This Issue

Much of the earliest research in computer music involved not synthesized sound, but algorithmic composition for traditional, acoustic musical instruments, and this remains an active area to this day. In this issue's first article, "Between the Abstract and the Concrete: A Constraint-Based Approach to Navigating Instrumental Space," Luc Döbereiner critiques this tradition. The author argues that most algorithmic composition for traditional instruments has treated music in an abstract, instrument-neutral sense, ignoring the rich parameter space involved in playing specific instruments. As a counterexample, he presents his software OboeJS, which allows the user to specify constraints for generating sequences of oboe fingerings (where "fingering" is used broadly to include not only finger placements but also parameters such as embouchure and air pressure). The oboe multiphonics depicted on this issue's front cover exemplify search results using such constraints. The author's aim is to derive musical structure from the space of possibilities of the instrument itself, instead of considering only an abstract space of pitches, durations, and dynamics.

The next pair of articles presents research in two areas of robotics: aesthetics and technology. Alexander Sigman's article surveys robot operas, i.e., multimedia musical works in which intelligent agents play a central role. The survey's analytical orientation derives from the aesthetic criteria of the early 20th-century Bauhaus artist László Moholy-Nagy. Moholy-Nagy favored theatrical presentations featuring mechanized apparatuses, with humans either absent or at least occupying a role that did not overshadow the machinery. Sigman considers whether the robots in some recent operas replace human actions and modes of expression (à la Moholy-Nagy), augment them, disembody them, or absorb them (such that the robot is essentially just a virtual human, contradicting Moholy-Nagy's goals).

The technical article by Juan Pablo Yepez Placencia and co-authors examines the organology of an important subset of musical robots: self-playing, mechanized stringed instruments. Many of these mechanical-electronic, or "mechatronic," chordophones were inspired by the electric guitar. Accordingly, this survey focuses on designs that play the strings by plucking them. The authors analyze different approaches to frame construction, such as whether the device's frame holds an array of actuators (such as solenoids) corresponding to all the possible pitches, or whether there is an independent mechatronic module per string. The article goes on to examine plucking mechanisms, transducers, and pitch selectors, and then lists ways to overcome design challenges such as noise, electromagnetic interference, and latency. The authors also describe how mechatronic chordophones can be enhanced through software intelligence and various techniques for user control.

In our final article, David Johnson and colleagues describe a system for detecting a pianist's hand positions. Whereas a common application of hand detection in computer music involves gestural control of synthesized sound, the application described in this article is instead pedagogical. The goal is to detect when a piano student's hand posture deviates from normative playing technique. The posture detection system uses a 3-D structured light camera, such as a Kinect, placed above the piano to capture the student's hands from overhead. The camera produces the 3-D information as a depth map, whose pixels are then processed to segment the left and right hands. The next step is to extract features. The authors describe their experiments, using data captured from beginning piano students, to evaluate two different feature-extraction algorithms: histograms of oriented gradients

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Front cover. Two illustrations from the article by Luc Döbereiner, each showing a group of multiphonics available on the oboe, as retrieved by an OboeJS search. In the top illustration, consecutive multiphonics share at least one strong partial. In the bottom illustration, they share all but one or two pitches. The top two "staves" in each illustration depict the oboe fingerings, and the lower, conventional staves show the resultant pitches (louder ones being represented by larger noteheads).

Back cover. A set of images from this issue's Products of Interest section.

and histograms of normal vectors (HONV). The HONV algorithm was found to be more accurate, especially when it incorporated an improvement by the authors.

The Products of Interest section describes new versions of the popular Max and Cubase software environments as well as some plug-ins. Numerous hardware devices are also announced, among them mixers, controllers, audio interfaces, and microphones, the last of these including an Ambisonics recorder.