Techniques at the Intersection of Computing and Music

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Abstract
Our work on Performamatics aims to enhance students’ computational thinking (CT) by engaging them in fundamental concepts that unite computing and music. Our approach leverages students’ near universal interest in music as a context for rich CT experiences. The techniques we share are used in a General Education course open to students of all majors to pick up and has some terrific capabilities about what, exactly, constitutes “music.” Students begin by sequencing sounds in Scratch in a manner similar to what they did in Audacity. There is much more they can do, however, using loops and control structures. They also learn about the limitations of computer software as they try to do things that the system just can’t handle.

Next we introduce intervals, focusing on the major 2nd and the perfect 5th. We show students how to program these and we have them create a composition using only these intervals. More advanced students program the intervals algorithmically and add randomization to have the music change each time it is played.

To introduce lists, we have students work on a piece that they must transpose from one key to another. This forces them to use offsets controlled by variables.

Finally, we introduce physical interaction between Scratch and the Ichiboard, a small device packed with sensors, a slider, a button, and accelerometers from which Scratch can read values that control the notes it plays (see www.cs.uml.edu/ecg/index.php/IchiBoard/IchiBoard). This technique gets students doing the most sophisticated programming in the course, as they must scale the sensor values to ranges that are appropriate for playing music.

Culminating Performances
Our course builds to a “recital” in which students showcase final projects based on the course assignments. Performances are in a venue other than our normal classroom, and students are welcome to invite their friends and family. Middle and secondary school students also attend, not only for their own benefit, but for the benefit of our students, as well. By explaining their work to younger students, our students expand and deepen their own understanding of the intersection between computing and music.

Our presentation will feature videos, recordings, and live examples of student work to demonstrate the types of results that students produce for the assignments described above.

Project URLs and Locations of Materials
Further information on our work and the materials that we use in our classes may be found at:
- Performamatics: http://www.performamatics.org
- Sound Thinking: http://soundthinking.uml.edu

Acknowledgments
This work is currently supported by National Science Foundation Award No. 1118435, “Computational Thinking through Computing and Music.” Principal Investigators: Jesse M. Heines, S. Alex Ruthmann. Senior Personnel: Fred G. Martin and Sarah Kuhn. Any opinions, findings, and conclusions or recommendations expressed in these materials are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.