

Pendulum: A Programming Toolkit for the Development of Physically Interactive Art Applications

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Workshop Description

This workshop will introduce participants to Pendulum, a programming toolkit designed to acquaint learners with computational thinking, programming, and interface design while also exploring the role of play and embodied cognition in these areas. Pendulum includes a continually evolving library of modular abstractions developed in Puredate (Pd), a graphical programming language used for creating interactive musical and visual applications. While Pd can accommodate nearly any kind of conceivable input, Pendulum focuses on the Nintendo Wii controller as an end-user input device; trading mouse and keyboard-based input for position, acceleration, and multi-axis rotation presents a number of exciting opportunities and challenges to the programmer in addition to providing an opportunity to study how dynamic physical activity and consequently rich input impact learning and practice in programming.

As a constructionist learning technology, Pendulum takes advantage of a number of features of the Pd language. Modular abstractions permit fruitful exploration and theory-making by allowing learners to incrementally increase the complexity and sophistication of their programs; for instance, a user might begin by simply plugging his or her Wii input into a virtual scope, visualizing rotation around a particular axis. Next, this same data could be expressed numerically and the user could scale it or apply any kind of mathematical function to it. At any point in this process the input could be directed towards one or more of many available functions for synthesis and manipulation of audio and video, but the learner has ample opportunity to test and refine his or her understanding along the way. As a dataflow programming language, there is no compiling and programs can even be editing while running, providing literally instantaneous feedback. Because Pd is open-source and existing programs can be modularized rather easily, Pendulum applications are highly shareable in whole and in part, in face-to-face learning communities or across the internet. Perhaps most powerfully, changes in programming understanding and computational thinking have dramatic payoffs in breadth of potential creative expression. For instance, learning a new computational concept such as recursion could completely reinvent a learner's notions of how the virtual musical instrument that they've constructed might manipulate or produce audio. Subsequently exploring potential applications could further refine their computational recursion understanding.

The workshop will begin with a short tour of the Pendulum system and the presentation of some projects that have been developed by learners of a variety of ages and backgrounds. Following this, participants will be able to discuss, tinker, and construct, as a larger group at a main workstation or at one of several satellite stations. All are invited to download the appropriate software (www.activelearninglab.org/pendulum) prior to the workshop and use their own machines if they like, with the presenters providing as many Wii controllers as they can make available. Near the end of the workshop participants can present what they have created if they choose to and the presenters would welcome questions, feedback, and a discussion of related topics of interest.

Keywords

keyword; programming, computational thinking, embodied cognition, music, art, dance, interfaces, open source