## Workshop Title: Finch, Hummingbird, and Snap!

## Presenter Details

Tom Lauwers
Founder, BirdBrain Technologies LLC
4110 Murray Ave., Pittsburgh, PA 15217
Phone: 412-216-5833, Fax: 412-283-9134
Email: tlauwers@birdbraintechnologies.com

## Session Overview

We will introduce attendees to two hardware platforms used to teach computer science, math, science, and engineering: the Finch robot, and the Hummingbird Robotics Kit. Both platforms were developed at Carnegie Mellon's CREATE lab and are now commercially available. Finch and Hummingbird connect to a computer over USB and can be programming with Snap, which is heavily based on Scratch. We will demonstrate the basics of using Snap to program the Finch and components from the Hummingbird kit. Come learn how to control pen graphics with accelerometers, control robots with "key pressed" commands, set shiny, color-changing LEDs to respond to how much light is in the room or how loud it is, and much, much more!

## Presenter Background

Tom Lauwers is the founder of BirdBrain Technologies LLC[1], a Carnegie Mellon spin-off devoted to commercializing educational tools developed at the CMU Robotics Institute's CREATE lab.

Tom received his Ph.D from the Robotics Institute in 2010 for research into how to design educational tools such that their features properly align with the learning goals and learner characteristics of a specific course. Two of the projects Tom worked on as a student are now commercially available: the Finch robot and the Hummingbird Robotics Kit. Tom's primary responsibilities on these projects prior to graduating were designing the hardware and coordinating curricula, software, and pilot studies in cooperation with high school and college educators.

Tom has extensive experience leading workshops on Finch and Hummingbird, traveling to conferences several times per year to do hands-on workshops of this nature.

[1] www.birdbraintechnologies.com

# Background Information on Finch, Hummingbird, and Snap!

## Finch Robot[2]

The Finch is a $99 robot designed for introductory computer science education. It is the result of the four year CSbots study at Carnegie Mellon's CREATE lab. The Finch is designed to allow students to write richly interactive programs using light, sound, and motion outputs and a suite of sensory inputs. The Finch is currently programmable in Java, Python, C, C#, C++, Visual Basic, Processing, Scala, MATLAB, and several drag and drop languages, including Snap.

Figure 1: Two Finch Robots

## Hummingbird Robotics Kit[3] (www.hummingbirdkit.com)

The $199 Hummingbird robotics kit is comprised of a controller, LEDs, sensors, and motors. It is designed to enable engineering and robotics activities for ages 10 and up that involve the making of robots, kinetic sculptures, and animatronics built out of a combination of kit parts and crafting materials. Hummingbirds are actively being used in topics as different as anatomy, poetry, and social studies, art, science, and engineering and represent a great way to inject CS concepts into core courses and at earlier grade levels than typically possible: most Hummingbirds in use are used in non-CS/engineering courses with students in 5$^{th}$ to 8$^{th}$ grade.

[2] www.finchrobot.com
[3] www.hummingbirdkit.com

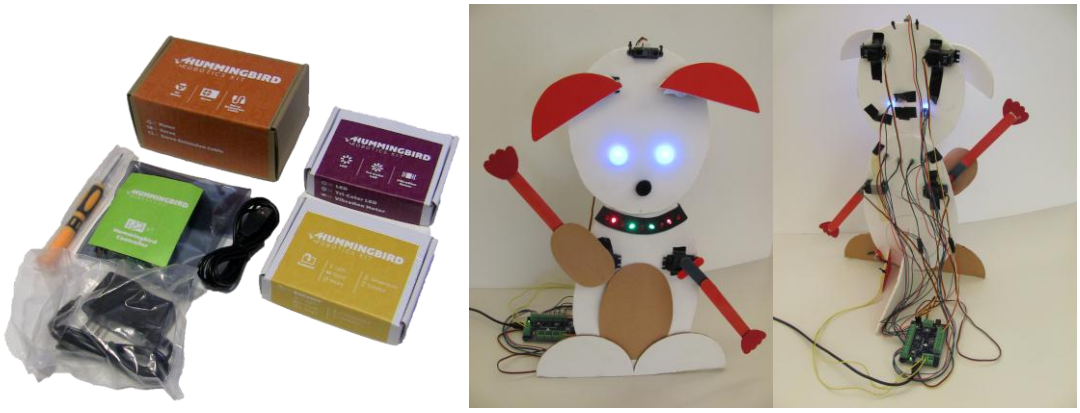

**Figure 2: Kit Contents (left), Robot built from kit parts (center and right)**

## Snap[4] (snap.berkeley.edu)

Snap! is a spin-off of Scratch and adds several features to Scratch, including the ability to create your own blocks, recursion, lists, and a sandbox for third-party tools. Snap is currently in alpha and will be released into beta by March. We have created modules and a background server program to allow Snap to communicate with Finch and Hummingbird[5]. Although it is still in alpha, a number of teachers are already using Snap with Finch and/or Hummingbird, and we are very excited about its potential in the 2013-2014 school year when both Snap and our plugins will be in beta or release.

## Proposed Workshop Activities

Our intent is to devote the bulk of the workshop to guided, hands-on activities. A rough schedule may progress as follows:

10 minutes: Introduction to the Finch's sensors and outputs, Hummingbird sensors and outputs, and a brief tutorial on how to connect electronics to Hummingbird.

10 minutes: Demonstration of how to use Snap to control Finch and Hummingbird. We will assume familiarity with Scratch/Snap's overall interface and will concentrate on the blocks for reading sensors and setting outputs on the two robots.

20 minutes: Divide into two groups, a group of Finch users and one of Hummingbird users. Both groups will be prompted to try several short activities (though they are free to explore if desired). Short activities may include:

| **Finch** | **Hummingbird** |
|---|---|
| Robot Dance | Use sensor to control color of an LED or speed of a motor |
| Keyboard Control Program | Use the Hummingbird's knob to move the pen |
| Obstacle Avoider | Use a distance sensor to change pen size |
| Accelerometer-sensor control of pen | Fade between several LEDs based on where the mouse is located on the screen |

20 minutes: Groups switch, so that Finch users try Hummingbird and vice versa.

[4] snap.berkeley.edu
[5] BirdBrain Technologies version of Snap is at www.finchrobot.com/software/birdbrain-snap-v02-alpha

## Logistical Details

We can bring eight Finch robots and eight Hummingbird kits to the workshop for use by attendees, with the intent to serve up to thirty attendees in a pair-programming setup. As the Hummingbird is a kit of parts and requires room for assembly, some table space on the order of 4-6 square feet per pair would be useful. We request that attendees bring their own laptops, and can provide links to software to install in advance; the software is free and works on all major operating systems except Chrome.