SkelScratch: Scratch v. 2.0 with Kinect v. 2.0

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Introduction

The Microsoft Kinect is an amazing device that is able to capture detailed spatial information about the world in its view. Specifically, it has a camera and software that make it particularly good at tracking human bodies. Scratch is software developed by MIT that simplifies programming so that even kids can learn the beginnings of software development. Scratch version 2.0 executes completely in a browser, thus requiring no software installation. When paired with a Kinect, students can create programs that react to and can be controlled by one or more bodies.

Objectives

Our first goal for the summer was simply to determine if Scratch 2.0 was currently capable of communication with the Kinect. If that was the case, our second goal would be to then develop and release an open source program to do so.

Methods

Around a decade ago, Stephen Howell wrote a library, Kinect2Scratch, to allow Kinect v1 to communicate with Scratch v1.4. With the release of Scratch 2.0, his library no longer worked. This project sought to re-create and enhance his work, and additionally, to make the code all open source so that others may extend it. Problems to be solved included determining how to communicate with Scratch v2.0; how to read the (x, y) coordinates for body joints from the Kinect device; and how to communicate the information to Scratch.

For the first problem, we discovered that MIT had recently created a Javascript-based extension API to Scratch v2.0. For communication, we found that WebSockets worked well for client-server communication, and that many browser architectures support it. To get the Kinect information, we wrote a server C# application called Kinect2JSON. This application communicates the data over the network in the common JSON format.

Results and Conclusions

Our client-side library, called SkelScratch, reads in the Kinect JSON data, and creates Scratch "blocks" that allow programmers to use the Kinect data in their programs.

We successfully created an application that works on Windows with both Kinect v1 and Kinect v2, with Scratch 2.0. It works both locally and over a network -- a setup not possible with the old system. We created some examples to show its workings as well, including a simple bouncing ball game.

Our system makes available several programming blocks (shown in dark blue under the "SkelScratch" section of the screen) that allow a program to track up to six bodies of 26 joints (with x, y, and z) each. Additionally, a SkelScratch program can select the source of its information by specifying the IP address of the machine sending the Kinect JSON information.

SkelScratch was a great success. It works without bugs, quickly and logically. We think this tool will be a boon for students around the world as they learn to use the Kinect to program amazing new things.


The example ball bounce project in Scratch 2.0 using SkelScratch