Tech News

Running scratch or Alice at home

There are pointers to the version of scratch we are using (as well as some example programs) at

http://www.soe.ucsc.edu/~karplus/scratch_programs

I've also put PDF files with the back copies of *Tech News* there, so parents of kids who join Tech Club late can still read all the issues.

There are also pointers to Alice, a somewhat more sophisticated language for beginning programmers based on 3D animation.

Family Science Night

The Family Science Night Committee is still looking for volunteers to set up a "mini-Exploratorium" in the Fellowship Hall Tuesday April 24. For more information and to volunteer to help see

http://www.soe.ucsc.edu/~karplus/family-science-night.html

Sound Crew

Last week we talked about how to do sound effects in scratch. This week, we'll learn how the school's PA system works and practice operating it.

A Public Address (PA) system is intended for amplifying voices to be heard by large groups of people. It consists of three essential components:

- a microphone ("mike") to pick up the sound of the voice and convert it to an electrical signal,
- an amplifier to convert the low-power electrical signal from the microphone into a high-power signal, and
- a loudspeaker, to convert the electrical signal back into sound.

The school's PA system is a little bit more sophisticated, in that it can mix the signals from several different microphones and can add some special effects (like reverberation) to change the way the system sounds.

Microphones

There are two different types of microphones in common use: dynamic microphones, which are like loudspeakers in reverse, and condenser microphones. A dynamic microphone has a small, light coil of wire attached to a flexible diaphragm. When sound waves hit the diaphragm they move it back and forth, moving the coil in a magnetic field, which produces electricity to be amplified. A condenser microphone has a conductive diaphragm stretched tight a short distance from another conductor. When the diaphragm is moved by sound waves, it changes the distance between the conductors, changing the capacitance. If you apply a voltage across the microphone, you can detect the change in capacitance.

Dynamic microphones are more rugged than condenser microphones, but condenser microphones are lighter and provide better response to higher frequencies. I believe that the school's mikes are condenser microphones.

Class D amplifier

The signals from the microphones are amplified by low-power preamplifiers that have gain (how much they amplify) controlled by sliders. There are also some simple tone controls to change high frequency and low frequency response. The signals from the different input channels are then mixed together.

The output stage of modern sound amplifiers (including the school's new system) are "class D" amplifiers, which use high-power, very high-speed transistors as switches that are turned on and off very quickly. One switch connects the loudspeaker to a positive voltage, the other connects it to a negative voltage. A coil and some capacitors smooth out the signal so that the voltage to the loudspeaker is determined by what fraction of the time the switch to the positive voltage is turned on.

This type of amplifier is very efficient, with most of the power from the power supply being delivered to the speakers, rather than wasted as heat.

Digital Effects (FX)

The school system has an extra feature: a digital effects generator. The voltage signal from the mixer is converted to a stream of numbers, like a sound file in a computer. A small computer in the amplifier does computations on this stream of numbers to get many different effects, such as reverberation and chorusing. The output number stream of the effects generator is converted back to an analog voltage signal to mix with the main signal.

There are several different effects to choose from, and we should have an opportunity to experiment with them today.