ByteNoise

Modular synthesiser

Not all synthesisers are small devices comprising a keyboard and a bunch of knobs, containing a set path to route the audio from the oscillator to the filter then the amp and finally out of the speaker socket, all housed in a single box. Some synthesisers are modular, giving you the freedom to link together whichever parts of it you want.

Put simply, if synthesisers were toys, modular synthesisers would be Lego. They're harder to use at first, but once you learn how the different building blocks fit together, you can create anything your imagination and budget allow for.

Examples of modular synthesisers:

- **Buchla Music Box** (1963) One of the first modular synthesisers. Well suited for making interesting noises.
- **Moog modulars** (1960s) The first modular synthesisers to use keyboards. This made them much more user friendly and therefore popular. They were further popularised by Wendy Carlos, thanks to her 1968 album Switched-On Bach.
- **Doepfer A-100** (1995) This revived the analogue modular synth market.
- **Analogue Systems RS Integrator** (1998) Impressive looking modulars, complete with wooden cases.
- **Synthesis Technologies MOTM** (1998)

Typical modules:

- **Oscillator** This makes the initial sound
- **Noise** This makes harsher sounds by giving a random output
- **Filter** This takes away certain frequencies and boots others, giving the sound a unique character
- **Attenuator** This makes the whole thing quieter
- **LFO** This is a very slow oscillator, usually too slow to be audible
- **Contour Generator** Also known as an envelope generator, this produces an output that can slowly increase and decrease over time, but not periodically like an LFO
- **Sample and Hold** This samples its input periodically, and constantly outputs that sample

Linking them together

Modular synths are always more than the sum of their parts, because any part of them can be linked to any other part in various different ways. Using just the basic building blocks listed above, you could create a variety of different sounds.

For example, we could link the LFO's output to the oscillator's frequency input. That would make "woo-woo-woo" noises like in old arcade games as the oscillator is told to constantly raise and lower its pitch. Not a bad starting point.

A more practical approach would be to hook up a keyboard to the oscillator's frequency input, and link the trigger and gate outputs of the keyboard to a contour generator, such as one that might produce an ADSR envelope. Whenever you play a note, the oscillator will start to output at the correct frequency,

and the contour generator will start to run through its course. Then you can just connect the contour generator's output to control an attenuator, and link the oscillator's output to the audio input on the same attenuator, and you've got a very basic synthesiser that will actually play the notes you want it to. When you press a note, it will quickly rise to the maximum volume at the correct pitch, then fall to a more comfortable volume until you take your finger off the key, at which point it wall fall to silence.

Then you could add a filter in between the oscillator and attenuator, and control its cutoff point with another contour generator, say one that simply decays from a certain starting point to zero. Then you can connect the keyboard's trigger output to that contour generator (you'll need another module to split it into two different outputs so that it can still be plugged into the other contour generator at the same time), and then you're getting into acid line territory if you have the filter's resonance turned up.

Everything is multi-purpose

Being able to link things together in any way you want to gives you much more freedom than you'd first realize, if you're used to hardwired synthesisers that have set ways of routing everything. For example, a synth with two oscillators can use them both to produce the same note, only with one an octave up than the other one to produce a fatter timbre. Most synths let you do that. They probably don't let you use the output of one oscillator to determine the frequency of the other one, going beyond vibrato to open up a whole new method of synthesis - FM synthesis. The point here is that just because an oscillator's output is audible and melodic sounding, it doesn't mean it *has* to be used

as audio. It can be used to control something else.

As another example, white noise is audible and is the starting point for some percussive sounds. Instead, though, you could use it in conjunction with a sample and hold module to output a different random voltage at a set interval. That could be fed into an oscillator's frequency input to produce the cheesy "bleep-bloop-bliip" sound that computers were supposed to produce in old sci-fi shows.

Expansion

Another main advantage is expansion. With a hardwired keyboard, you have to buy it all at once. If you decide it would sound better with another oscillator in it later on, you can't very easily take it apart and solder a new one onto its circuit board. With modular synths, however, it's quite possible - even the standard approach - to start off with a handful of modules and buy new ones whenever you feel the desire and have enough money, or to sell modules you don't find yourself using any more.

Note that all of the above examples are of some relatively very simple patches. Now picture a whole wall covered in hundreds of these modules and imagine the possibilities of how they can all affect each other.

Modular synths versus hardwired synths

Modular synths aren't for everyone. If you want to turn on a machine and immediately have access to many different instrument sounds, you'd probably be better off with a workstation such as the Korg Triton LE. If you want something

that sounds realistic, you might prefer a sampler such as any by Akai. If, however, you want to understand the underlying principles of subtractive synthesis and be limited only by your imagination, modular synths can be as versatile as you need. They're distinctly artificial sounding, but with enough patience you can coax some wonderful sounds out of them.

And people thought that Wendy Carlos was cheating by pushing a few buttons to make the synthesiser do all the work...

References

BBC: Tomorrow's World: The Moog Synthesiser