

THE ESSENTIAL GUIDE TO...



Additive synthesis

Mac PC It used to have a reputation for being difficult and unwieldy, but additive synthesis has come of age...

JARGON BUSTER

► **PARTIAL**
Partials are what define the harmonics present in an additive synth patch

► **ENVELOPE**
Envelopes can be used to change partials over time

► **HARMONICS**
The individual frequency components that make up a sound

Back in *cm90's Essential Guide*, we looked at subtractive synthesis. As its name suggests, this technique is based around the principle of taking a standard waveform and removing (or subtracting) harmonics using filters. This month we're focusing

on a technique which, in many ways, is the exact opposite: additive synthesis.

Although additive synths have been around for a long time, it's the subtractive sort that have been the mainstay of electronic music for the past few decades, mainly because

additive synthesis can be difficult to understand. Hopefully, though, we'll be able to give you a good idea of how it all works in this tutorial.

Other barriers to the adoption of additive synthesis have traditionally been tricky user interfaces and the fact that a fair amount of raw number crunching is required if you want to edit a sound on the fly. Today, however, we're spoiled by extremely powerful computers and soft synths with fantastic user interfaces, so there's never been a better time to find out what additive synthesis has to offer. **cm**

THERE'S NEVER BEEN A BETTER TIME TO FIND OUT WHAT ADDITIVE SYNTHESIS HAS TO OFFER

THE ANATOMY OF AN ADDITIVE SYNTH

GENERATOR SELECT
These buttons (A to D) can be used to individually set up the four additive generators

PATCH SELECTION
These drop-down menus are used to select a different patch for each corner of the morph path



PATCH SELECTORS
These two drop-down boxes can be used to select patch banks and individual presets

RESET BUTTON
This can be used to quickly return Cameleon 5000 to its clean, default preset

MORPH TIMELINE
This graph shows how the morph path changes over time

MORPH PATH
Use this path to control how Cameleon 5000 morphs between patches over time

RANDOM MORPH
Click here to set up a random morph path in the Morph section to the left

WHAT IS IT?

Contrary to subtractive synthesis, additive synthesis involves building a sound up by the introduction (rather than filtering away) of harmonics. While subtractive synthesis is sometimes likened to sculpting (chipping away stone that's not required), parallels can be drawn between additive synthesis and painting, where the artist starts with a blank canvas and adds paint to build up a picture. But just as an artist can be intimidated by a blank canvas, so it can be hard to know where to start with an additive synth. Fortunately, there are a number of easy ways to get going (See *How do I use it?*).

A basic additive synthesis building block is called a partial. Partial is often visualised as a series of vertical bars that represent the levels of subsequent harmonics. While it's quite possible to create a tone that uses just one partial, the result will be monotonous (quite literally) and static – about as interesting as a pure sine wave or sawtooth. The secret to synthesizing interesting sounds is change and movement.

To add life to an additive patch, a partial must alter over time. You can make it change using envelopes or by morphing between different partials in quick succession.

WHAT'S IT USED FOR?

Most synthesis techniques have some kind of overall sound associated with them, and additive is no exception. While FM (which we covered last month) calls to mind percussive 'bong' or 'twang' type sounds, additive synthesis is often associated with rich, edgy metallic sounds or transparent, glassy pads. This means that additive synths are most suitable for creating atmospheric and abstract music.

With some work, however, additive synthesis can be used to produce a much broader range of sounds. The secret is knowing how to avoid producing yet another additive-sounding texture (see *How Do I Use it?*).

We'll be the first to admit that additive synthesis is not the most accessible method of making sounds and textures. However, as computers have become more powerful, additive synths have become easier to use and you can get immediate feedback on what effect the changes you're making to a patch are having. Previously, sound designers had to wait for additive synths to regenerate the sound from scratch before they got any response.



◀ The square route: Cube 2 is ideal for the additive apprentice

HOW DO I USE IT?

You can go about creating a new additive patch in a number of ways. The traditional approach involves defining partials (ie, the relative volumes of all harmonics) and envelopes (how the partials change over time). While using this approach gives you the satisfaction of starting from a blank canvas, it's very difficult to produce a decent sound this way. If you want to create natural, non-metallic sounds, try to keep the levels of the upper harmonics much lower than the first few.

Many contemporary additive synths enable you to create new patches in alternative ways that are much more instantly gratifying. Probably the most popular technique is called resynthesis: typically, the synth will load a normal audio sample and analyse its harmonic content over time before calculating the partials to create a patch that sounds approximately like the original sample. The partials can then be modified to taste afterwards.

Certain additive synthesizers offer more advanced features, which open up a whole new range of creative avenues. Camel Audio's Cameleon 5000, for example, can load image files and interpret them as additive patches. Alternatively, an existing patch can be saved as an image file, edited in a standard image editing application and then reloaded. This technique is demonstrated in the three-step walkthrough at the bottom of this page.

FIVE TO TRY...

VirSyn Cube 2
www.virsyn.de



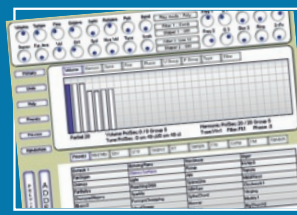
Tiny God Heartburn
www.tinygod.com



Tiny God Meridian
www.tinygod.com



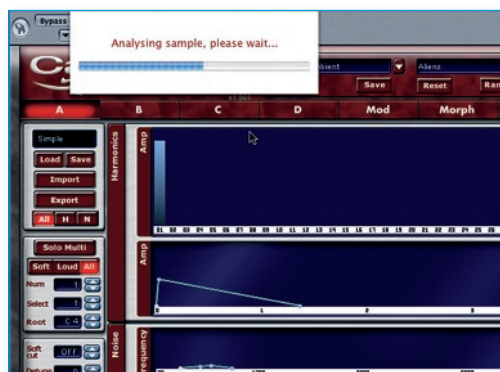
ConcreteFX Adder
www.concretetfx.com



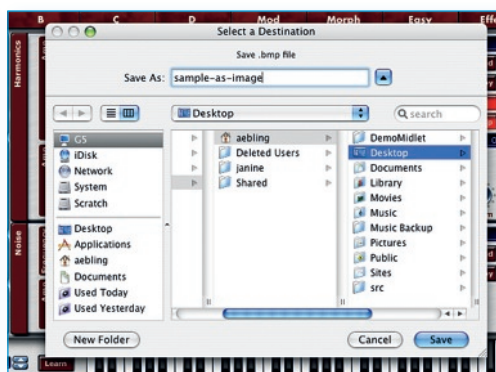
Progress Audio Soup
www.progressaudio.co.uk



STEP BY STEP Using Cameleon 5000 to turn images into sound



1 Load Cameleon 5000 (www.camelaudio.com) into your host application. Start by pressing the **Reset** button (below the preset menu), and then click on the **A** tab to access the first generator. Press the **Import** button and select a sample to load. The audio will be analysed. »



2 Play your keyboard; you should hear something that resembles the sample you just loaded. Press the **Export** button to save the sound as a BMP image file. Load this into a graphics editor and either blur or sharpen the image before saving it back to disk. »



3 Switch back to your host application and click on the **H** button in Generator A (to select harmonics) followed by the **Import** button. Now select the modified image file you saved in the previous step and click **OK**. Play some more notes on your keyboard to hear the modified sound.