
FUNS part 1

tutorial for the Kurzweil K2-series of synths

by Brian Cowell.

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The FUNs (short for FUNCTION) on the K2's is a process in which 2 events are mathematically processed by a function and the result can be used as a control source. While this seems to be complicated to many, it need not be. So lets de-mystify them a little.

There are 2 types of inputs into a FUN.

1. Bipolar => values from -1 to 0 to +1
2. Unipolar => values from 0 to +1

Bipolar

When thinking of 'bipolar' controllers, its best to relate in terms of the steering wheel of your car. So if were to have the steering wheel fully locked to the left it would in Kurzweil terms have a value of -1. When the steering wheel is central, it would have a value of 0. And fully locked right, it would have a value of +1. So basically, any controller that has a negative and positive range is considered to be 'bipolar'. Controllers such as the Pitch bend wheel (PWheel), ENV2 & ENV3, some LFO's etc.

Unipolar

Unipolar is different. Its values range from 0 to +1. So back in our car, we would think of the accelerator pedal as being unipolar. Its at 0 to begin with , until we press it all the way down to get maximum speed. So having the accelerator pressed fully down would result in Kurzweil terms of having an output of +1. Controllers such as the Modwheel (MWheel), foot pedal (FOOT), AMPENV , midi CLOCK pulses etc. So now that we know the difference between unipolar and bipolar, we can now look at our first FUN. Which will be 'Quantize b to a'.

This FUN has a wide range of uses , which is the reason I've chosen to start with it first. The other reason is that we can build other FUNs around it to show what can be done and what steps need to be taken.

Quantize b to a

The idea behind this FUN is that it will turn what ever controller we put into the 'input b' slot, and turn it into a stepped controller. So it won't 'slide' like they normally do but take a staircase effect instead. The key to this FUN relies on what we put into 'input a'. As it is what we put into 'input a' which will determine how many steps the controller in 'input b' will take to reach its maximum output.

INPUT A => the amount of steps .

INPUT B => the controller that will be 'stepping'.

So referring to page 16.7 in a K2000 manual. You can cross reference with what I'm talking by looking at the columns provided for 'Quantize b to a'.

EXAMPLE no.1

We want make the K2's pitch "step" through 6 notes in an octave all the way up to 1 octave above the key we have pressed. And also 6 steps down.

We know the mission, so lets look at what we've got . (page 16.7 on the K2000 manual.) The middle column on page 16.7 tells us that to get 12 'steps' , we must have a 'bipolar' controller for 'input b' . And that the values for 'input a' must be within the range of 0.685 to 0.75. Since we know that the Pitch bend wheel (PWheel) is bipolar, we will use that.

So 'input b' will be PWheel And 'input a' will be 0.74 (it falls between the 0.6875 and 0.75 range)

Now our FUN looks like this : FUN1: 0.74 PWheel Quantize b to a. So now, on our Kurzweil's we do the following using "199 Default Program";

1. press [EDIT]
2. press [KEYMAP]
And change the KEYMAP to "146 Partial 1,3,5".
3. press [EFFECT]
And change the "wet/dry Mix " to 45% wet.
(NOTE : This is "Sweet Hall" on a K2000. Any effect will do.)
4. press [FUN]
Using FUN1 we change 'input a' from 'off' to read 0.74. (turn the alpha dial wheel clockwise)

We then change 'input b' to PWheel

Finally, we change 'function' to Quantize b to a.

5. press [COMMON]
And change the 'Pitch Bend Range ' to Oct

This is the global setting for pitch bending.. Since we are going to be using a FUN to do the pitch bending , we don't want this messing up our results. Play and use the pitch bend wheel now. It does nothing.

6. press [PITCH]
Change 'Src1:' to 'FUN1'
Now change the 'Depth:' to 1300ct.

"Uh Oh !"....."What is happening here Brian ?". "1300ct is more than 1 octave !' 1200 ct = 1 octave = 12 notes.

Well , look at page 16.7 on the manual. You will see that the first step is taken between values of 0 to 0.0625 . And the pitch wheel is in its normal central position which has an output of 0. So the FUN will take 1 step when we play a note regardless whether we touch the pitch wheel or not.

We don't want this . We need to move the keyboard back down 1 semitone now. To move it back 1 semitone we must change "Coarse:" to "-1ST".

So now, we've moved 1 semitone . Now if we must add 100 ct to the octave (1200ct) to keep it all in line. If we didn't, we would bend the pitch wheel up a maximum of 11 notes only. This is why the 'Depth:' parameter is set to 1300 ct. (1200 + 100 =1300 ct)

Now play the keyboard and move the Pitch bend wheel slowly and count the steps. Cool! Isn't it ?

We can use any other 'bipolar' controller in here instead of the pitch wheel. So lets try something like an LFO.

7. press [FUN]
Change 'input b' to LFO2

Play the keyboard. The LFO is moving way to fast.

8. press [LFO]
Change the LFO2 "MnRate :" to 0.20H

Now play the keyboard. More cool stuff. !

Also, try changing the "Phase :" settings and see what you come up with. Its all interesting stuff.

Here is a special note if you change the "Shape :". If you change the "Shape :" from 'SINE' to 'SINE+', then you have changed it from being a bipolar source (-1 to +1) to a unipolar source (0 to +1). Page 20.10 & 20.11 show pictures of the LFO shapes.

All right! Here is a quick one.

9. Change the 'input b' in FUN1 to ENV2.
Go to the ENV2 page and change the following:

ATT1: 1.00 and 100%
ATT2: 2.00 and 0%
ATT3: 2.00 and -100%
DEC1: 1.00 and 100 %
LOOP: seg1b

If your not sure of what's going on here in the ENV2 page , then check out the AMPENV tutorial.

Epilogue:

That's it for now. There's plenty to experiment here with. There will be more shortly on expanding from here and beyond. I hope you've learned something. :-) Enjoy.

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