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Oscillator Block

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Oscillator Block (#p2601)

by **SeishinKakui** » Sun Dec 27, 2015 4:53 pm

I'm loving having an additional oscillator that doesn't use the internal LFOs. But I am hoping the range of the block can be increased, because being able to really wind it up can be handy for special effects. I've been using the stock block then modifying it to test with the SPINIDE, but it would be cool to do it on the fly within SPINCAD. Also would it be possible to include a square wave output pin rather than putting it on the ADCR as in Frank's example here:

http://www.spinsemi.com/forum/viewtopic ... ht=counter (http://www.spinsemi.com/forum/viewtopic.php?t=28&highlight=counter)

```
;sine + square generator
;
; SIN = SIN + freq * COS
; COS = COS - freq * SIN

; POT0 is frequency control
; POT1 is amp

; Define a couple register
equ   s   reg0
equ   c   reg1

; Initialize SIN to 0.5, COS to 0 on start
skp   run,3
SOF   0,0.5      ;initialize SIN to 0.5
wrax   s,0
wrax   c,0      ;initialize COS to 0

;Normal program starts here
rdax   c,1      ;Read COS
mulx   pot0      ;freq * COS
rdax   s,1      ;SIN + freq*COS
wrax   s,-1      ;Save SIN and mult by -1
mulx   pot0      ;freq*(-SIN)
rdax   c,1      ;COS - freq*SIN
wrax   c,1      ;Save COS

mulx   pot1      ;scale output

wrax   dacl,1      ; write output

skp    NEG, out_low   ; If negative, then skip
sof    0,0.5    ; Positive output
skp    GEZ, scale_out   ;Skip to the output step
out_low: sof 0,-0.5  ; Negative output
scale_out: mulx   pot1
wrax   dacr, 0
```

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Re: Oscillator Block (#p2602)

by **SeishinKakui** » Sun Dec 27, 2015 8:32 pm

I should add the hacked code from the oscillator block that gives me a wider range of output frequency:

```
;------ Oscillator
SKP RUN ,3
WRAX REG0,0.0000000000
SOF 0.0000000000,-1.0000000000
WRAX REG1,0.0000000000
RDAX REG0,0.5000000000      ;sub audio to over 5kHz
MULX POT0
RDAX REG1,1.0000000000
WRAX REG1,-1.9999000000   ;sub audio to over 5kHz
MULX POT0
RDAX REG0,1.0000000000
WRAX REG0,0.0000000000
```

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Re: Oscillator Block (#p2603)

by **Digital Larry** » Sun Dec 27, 2015 10:20 pm

That's a great start. The next thing I need is how to calculate the coefficients given the frequency. This will be the displayed frequency that is what you get when the pot input is 1.0, as well as by default when there is no pot input.

The existing Oscillator block is an example of something I threw in there to see if it worked, then didn't think too much about it after that, although I have used it from time to time, primarily as an additional LFO. The oscillation range was pretty heavily constrained as the freq parameter only goes to 0.01 max.

I think that the frequency function for this oscillator is the same as a 2-pole filter. Looking at the code I wrote for the existing oscillator block, I can't tell that there is any exponential function translating the frequency coefficient to the actual frequency. So I don't even know whether the existing frequency readout is accurate or not.

It's trivial for me to add a cosine output to the code you supplied, as well as a "square" cosine output. I've already made it so that if the sine square output pin is not connected, no instructions are generated to create the square waveform. So, you want cosine and squared cosine outputs while we're at it?

Another thing that comes to mind is whether to offer the option of 0.0 to 1.0 operation as well as +/- 1.0 or +/- 0.5. I can make centered square +/- 1.0 as then you can use the width control to constrain it. If you want 0.0 to 1.0 output range then you have to do that scale/offset before applying the width control, since the goal is to keep the lower edge at 0.0 instead of the middle as with +/- 1.0 output range.

Thanks!

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Re: Oscillator Block (#p2604)

by **Digital Larry** » Mon Dec 28, 2015 9:26 am

In the event you are interested, here's how I turned this into a block.

Right now there is a control panel slider defined but it's attached to the variable "gain" which does nothing in the oscillator code. Once I figure out the correct scaling function I will attach the slider to 'freq' instead.

It's important to realize a few things about slider controls and control inputs.

First, the functions which transform a frequency value to a filter coefficient are usually approximations that are more accurate at lower frequencies.
Next, because of coefficient quantization, you will wind up with frequency quantization of filters if you use the coefficients directly. I've seen a

couple examples where an additional multiplication is used to enhance the resolution of coefficients embedded into RDFX or RDAX instructions. Finally (for now), when you have a control input to a block, generally it multiplies the filter coefficient by the control or pot value in a linear way. So, even if the control panel frequency slider is set up for either linear or log scale readout of frequency, when you attach a control, you will be scaling the parameter down linearly. You can of course do other things like use power, scale/offset, log etc. to adjust the control input curve. The only reason I bring it up is that I think it will be challenging to have a control input to an oscillator that will give an accurate tracking output frequency based on the control value. But that's just an opinion.

```
@name "Oscillator II"
@color "0xf2f224"
@controlInput freq 'Frequency'
@controlInput width 'Width'
@controlOutput sineOutput "Sine Output"
@controlOutput sqrOutput "Square Output"

equ gain 0.5
@sliderLabel gain Gain -1.0 1.0 0.5 1000.0 3

;sine + square generator
;
; SIN = SIN + freq * COS
; COS = COS - freq * SIN

; POT0 is frequency control
; POT1 is amp

; Define a couple register
equ   s   reg0
equ   c   reg1
equ sineOutput reg3

; Initialize SIN to 0.5, COS to 0 on start
skp   run, start
sof   0, 0.5      ;initialize SIN to 0.5
wrax   s,0
wrax   c,0      ;initialize COS to 0

start:
;Normal program starts here
rdax   c,1      ;Read COS
mulx   freq      ;freq * COS
rdax   s,1      ;SIN + freq*COS
wrax   s,-1      ;Save SIN and mult by -1
mulx   freq      ;freq*(-SIN)
rdax   c,1      ;COS - freq*SIN
wrax   c,1      ;Save COS

@isPinConnected Width
mulx   width      ;scale output
@endif

wrax   sineOutput,1      ; write output

@isPinConnected "Square Output"
equ sqrOutput reg4
skp    NEG, out_low   ; If negative, then skip
sof    0,0.5    ; Positive output
skp    GEZ, scale_out   ;Skip to the output step
out_low:
sof 0,-0.5  ; Negative output
scale_out:
@isPinConnected Width
mulx   width
@endif
wrax   sqrOutput, 0
@setOutputPin "Square Output" sqrOutput
@endif

@setOutputPin "Sine Output" sineOutput
```

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