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How does the Envelope Block work?

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How does the Envelope Block work? (#p1364)

by **SISKO** » Mon Jul 01, 2013 10:49 am

Preety descriptive title for this topic

I made a simple VCF (4pole LP) but do not quite understand the Envelope Block.
It just: left input -> LPF -> left output. The LPF cuttof is cotroled with the envelope block, and the envelope block is controlled by the right input.
I do get a variable filter, but it seems as if the signal level entering the envelope block would be too low.
Is there any kind of "sensitivity control"?
Im thinkig of amplifing the signal entereing the evelope detector and tailor it down with a volume control, but dunno if its feasible

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Re: How doe the Envelope Block work? (#p1365)

by **Digital Larry** » Mon Jul 01, 2013 11:24 am

Hi SISKO,

My experiments with the Envelope Block haven't been too successful yet, but let me give you a place to start.

I suggest that you run the control output of the **envelope** block through a **scale/offset** control block. Adjust the "Output low" level of the scale/offset block to set the starting point for the filter. Adjust the "output high" level to set the sweep width. I'm trying it just now and I don't get the

impression it is sweeping very much even with the output high set all the way to 1.0.

I'll take a closer look at it this afternoon.

Thanks!

DL

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Re: How doe the Envelope Block work? (#p1366)

by **SISKO** » Mon Jul 01, 2013 4:24 pm

It worked like a charm!

To learn how to use it I connected a pot to the control of the scale/offset block connected with the LPF and tweaked some parameters. When (Input high value - input low value) < 50 it seemed to stop working but when using audio + envelope detector insted of the pot, it worked.

The scale/osffet seems REALLY usefull, I will explore its potential soon.
Now.. If wed only had some kind of integration for the envelope decay or maybe an ASDR Just kidding
I play with it some more and see what I come with.

Thanks!

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Re: How doe the Envelope Block work? (#p1367)

by **Digital Larry** » Mon Jul 01, 2013 5:54 pm

Glad you got some action out of it!

I usually leave the input low and high at 0.0 and 1.0 respectively. It is possible with some settings of the scale/offset to come up with coefficients beyond the FV-1's capability to deal with them. See, in just one day you've found two fundamental issues with these blocks! Go to the head of the class!

The scale/offset block is really useful, especially when you have to use the same pot to control two

different parameters, and you can dial in the exact amount of each at the extremes. Another thing I do frequently is to avoid having something like the reverb return go all the way to zero. Your patches lose a bit of flexibility but gain in usefulness as you can map the full range of the pot to what you would normally use to your own taste.

I just looked over at the Spin forum, where I, errr... (cough) borrowed a lot of these code blocks. I can't really find the exact code snippet which resulted in the envelope block I have here. There are several possible approaches and I'll probably wind up trying all of them as there's no way to predict which one will be the most awesome.

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Re: How doe the Envelope Block work? (#p1368)

by **SISKO** » Mon Jul 01, 2013 8:20 pm

> ***Digital Larry wrote:***
> I just looked over at the Spin forum, where I, errr... (cough) borrowed a lot of these code blocks. I can't really find the exact code snippet which resulted in the envelope block I have here. There are several possible approaches and I'll probably wind up trying all of them as there's no way to predict which one will be the most awesome.

You answered what was gonna be my next question.
Ill play with it and report back results.
Such a fun soft

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Re: How does the Envelope Block work? (#p1369)

by **Digital Larry** » Tue Jul 02, 2013 5:18 am

Hi SISKO,

I looked at some of your posts over at DIYstompboxes and if I'm not mistaken you have written some VSTs... if there's an approach for doing an envelope that you'd like to share, let me know.

The one we have currently is:

- Take absolute value of the input.
- Run it through a low pass filter.

However it looks like I added a second low pass, and there's a mysterious "MAXX" statement in there... anyway, I have some guidance from Frank Thompson @ Spin forum and next time I get a chance I will try his suggestion. You can pick up the thread here if interested:

http://www.spinsemi.com/forum/viewtopic.php?t=403 (http://www.spinsemi.com/forum/viewtopic.php?t=403)

Now that SpinCAD Designer is more or less functional, I think it's time to focus more on the blocks themselves. I can and should be able to grasp the meaning of FV-1 code, but starting with the minimally-commented code examples is pretty tough, especially when they are sprinkled with "magic numbers" and no real explanation of how those numbers were arrived at.

Gracias,

DL

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Re: How does the Envelope Block work? (#p1378)

by **Digital Larry** » Fri Jul 05, 2013 6:02 am

I put some time into messing with different parameters of the **envelope block** yesterday (post release of build 395). One thing that's critical is the low pass filter that comes after the rectification. If this is set too fast (corner frequency too high), then if you connect it to a controllable filter (I almost said VCF!) then the center frequency modulates at an audio rate, resulting in a distorted or gurgling sound. Also, without any special logic, the attack rate is the same as the decay rate, which may or may not be what you wanted. Per my own taste, an envelope filter wants a fast attack and and adjustable delay. Ideally both would be independently adjustable. We'll see how clever I can get.

PS if you want to see what the envelope follower is doing, you can connect its output to the one of the inputs of the output block and use the simulator visualizer.

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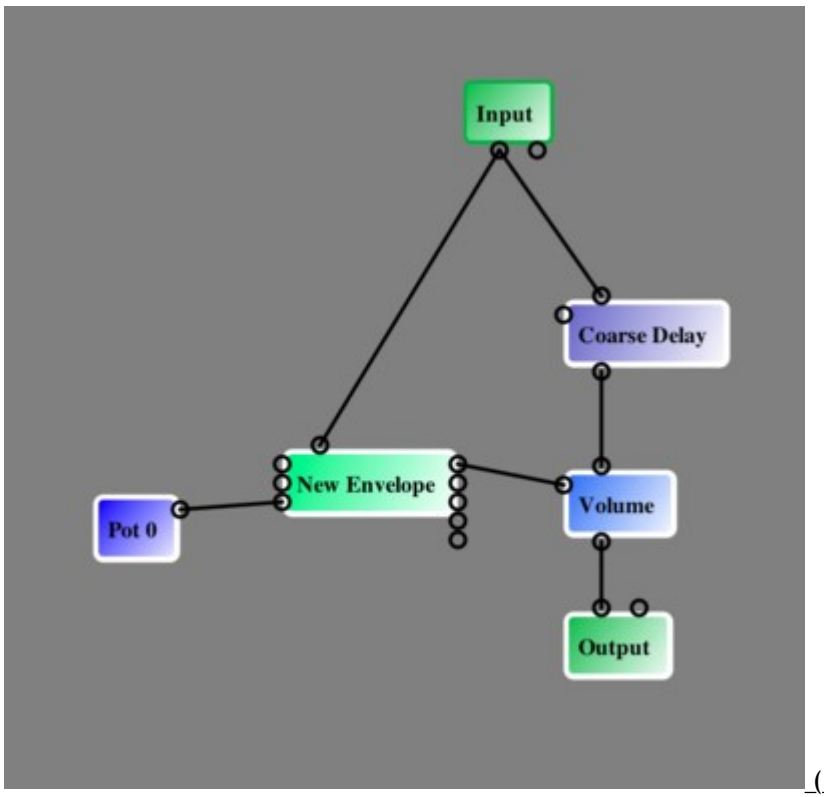
Re: How does the Envelope Block work? (#p2892)

by **pruttelherrie** » Wed Nov 30, 2016 9:22 am

Hi all,

I can't get the envelope block to work. Well, either that, or I'm doing something else wrong.

I have made my own FV-1 board, with hardware wet/dry mix and feedback from out-R to in-R. When I try attached patch, all signal is passed through, even when directly after playing a note I mute or switch off the input. I have tried almost all possible combinations of the envelope and envelope II block to no avail.
On a related note, is there some reference which I can consult regarding ranges of (control) signals? That would clarify a lot of questions and uncertainties I have about control signals and their scaling.



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Re: How does the Envelope Block work? (#p2893)

by **Digital Larry** » Thu Dec 01, 2016 6:06 am

Hi,

Thanks for your question. I haven't been putting any effort into SpinCAD for several months at least so I have lost track of some things I was going after. The "New Envelope" block is experimental and I don't remember exactly what I was doing there.

Here's what I can tell you over all about envelope generators. The original one is a full wave rectifier followed by a low pass filter. Although it would make more sense for the filter setting to be measured in terms of rise time, instead I show the low frequency cutoff because I already had a slider conversion function available. But generally speaking, the lower the cutoff frequency, the slower the response. There's also (I think) some concept of a separate attack vs. decay filter, but I forget the details. The envelope goes positive when you put some signal in.

There is also a way to make a peak follower envelope, where the attack is instantaneous but the decay uses again a low pass filter. Some form of low pass is required to smooth out the ripples in the rectified audio signal so generally it wants to be below your lowest possible audio frequency, since modulating audio at audio frequencies gives rise to ring modulation type sounds which if you don't want them are pretty terrible sounding.

I looked at the auto-wah code supplied by Spin and it works in a different way. That one generates a negative going signal that starts AFTER the peak starts going down. I had never heard of such an approach and figure they developed it by ear. That, I believe, is what is in the "New Envelope" block.

To get a general idea of what the envelope generators are doing, you can connect a control output temporarily to the SpinCAD output block and look at what it is doing on the signal visualizer. Or on a real board, you could put a scope probe on that unused (for audio) output to see what it is doing.

Another thing to keep in mind about using envelopes is that I cannot know what signal levels you are using, so mapping from a simulator result to your real world board will require you to tweak the gain going into the envelope generator in most cases.

For the original envelope generator, since it uses a FW rectifier, aka the ABSA instruction, a signal which goes -1 to 1 will result in the envelope going from 0 to 1.

For your example, you haven't said what you are trying to accomplish, though my guess is that you are trying to make a ducking delay, where the delay volume is suppressed until you stop playing. Also, if you put the generated Spin ASM into your post, there will be no ambiguity as to what is happening compared to SpinCAD blocks.

You might also attempt to build your own envelope detector out of primitives such as absolute value, low pass filter, maxx, etc.

Regarding "control ranges" please ask specifically about one or the other block, because I doubt I have documented it all neatly. Again if you are somewhat familiar with Spin ASM you might be able to figure out what is going on. The volume block is just a multiply of the input with the control signal and represents a "linear" pot.

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Re: How does the Envelope Block work? (#p2894)

by **pruttelherrie** » Thu Dec 01, 2016 10:30 am

Hi, thanks for your extensive response! Much appreciated.

You're right, initially I was trying some kind of dynamic delay, but since I didn't get the output I expected, I simplified the patch to the screenshot to find out how it works. I'm not familiar with spinasm and I really like what I can do with only your Designer!

I've been reading up on how the FV-1 works under the hood on this page:
http://www.spinsemi.com/knowledge_base/pgm_quick.html (http://www.spinsemi.com/knowledge_base/pgm_quick.html)
It clarified quite a bit about the levels: everything is scaled from -1 to +1 it seems.

Unfortunately, the level display of the simulator stopped working: it only works once after starting the program?!?! If I don't activate the level display, the simulator can be stopped and restarted without problems. I should be able to get some debug-output from SpinCad Designer? (I'm on a Mac, by the way, Mac OS 10.10).

I'll hook it up to my scope tonight and continue experimenting with the envelope followers.

> Another thing to keep in mind about using envelopes is that I cannot know what signal levels you are using, so mapping from a simulator result to your real world board will require you to tweak the gain going into the envelope generator in most cases.

True enough. Will keep that in mind. I'm mostly working with heavy guitars so almost no dynamic range and all signals are pretty much either close to maxed or zero 😉

Since I've finished the board and got uploading to work, I've wasted quite a few evenings with playing around and jamming, thanks so much for creating this! For me it makes the development of patches su much more insightful and enjoyable than needing to stare at the asm!

Speaking of uploading, how difficult would it be to implement a button or menu that saves a hex to a temporary file and then calls a shell script or something to upload it to the EEPROM? I've looked into Java development for 15 minutes but I found that the equivalent to exec() isn't that simple?

Then on a closing note: I understand that the forum got hacked in january and many of the attachments are corrupted. Is it a lot of work to do something like a mass-re-upload of all attachments in one post, or something like that?

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Re: How does the Envelope Block work? (#p2895)

by **Digital Larry** » Thu Dec 01, 2016 10:59 am

I haven't checked the simulator on a Mac recently, so I can do that soon. I'm on 10.9.5 so I hope that is not the issue (some change in 10.10 causing the problem).

"How difficult" to implement an uploading button? That is unknown but my goal is to develop some boards which could interface directly to a PICKit2 programmer, then look at it. So it's probably a few months off since I'm not seriously working on an FV-1 design at the moment. There are apparently command line tools which can be used to do the programming so conceptually it's not difficult. From the sound of it, though the programming utility binary might be OS dependent.

Audio is scaled -1.0 to 1.0.
Built in Sin LFOs go from -1.0 to 1.0. The Sin/Cos LFO block in SpinCAD has an output scale option, but it gets 0.0 to 1.0 by adding a scale/offset instruction.
Ramp LFO width depends on the width you set it up with. It goes up from 0 to whatever height. I think at width = 4096 it is at 1/8 or 1/4 of full scale so you need to multiply it or add itself again a few times to get it to go fro,m 0.0 to 1.0.
Controls (like pots) go from 0.0 to 1.0.

Regarding the attachments, the biggest issue is that I didn't keep track of them very well, so I may have them or I may not. Why don't you ask about one(s) you are interested in and I will see if I can find them. Some of the older ones, if they were patches, weren't compatible with new versions of the program anyway. But I'm willing to try to recreate a few of them.

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Re: How does the Envelope Block work? (#p2896)

by **pruttelherrie** » Thu Dec 01, 2016 12:40 pm

Thanks, useful info!

At the moment I use a Pickit2 with pk2cmd wrapped in a bash script for the right options on the commandline for writing the EEPROM, but I'm also looking into an Arduino or pure AVR/V-usb solution.

Not a high priority so I can wait until you look at the direct programming. I'm not sure if there's a standard for USB-I2C that you can implement directly in Java.

Weird thing about the simulator is that it used to work, and I don't know why it doesn't anymore.

I'll get back at the attachments later. No big problem if you lost certain one, no need to put time into recreating them!

Will keep you updated (also on the envelope).

--
Iwan

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Re: How does the Envelope Block work? (#p2897)

by **Digital Larry** » Thu Dec 01, 2016 2:09 pm

How about you make your bash script into a monitor loop that checks to see if a certain hex file gets updated, and if so then it runs the upload command? Then as soon as you saved the hex file, it would get uploaded. A little inconvenient because you have to use the same file name all the time, but could be a workaround to save a little time.

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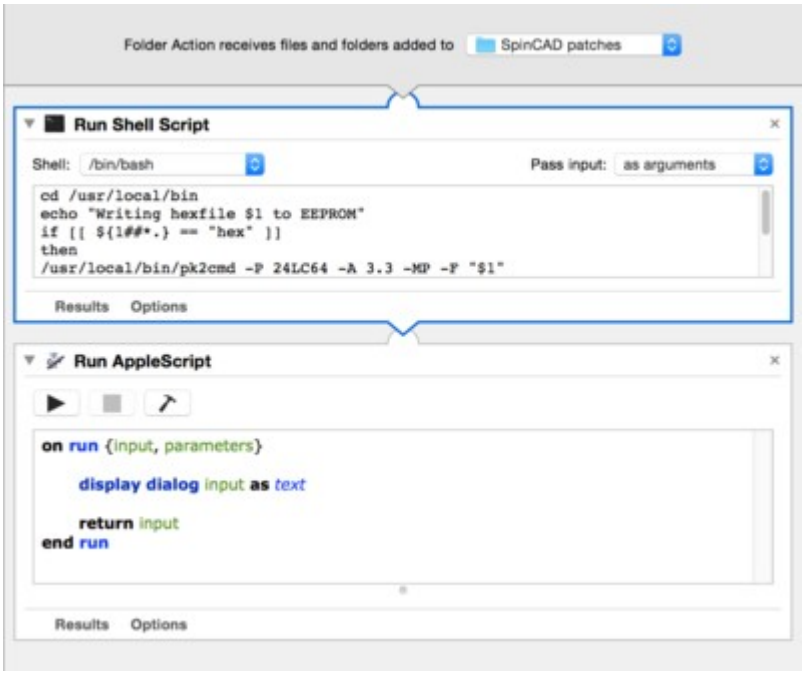
Re: How does the Envelope Block work? (#p2898)

by **pruttelherrie** » Fri Dec 02, 2016 9:07 am

Done & works, thanks for the tip!

I used an Automator action since there's no 'watch' or 'inotify' on MacOS and a folder action is more elegant than polling 
In case somebody else wants to do this.
You need to cd into the folder where the PK2DeviceFile.dat file resides, so I copied that one also to /usr/local/bin. You could also use the -B option to indicate the path to that file. The AppleScript part is for the Dialog, I guess you could also use osascript for that but since we're already in Automator, what the heck.

```
cd /usr/local/bin
echo "Writing hexfile $1 to EEPROM"
if [[ ${1##*.} == "hex" ]]
then
/usr/local/bin/pk2cmd -P 24LC64 -A 3.3 -MP -F "$1"
/usr/local/bin/pk2cmd -P 24LC64 -A 3.3 -YP -F "$1"
fi
echo
```



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Re: How does the Envelope Block work? (#p2899)

by **Digital Larry** » Fri Dec 02, 2016 8:33 pm

Cool, thanks for sharing the tip.

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