DEFRACTOR

Ver.0.94ß

DIGITAL SYNTH WITH SAMPLE GENERATOR

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DISCLAIMER

I have NO resposability on damages caused by this software. You can NOT change any part of this software.

This program is FREEWARE than you DON'T have to pay for it! Commercial use is allowed after my permission.

If you use samples generated by this program write it in your tunes/midis. Thx.

This documentation may contain -TRUE- JPEG-english speech. That means I think to NOT have a good english... if you don't understand something mail me; I hope to reply with a better english... (I HOPE :) !!!).

WHAT'S NEW?

DEFRACTOR 0.94ß
- Pinch/Punch Filtering gives decent results (but I have to work around it... if you like its process now, mail me... ;))
- Added Noise generator
- Solved a *BIG* bug in Custom Wave Form Loader (I didn't see it :))
- Support for Defractor Enhaced Instruments (.DF2)
- Removed the configuration file (thx to AKA)
- Nice Enhacements :)
- Better wave form redrawing (thx to AKA)
- Many fixes to the code (thx to AKA)
- Intelligent Preview! Now the sample isn't recalculated evry time you press the preview button (I'm just working on this but thx for AKA suggestions)
- Added demo instruments (thx both MAZ and AKA)

DEFRACTOR 0.93ß
- Added copy and swap buttons
- Added the "None" shape
- Completely fixed the "Logarithmic Tooth" (now works!)
- Changes on the SwapFile Handler
- Fixes in the Sample Preview
- Envelope generation is a "bit" faster than the old one
- Envelope generators, Internal Multiplier and Division Factor has now 0 (zero) control. No more "division by zero" :)
- Started Pinch/Punch filter debugging (fixed some bug)
- Proportional Stretching gives something near what it has to do... ;)
- Custom Stretch now active but NOT near what it has to do... :(
- Added "Bell" function
- Documentation in .DOC format (word 7.0)

DEFRACTOR 0.92ß
- Fixed a BIG bug in check-boxes

DEFRACTOR 0.91ß
- Fixed some bug in Load/Save Instrument (it doesn't work after sample generation)
- Changed Frequency Scroll Bars Lenght
- Little change in the source code
- Now is 3/4 times faster in sample generation

- .WAV support
- .XI support (buggy)

DEFRACTOR 0.9ß
First release of the program.

WHAT IS DEFRACTOR?

I don't know! Ehehehe... Defractor is a sample-generator software based on 2 oscillator combined in a twisted way.
It's NOT a vintage-analog-synth emulator (sorry if you are looking for it).

Each oscillator has this feature:
- Selectable Wave Form: 12 waveforms + 1 Custom Loadable Shape;
- Internal Amplifier/Attenuator with distortion;
- A frequency (of course :));
- An envelope generator (Attack+Decay);
- A section called *"More Settings..."* where you can find Modifiers, and Shape options.

After the mixing of the 2 oscillators the output signal pass thru a Smoothing Filter, a Pinch/Punch Filter (my own filter algorithm), an Overdrive and an Attenuator.

HOW DEFRACTOR WORKS

Synthetically: the two oscillators are mixed together and the mixed output modulate the oscillator 2. That's the force and the limit of DEFRACTOR. You have take that the mixed output is the LFO of oscillator 2.
In the samples created with DEFRACTOR you will notice that the oscillator 2 is the MAIN signal and the oscillator 1 do all the effects. That is its force when it makes no-pad samples (TB-303 -like and something like it...) it sound is fat and powerful. Pad's are really poor with DEFRACTOR (when I test the program nothing REALLY good comes out! ;) and when I say REALLY good I'm talking about samples to die for!!!).
After that you know why the oscillator 2 envelope generator is the most important in the sample.
Here a simple scheme:
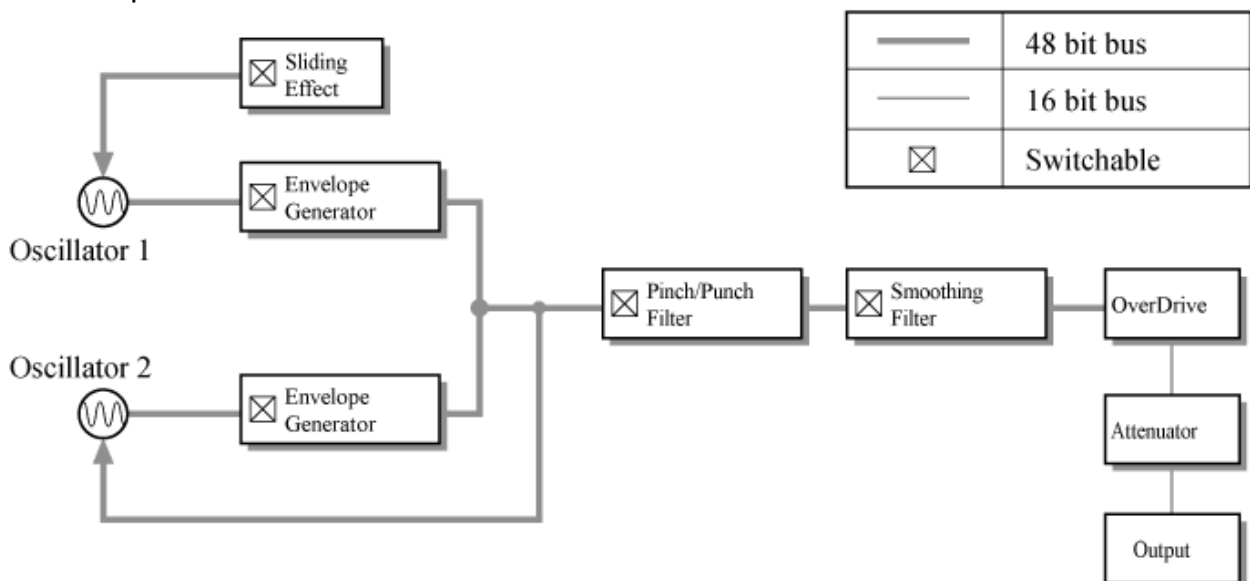
Conclusion: All the sample generation turns around the oscillator 2 enveloped output.
I hope to have always a 1:1 generation in all future version. That means the core generation of 1 sec of sample will not exceed 1 sec of calculation.

FEATURES

Here the specs of the Defractor Core:
- 48 Bit Oscillators mixing + 48 Bit Envelopes;
- 48 Bit Generation Engine;
- 48 Bit Smoothing Filter;
- 48 Bit Pinch/Punch Filter;
- 48 Bit Overdrive;
- 16 Bit Attenuator;
- Sliding F/X used for simulate velocity;
- Frequency & Amplitude synchronizers;

In future version of DEFRACTOR all the 48 Bit feature will be lower to 32 Bit generation. The use of a 48 Bit Float is a reminescence of the DOS experimental-version of DEFRACTOR. The 32 Bit generation will be faster than this.

SYSTEM REQUIREMENTS

R.P.E. (**R**eally **P**oor **E**nviroment):
- 486
- 8 Mb RAM
- 800x600 Display Resolution
- A program that loads 16 Bit SIGNED RAW data in INTEL order. Something like Sound Forge XP, Sound Forge 4.0, CoolEdit 95 or CoolEdit 96.

D.S.E. (**D**ecent **S**ystem **E**nviroment):
- Pentium
- 16 Mb RAM
- 800x600 Display Resolution
- A program that loads 16 Bit SIGNED RAW data in INTEL order. Something like Sound Forge XP, Sound Forge 4.0, CoolEdit 95 or CoolEdit 96.
- A Fast Hard Drive or SCSI Hard Drive (required only for very long samples)
- A Sound Card (required only if you want to listen to the samples and sample preview)

DEFRACTOR TOOLS ANALISYS

FILE MENU

Reset Synth

It reset the synth variable/oscillators settings to the start-up default.

Open Instrument...

Opens a instrument file .DFC. The .DFC file contains all the settings of the synth except for Stretching (Proportional and Custom) and custom wave form. Then if you use a custom wave-shape and you want to exchange an instrument with others, you MUST enclose the custom shapes the instrument use. For the .DFC format specifications see below.

I also added the .DF2 format (Enhaced Instrument) that stores Custom Wave Forms.

Save Instrument...

Save current instrument in standard 1.0 Defractor instrument (.DFC) or Defractor Enhaced instrument (.DF2). You MUST use the enhaced instrument format if you want to store your custom waveforms with instrument settings.
Standard Defractor Instrument (.DFC) Advantages:
• Very small size (less than 500 bytes)
• Stores all the basic information for making a good samples
Standard Defractor Instrument (.DFC) Disadvantages:
• It doesn't store Stretching information
• It doesn't store Custom Wave Forms
Enhaced Defractor Instrument (.DF2) Advantages:
• Stores all information of the instrument (Stretching, Custom Wave Forms)
Enhaced Defractor Instrument (.DF2) Disadvantages:
• "Big" size of the instrument file (more than 16K)

The .DFC file is concepted for quick internet exchange of instruments.

Save As Sample...

Save current instrument as a sample. This function generate the sample and save it to the disk. The .RAW file is 16 Bit SIGNED and WITHOUT HEADER - its playback rate is 44100 Hz - INTEL byte ordering. The .WAV file is a standard microsoft wave. The .XI file is a standard FastTracker II instrument file (with tuning & envelope); you will find the correct playing-rate in C-5.

Instrument/Sample Settings...

This call the "Instrument/Sample Settings" window.
> **Instrument Name** - is the name of the instrument (this will be saved only in the .DFC format and in .XI instruments). >40 chars.
> **Instrument/Sample Length** - is the length, in secs, of the sample (or the instrument). From 0.05s to 8m20s (500s).
> **Buttons** - Quick selects length of the instrument. The three buttons called *"0.74297"*, *"1.48594"* and *"2.97188"* gives a sample size of 64K, 128K and 256K respectively (this is usefull for making samples for GUS boards).

Exit Defractor

Close the program without confirmation (really simple to use ;)).

OSCILLATOR 1 and OSCILLATOR 2 MENU

All this functions work in the same way for both the oscillators.

Sine

Set the oscillator using a Sine wave-form. Phase is 0 degrees.

Square

Set the oscillator using a Square wave-form.

Saw Tooth

Set the oscillator using a Saw Tooth wave-form.

Triangular

Set the oscillator using a Triangular wave-form.

Exponential Tooth

Set the oscillator using a Exponential Tooth wave-form.

Logarithmic Tooth

Set the oscillator using a Logarithmic Tooth wave-form. Thru the "More Settings..." window you can change the bending rate of the shape.

Square+Duty Cycle

Set the oscillator using a Square wave-form with Duty-Cycle. Duty Cycle can be changed thru the "More Settings..." window.

Pulse

Set the oscillator using a Pulse wave-form. The Pulse type can be changed in the "More Settings..." window.

Parabolic Tooth

Set the oscillator using a Parabolic Tooth wave-form. This tooth wave-form is "belled". This means it contains a positive and a negative tooth. Next version will support the single tooth wave-form.

Circular

Set the oscillator using a Circular wave-form. Circular Stretching can be modified thru the "MoreSettings..." window.

Ramp Tooth

Set the oscillator using a Ramp Tooth wave-form. As the Parabolic Tooth this wave-form is "belled" but in this one you don't need the single tooth shape (the single tooth is Saw Tooth).

Noise

Set the oscillator generate noise.

None

Set the oscillator to a plain, silent wave-form.

Custom...

Load a custom shape in .RAW format. The .RAW file must be WITHOUT HEADER, 16 Bit SIGNED data in INTEL order. The optimal shape size is 4410 Bytes (0.1 secs). Lower sizing will fill the difference with 0 (zero). Higher size will be cutted.
In future version a .RAD format will be supported.

Save WaveForm...

Save current wave-form to disk in .RAW format.

ABOUT MENU

About Defractor...

Shows the "about" window of DEFRACTOR.

Contributors/Beta Testers...

Show the "Contributors/Beta Testers..." window. If YOU want to **appear** in this window see the instruction below.

LAYOUT

Frequency Scroll-Bars & Frequency Edit-Boxes

Changes the frequency of the oscillator. Frequency variations are NOT shown in the panel above. The frequency range is 1 to 32000 Hz. Left tools set oscillator 1 properties, right tools set oscillator 2 properties.

"More Settings..." Button

Opens the "More Settings" window. This window contains tools for changing the waveform "look".

Tool	Saved in .DFC	Description
Parameter 1 (Scrool-bar)	Yes	Set Duty-Cycle, Pulse-Width, Circular Stretching and Bending Rate for Square+Duty Cycle, Pulse, Circular and Logarithmic Tooth respectively.
Parameter 2 (Scrool-bar/Inactive)	Yes	Unused
Upper (Check-box)	Yes	Switch the positive part of the pulse on and off.
Lower (Check-box)	Yes	Switch the negative part of the pulse on and off.
Reset Shape (Button)	No	Reset all changes of the wave-form.
Proportional Stretch (Scroll-bar)	No	Stretch the wave-form using a proportional algorithm.
Custom Stretch (Scroll-bar)	No	Stretch the wave-form using my own algorithm.
Mirror (Button)	No	Mirror (vertical) the wave-form
Reverse (Button)	No	Reverse the wave-form (same as Mirror button but it works horizontally).
Bell (Button)	No	Apply the "Bell" function to the waveform. The "Bell" function stretch the wave to an half of its length the it attack a mirrored copy of the stretched wave at the end of the first one (then the length is equal to the original).

Envelope Generators Panel

Contain the settings for the Envelope Generators. The envelope type is AD (Attack & Decay). The attack time range starts from 0.00 sec to 30.00 sec. The decay time range starts from 0.00 sec to 240.00 sec.

Tool	Saved in .DFC	Description
Enveloping Oscillator 1	Yes	Enable/Disable enveloping for oscillator 1 signal.
Enveloping Oscillator 2	Yes	Enable/Disable enveloping for oscillator 2 signal.
Attack	Yes	Set the Attack Time (the left one for the oscillator 1, the right one for the oscillator 2).
Decay	Yes	Set the Decay Time (the left one for the oscillator 1, the right one for the oscillator 2).

Filters Panel

This panel contains all the 48 Bit filters that works directly in the generation-engine.
Overdrive and Attenuator works on the 48 Bit engine output.

Tool	Saved in .DFC	Description
Smoothing	Yes	Enable/Disable smoothing filtering.
Smoothing Power	Yes	Set the power of the smoothing filter.
Pinch/Punch	Yes	Enable/Disable Pinch/Punch filtering.
Pinch/Punch Power	Yes	Set the power of the Pinch/Punch filter.
Pinch/Punch Threshold	Yes	Set the threshold level of the Pinch/Punch filter.
Sliding	Yes	Enable/Disable sliding.
Sliding Ratio	Yes	Set the sliding ratio. The ratio is Hz/sample.
Sliding Up/Down	Yes	Set the sliding goes to higher frequencies (Up - Enabled) or to lower frequencies (Down - Disabled).

Smoothing Filter Overview

Higher values for Smoothing Filter correspond to less smoothing of the sample-wave; lower values correspond to higher smoothing. Smoothing result is like a low-pass filter.

Pinch/Punch Filter Overview

Pinch/Punch filter is a bit strange filter. It works as a distortion. The Threshold value set how much wave will be Pinched and how much is Punched. This filter work symmetrically to the 0 axis; this means it works in the same way in the positive-part of the wave as in the negative one but it NEVER work in all the amplitude width (it has two different process for a single sample if it is negative or positive).

Sliding Overview

Sliding is a tool used to increase or decrease the frequency of the oscillator 1. This is like turn a resonance knob on a synth, a portamento effect or a modulation knob, depends on the engine settings. Ratio specify how much quickly the frequency decrease or increase (this depends on the Up/Down check-box). The Ratio value is in Hz per sample. This mean you can have a sliding from 13.23 Hz/sec to 132.3 KHz/sec.

Sliding is also useful to simulate (?) high-frequency decay on a bass or synth hit, or to make a scream-like sample.

Advanced Panel

It contains advanced and engine output modifiers. The Internal Multiplier and the Division Factor are really advanced settings (see after the table).

Tools	Saved in .DFC	Description
OverDrive	Yes	Set the overdrive power.
Attenuator	Yes	Set the attenuator power.
Amplitude Synchronizer	Yes	Enable/Disable Amplitude synchronization for oscillator 1.
Internal Multiplier*	Yes	Multiplies the output of the routine that mix oscillator 1 with oscillator 2.
Division Factor*	Yes	Reduce or raise the power of the internal LFO.

* This setting work directly to the core of the generation-engine.

OverDrive Overview
That's really simple! Higher values gives higher overdrive.

Attenuator Overview
Higher the value higher the attenuation.

Amplitude Synchronizer Overview
This tool synchronize the amplitude and the phase of oscillator 1 with the oscillator 2 amplitude. Why this? Because the Amplitude Synchronizer is useful to make BassLine-like samples or fat bass hits.

Internal Multiplier and Division Factor Overview
The Internal Multiplier multiplies the output of the oscillator mixing routine. The result is to modulate (or over-modulate) the sound.
The Division Factor reduce or raise the power of the internal DEFRACTOR LFO system. Please don't set it to 0 (the program will crash).
Now I think you are a "bit" confused but it's difficult for me explain what really do this two values. I leave them to give you more flexibility on the sound feel. With this two values you can do softly or violent sonority with the same effect and without touch any oscillator tool.

Sample Preview

It previews the instrument. It generates the sample thru the same algorithm of the sample generation; then what you are listen is exactly what will be saved (is you save it) and played in your tracker/sequencer.
To use the Sample Preview you need a sound card or a playing device.

'>>>' and '<<<' Buttons

This two buttons are used to copy the oscillator waveform (with frequency, settings and amplitude). The **>>>** button copies Oscillator 1 settings to Oscillator 2. **<<<** button copies Oscillator 2 settings to Oscillator 1.

< -- > Button

This button swap settings between Oscillator 1 and Oscillator 2.

HOW TO BUILD A SOUND

This section is like a simple tutorial on how to make a simple sound.

An example on creating bass synth touch samples:

Set the length of the instrument (sample) thru the Instrument/Sample Settings window. A bass synth isn't too long then 0.5 secs or 0.7429 secs (for GUS users) is enought. Set the instrument name (if you want). Click on DONE and start setting up the synth.

Set the main oscillator, Oscillator 2, frequency to 110.0 Hz, then enable the oscillator 2 volume envelope (attack 0.006 secs; decay ~0.8 secs).

Set the oscillator 1 waveform to Sine.

Now set the overdrive (usually I set it to 1.10) and the smoothing filter (2.100). When you set the smoothing power don't go below 1.6 because it REALLY smooth the waveform!

What kind of sound we want to have? An analog-synth like? A 90's expander?

To have a analog-like sound I suggest to set the oscillator 2 waveform to Saw, Triangular or Square (generally I don't use the Sine shape to make bass sounds). Using a Parabolic Tooth or a Ramp Tooth will give good result if you like recent sound synthesis.

I suggest to leave the Amplitude/Phase Synchronizer checked (I don't like the result the synth gives when it is off).

Now set the oscillator 1 frequency like a modulation filter; 220 Hz or 330 Hz sounds good. Preview it.

If the sample sounds too rich of high-frequencies add more smoothness (lower the value of the smoothing power) or lower the oscillator 1 frequency. You can also increase the sliding ratio.

Do you like the sample? If it does, save it with Save As Sample...; set your preferred format and click OK.

In the same way of this bass sample, you can create 303-like sounds and other acid sounds. Varying the Division Factor and the Internal Multiplier you can customize the synth generation.

KNOWN BUGS

- Both Stretching tools aren't full working
- I need to work around the Pinch/Punch Filter (it gives result that are only near what I want)
- Wave form name sometimes wrong after loading an instrument
- .XI format writes data with displace.... you can find buggy distortion zone

DEFRACTOR FUTURE

That's what you will find in future versions. If you have any suggestion or comments write to me (don't ask for miracles please! :)).

- I'm planning an Enhance Filter and a little 16 position sequencer
- Your suggestions (shot now! :))

DEFRACTOR FAQ

Q: Does anyone ask you something about the program?
A: No! :)
Q: Why don't you add some demo instruments?
A: As you can see I add demo instruments in this release (0.94ß) :).

CONTRIBUTORS

Do you want to support FREE-WARE programmers (the poorest coders in the globe :))?

You can do it by send a VERY little contribution. The contribution is only 5$ US (or 8.000 to 10.000 Lire for italian guys). If you think the value of DEFRACTOR is more send more money, if you think is less send less money.

Contribution? What gives?

Happiness (for me) and *Glory* (for you). If you send money your name will compare in the Contributors/Beta Testers Window (that's the Glory... ehehehhehe....); at the same time I will be more happy :).... If you send more than 100$ I will add a window in DEFRACTOR only for you in a DEFRACTOR DeLUXE Release!!! Ehehehhehh.......

Send money to:
    Jenner Fusari
    Via Sammartina 50
    48020 - Villa S.Martino (RA)
    ITALY

THANX & GREETINGS

Big Thanx to:

Fabio Rani	*(Beta-Tester)*
Dixan	*(Supporter)*
Pedr0/CBR	*(Supporter)*
Swan & SCREAM Org.	*(Supporter)*
M00nShado	*(Denigrator ;) eheheheh....)*
Pirazzini "PiRaZ" Claudio	*(Estimator)*
AKA	*(Suggester? ;))*
MAZ	*(Suggester? ;))*

APPENDIX 1 - THE .DFC FORMAT

Revision 970421.1 - Version: 1.0Beta2

ATTENTION - The format may change in future versions of DEFRACTOR (until the 1.0). I suggest to not code any loader for this version of the format. The .DFC format version 1.0 (non beta) will be the _REAL_ one.

OffSet	Size	Type	Description
0000h	10	Byte	DFC Signature: Byte 0 - 'V' Byte 1 - Version number (1st digit) Byte 2 - Version number (2nd digit) Byte 3 - Version number (3rd digit) Byte 4..9 - Unused
000Ah	40	String	Instrument Name (1st char unused)
0032h	6	Real	Instrument Length (sec)
0038h	6	Real	Oscillator 1 frequency Hz
003Eh	6	Real	Oscillator 2 frequency Hz
0044h	6	Real	Oscillator 1 amplification
004Ah	6	Real	Oscillator 2 amplification
0050h	145	OscSetup	Oscillator 1 Waveform Setup
00E1h	145	OscSetup	Oscillator 2 Waveform Setup
0172h	5	EnvSetup	Oscil. 1 Envelope Setup
017Bh	5	EnvSetup	Oscil. 2 Envelope Setup

0184h	1	Bool	Smoothing Filter Enable/Disable. Values:
			  0 :Disabled
			  1 :Enabled

0185h	6	Real	Smooth Power

018Bh	1	Bool	Pinch/Punch Filter Enable/Disable. Values:
			  0 :Disabled
			  1 :Enabled

018Ch	6	Real	Pinch/Punch Power
0192h	6	Real	Pinch/Punch Threshold

0198h	1	Bool	Sliding Enable/Disable. Values:
			  0 :Disabled
			  1 :Enabled

0199h	6	Real	Slide Ratio (Hz/sample)

019Fh	1	Bool	Slide Direction. Values:
			  0 :Down (Decrease)
			  1 :Up (Increase)

01A0h	6	Real	OverDrive
01A6h	6	Real	Attenuator

01ACh	1	Bool	Phase & Amplitude Synchronization. Values:
			  0 :Off
			  1 :On

01ADh	6	Real	Internal Multiplier
01B3h	6	Real	Division Factor

Type: OscSetup (Oscillator WaveForm Setup)			

+00h	1	Byte	Shape Number. Values:
			    0 - Custom
			    1 - Sine
			    2 - Square
			    3 - Saw Tooth
			    4 - Triagular
			    5 - Exponential Tooth
			    6 - Logarithmic Tooth
			    7 - Duty Square
			    8 - Sined Square (not available from menus)
			    9 - Pulse
			    10 - Parabolic Tooth
			    11 - Circular
			    12 - Ramp Tooth
			    255 - None

+01h	6	Real	Parameter 1
+07h	6	Real	Parameter 2
+0Dh	1	Bool	Option 1
+0Eh	1	Bool	Option 2
+0Fh	1	Byte	Unused
+10h	1	Byte	Unused
+11h	128	String	Unused

Type: EnvSetup (Envelope Setup)			

+00h	1	Bool	Envelope Enable/Disable. Values:
			    0 :Disabled
			    1 :Enabled

+01h	4	LongInt	Attack Time (msec)
+05h	4	LongInt	Decay Time (msec)

APPENDIX 2 - THE .RAD FORMAT

Not released yet.

APPENDIX 3 - THE .DF2 FORMAT

Will be available soon (it is under improvement).