# SYNTHEDIT QUICK START GUIDE

Analogue synthesizers use a relatively small number of electronic components. The key characteristic of these components is that they are controlled by means of applying a specific voltage. Their output is again a voltage, so therefore it is possible to link these components together in various ways to create almost an unlimited amount of different effects. SynthEdit is an application that simulates analogue synthesizer components. It uses a graphical interface, so it is really simple to link these components together to create almost unlimited instruments or sound effects. This guide is for version 1 of SynthEdit.

THE BASIC SYNTHESIZER

1. Start SynthEdit. When you start it the first time a demo synth loads automatically. Click on "File" and "New" to start a new synth. You don't need to save the current one.
2. Before you can build your synth you need to set up SynthEdit. It is quite likely that it will already have picked up your soundcard for output, but you may need to tell it which MIDI In device it needs to use. In SyntheEdit, go to "Edit" and then "Preferences". Choose the correct MIDI In device and click "OK".
3. You may want to drag your work area a bit bigger before you start. Now you are ready to build your first synth.
4. Right click in the work area and from "Insert", click "MIDI" and then "MIDI In" to create a **MIDI In** port. If you don't have a MIDI keyboard, you can also click on "Insert", "Controls" and "Keyboard". The latter will allow you to play on your PC or laptop keyboard. Drag your **MIDI In** module to the left of the screen.
5. Next you need a module that translates the MIDI signals into voltages. This you find by going to "Insert", "MIDI" and "MIDI to CV" (Control Voltage). Drag this module just to the right of your **MIDI In** module.
6. Now click on *MIDI data* on the **MIDI In** module and then drag to *MIDI In* on the **MIDI to CV** module. There is now a link between the two modules. The idea is that when you press a key on the keyboard, the *Gate* connector on **MIDI to CV** will go from 0 to 10 volts, and the *Pitch* connector will have a voltage that depends on which key you have pressed, thus representing the pitch. Of course the *Gate* will go back to 0 volt when the key is again released.
7. Next we need an oscillator. We find one in "Insert", "Waveform" and then "Oscillator". Connect the *Pitch* from **MIDI to CV** to the *Pitch* of the **Oscillator**. Now we can control the frequency of the oscillator by means of pressing the appropriate key. However, the oscillator continuously produces a signal, whether a key is pressed or not. We don't want that, so we need a module that can interrupt the *Audio Out* signal before it goes to the speakers.For that we use a VCA (Voltage Controlled Amp).
8. You find a VCA under "Insert" and "Modifiers". Connect the *Gate* from **MIDI to CV** with the *Volume* of the **VCA** and the *Audio Out* from the **Oscillator** with the *Signal* of the **VCA**.
9. Finally we need somewhere for the sound to go. From "Insert", choose "Input/Output" and then "Sound Out". The connectors *1* and *2* correspond to the left and right speaker. So connect *Output* from the **VCA** to both *1* and *2* (you can have more than one link to certain connectors).

Your basic synth is now ready and should look like the image below.
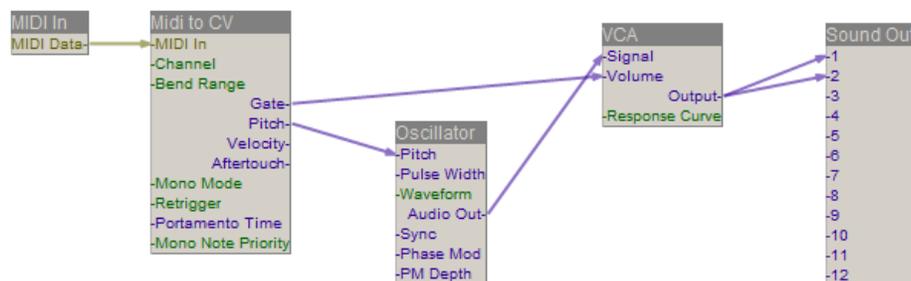
Click on the red play button at the top of the application to start the synth. There may be a bit of a delay between pressing the keys and hearing the sound. This is so called latency and depends on the quality of your soundcard. You may be able to improve things by going back to "Edit" and "Preferences" and change the "Play Ahead" setting to a smaller number. Don't go too small, as the sound will start to break up. Alternatively you may want to use ASIO4ALL software. This is free and creates a virtual ASIO sound card which has a really low latency. Once installed, restart the PC and select it as your "Audio Out" device under "Edit" and "Prefernces".

ADDING CONTROLS

Our basic synth works but we can't really control anything, so we are now going to add some controls.

1. From "Insert" choose "Controls" and then "List Entry". Place the List Entry to the left of the Oscillator and link the *Choice* connector of the **List Entry** with *Waveform* of the **Oscillator**. Right click on the List Entry and from "Appearance" choose "Up/Down Selector". You can now change the waveform of the oscillator. You may want to increase the size of your selector by dragging the bottom right hand corner.
2. From "Insert" and "Controls", choose "Slider". Connect the **Slider** to the *Pulse Width* of the **Oscillator**. Make sure you choose the Pulse waveform and then try your new slider.
3. If you want to know what is going on, choose "Insert" and "Controls" and "Scope2". Make your **Scope** a bit bigger and connect the *Output* from the **VCA** to the *Signal A* of the scope.

CHANGING THE "ENVELOPE"

The sound is still very harsh, so we are going to add an **ADSR** module. Before you add new modules it is best to stop the simulation by clicking the red square, as it makes the computer more responsive.

1. Remove the scope by clicking on it once and then press delete. Then from "Insert" and "Waveform" pick "ADSR". Drag the ADSR roughly underneath the Oscillator and the VCA, about halfway between them.
2. Remove the connection between the *Gate* of the **MIDI to CV** module and the **VCA** (click the link once and press delete). Now create a new link from the *Gate* of the **MIDI to CV** module to the *Gate* of the **ADSR**, and also link the *Signal Out* of the **ADSR** to the *Volume* of the **VCA.**
3. Finally, connect sliders to all of the remaining 5 connectors of the **ADSR**. The quickest way is to click the Pulse Width slider and then press Ctrl+c and then 5 times Ctrl+v. Move the sliders apart and link them up with the **ADSR**.

The **ADSR** produces a voltage "pulse" when its *Gate* connector goes to 10 volts. This pulse has a specific "shape" you can see in the diagram below.
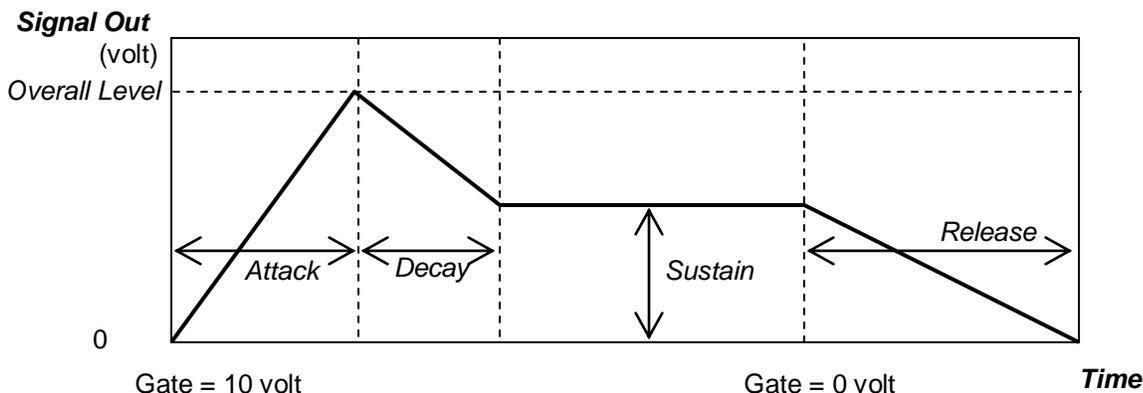
The voltage on the *Signal Out* connector will first increase from 0 volt to the voltage applied on *Overall Level*. The speed with which this happens is controlled by a voltage on the *Attack* connector. The higher the voltage on that connector, the longer it takes to reach the *Overall Level* voltage. At 0 volt the time is 0 seconds (i.e. immediately). As soon as the *Overall Level* voltage has been reached, the voltage on *Signal Out* will start to decrease again until it reaches the *Sustain* voltage. The speed with which this happens is controlled by the *Decay* voltage. The *Signal Out* voltage remains at the *Sustain* level, until the *Gate* voltage drops to 0 volt again. The *Signal Out* voltage will the start to decrease again to 0 volt over a period of time governed by the *Release* voltage.

Since the Signal Out voltage is varied in the above described way, the VCA will change the volume of the sound in the same manner. You should be able to get all sorts of effects by changing the **Attack**, **Decay**, **Sustain** and **Release** sliders and change the overall volume with the **Overall Level** slider. Remember to start the simulation again by clicking on the red play button first. Try the following settings for A, D, S and R: 0, 0, 10, 0 then 5, 0, 10, 5 or 0, 6, 5, 5 for a more piano touch effect.

FILTERING

1. From "Insert" choose "Filters" and then "Moog Filter". Now remove the link between the *Audio Out* of the **Oscillator** and the **VCA**. Link the *Audio Out* of the **Oscillator** with *Signal* of the **Moog Filter** and the *Output* of the **Moog Filter** with the *Signal* connector of the **VCA**.
2. Add 2 sliders, each for the *Pitch* and *Resonance* of the **Moog Filter** and then have a play.

PERIODIC EFFECTS – THE "LFO"

If we took a second Oscillator and instead of using it to produce sound we ran it at a really low frequency (in the range of say 1 Hertz), we could use the *Audio Out* signal as a regularly alternating control voltage for the *Overall Level* of the **ADSR**. This would create a tremolo effect. Such a facility is knows as an LFO or Low Frequency Oscillator.

1. From the "Insert" menu select "Waveform" and then "Oscillator". Drag this new Oscillator near the **ADSR**.
2. Right click the new oscillator and click "Properties". Change the "Title" to LFO and set the Remove the properties box again (click on the little x at the top right hand corner, you don't need to save any settings).
3. Insert another slider and put this to the left of the **LFO**. Connect the slider to the *Pitch* bus **LFO**. Right click the slider and select "Properties" from the menu. Now change "Low Value" to -6 and "High Value" to 0, and the "Title" to "LFO Speed".
4. Copy the waveform selector of the other oscillator and paste it to the left of the **LFO**. Link it up with the **LFO**'s *Waveform* connector. Insert another slider and link it to **LFO**'s *Pulse Width* (change title to suit).
5. Copy the VCA and paste it to the right of the LFO. Connect a slider to the *Volume* of this new **VCA**. In the slider properties change the title to "LFO Amount", as you will be able to adjust the amount of LFO effect with this slider. Connect the *Audio Out* of the **LFO** to the *Signal* connector of the new **VCA**.

We now have a working LFO, but haven't connected it to anything yet. It would be good if we use a rotary switch to determine the destination of our LFO signal, so we need to build another selector.

6. From the "Insert" menu choose "Flow Control" and then "1->Many". Drag this to the right of the new **VCA**. Connect the *Output* of the new **VCA** to the *Input* of the **1->Many** switch.
7. Copy one of the waveform selectors and paste it to the left of the **1->Many** switch and then connect it to the *Choice* connector of the **1->Many** switch. Then change its title to "LFO Destination".

We can now connect any *Spare Output* bus of the **1->Many** switch to any of the other modules. You can experiment to get the wackiest effects. Make sure you use a new *Spare Output* each time you make a link (they appear automatically). You can now channel the alternating signal from the LFO to any of the *Spare Outputs* using the selector. The following work really well:

- *Pulse Width* of the main **Oscillator**. You need to switch this Oscillator to "Pulse" waveform to have any effect. You can further control the effect by means of adjusting the Pulse Width slider that is already attached or the LFO Amount slider.
- *Volume* of the main **VCA** (i.e the one connected to the ADSR). Make sure you turn down the *Overall Level* of the **ADSR** and the **LFO Amount** otherwise you overwhelm the **VCA** and things will sound bad.
- *Phase Mod* of the main **Oscillator**.
- *Pitch* of the **Moog Filter**.
- *Resonance* of **the Moog Filter**.

You can also create an incredible pan effect using a **Pan** module (from Modifiers) between the main **VCA** *Output* and the **1** and **2** channels of the **Sound Out** module (remove the other 2 links). *Left Out* goes to *1, Right Out* goes to *2*, **VCA** *Output* goes to **Pan** *Input* and then link a spare output from the LFO 1-Many switch to the *Pan* connector of the **Pan** module.

PANEL MODE

You can create a panel for your synth by right clicking anywhere in the work area and choose Panel Edit. You will notice that all controls are bunched together, but you simply need to pry them apart and put them in the right place. You may also need to change some of their titles to make it clear what it is. The Up/Down selectors may not be very easy to see on the blue background, but you can change them to for instance a rotary switch in "Properties". You can also get different skins for your panels, which is outside the scope of this introduction. Make sure you save your synths regularly.