1 INTRODUCTION

tinySynth emulates the first analog synthesizers appeared during the 70s. It is a VSTi Synthesizer developed using the JUCE environment.

Frequenting the BA/BSC (HONS) AUDIO PRODUCTION at SAE Amsterdam I developed tinySynth as the topic of my final project. The tinySynth project was inspired by examples and ideas coming from the Internet and in particular the vstSynth of G.Olochwoszcz and the usage of STK libraries.

tinySynth in its simplicity it is fully functional. It is distributed according to open source license. I hope it can be used as a virtual instrument but also as an example for people who are starting the journey for the development of such as products.

Below are reported the tinySynth details and the instructions about the project's setup and recompiling.

2 TINYSYNTH PROJECT SETUP

The current section describes how to setup the tinySynth project.

The first step is to download the entire tinySynth project from the public repository https://github.com/AldoCiaccini/tinySynth, and save it inside the "C:\tinySynth_1.2.5" (for Windows OS) or "~/tinySynth_1.2.5" (for MAC OS)

The content of some directories (Download, JuceLibraryCode, and tinySynth_documentation), have been compressed, therefore, uncompressed them maintaining the same name in order to reconstruct the structure depicted in the figure below.
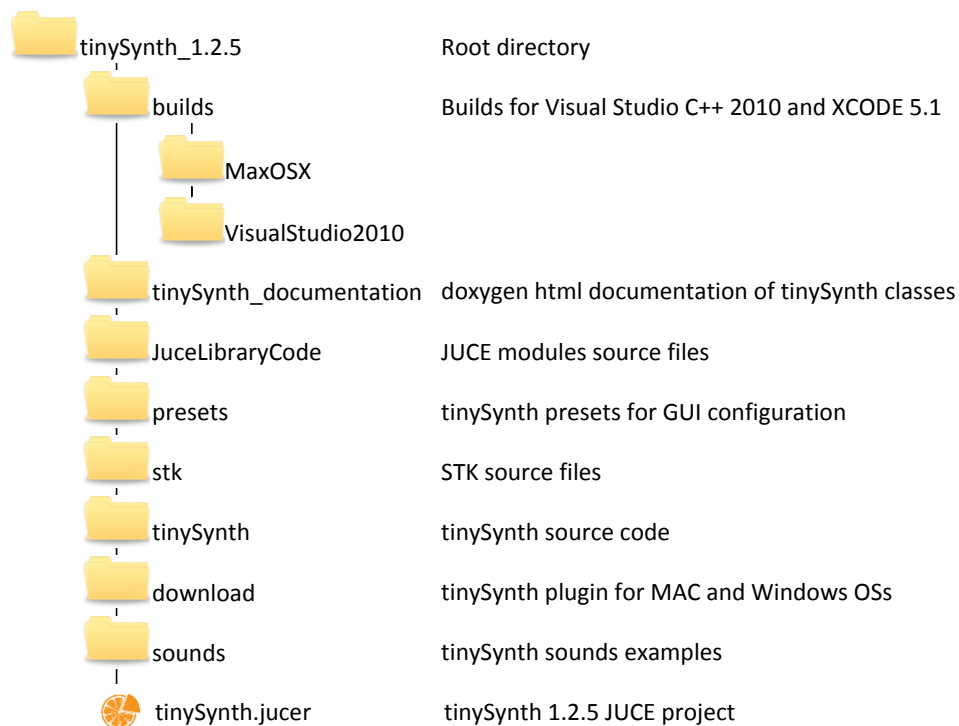
tinySynth_1.2.5	Root directory
builds	Builds for Visual Studio C++ 2010 and XCODE 5.1
MaxOSX	
VisualStudio2010	
tinySynth_documentation	doxygen html documentation of tinySynth classes
JuceLibraryCode	JUCE modules source files
presets	tinySynth presets for GUI configuration
stk	STK source files
tinySynth	tinySynth source code
download	tinySynth plugin for MAC and Windows OSs
sounds	tinySynth sounds examples
tinySynth.jucer	tinySynth 1.2.5 JUCE project

Figure 2-1: tinySynth project structure

The "sounds" directories contains some audio tracks with the aim to demonstrate the sound potentials of tinySynth.

The "download" directories contains the compiled tinySynth 1.2.5 plugin that can be played by using a DAW for MAC (32/64bit) and WINDOWS (32bit). The "presets" directory contains some files used to restore the GUI controls with predefined values, previously saved because able to generate interesting sounds.

In order to modify the tinySynth code and recompile it the a development machine shall be configured with the following additional software:

Windows

- Download and install Microsoft Visual Studio C++ Express 2010

- Download VST 3.x Audio Plug-Ins 3.x SDK and install in "C:\SDKs\VST3 SDK"

- Download the current free version of JUCE for Windows and install in "C:\JUCE"

MAC

- Download and install XCODE 5.1

- Download VST 3.x Audio Plug-Ins 3.x SDK and install in "~/SDKs/VST3 SDK"

- Download the current free version of JUCE for MAC and install in "~/JUCE"

3   TINYSYNTH SIGNAL FLOW

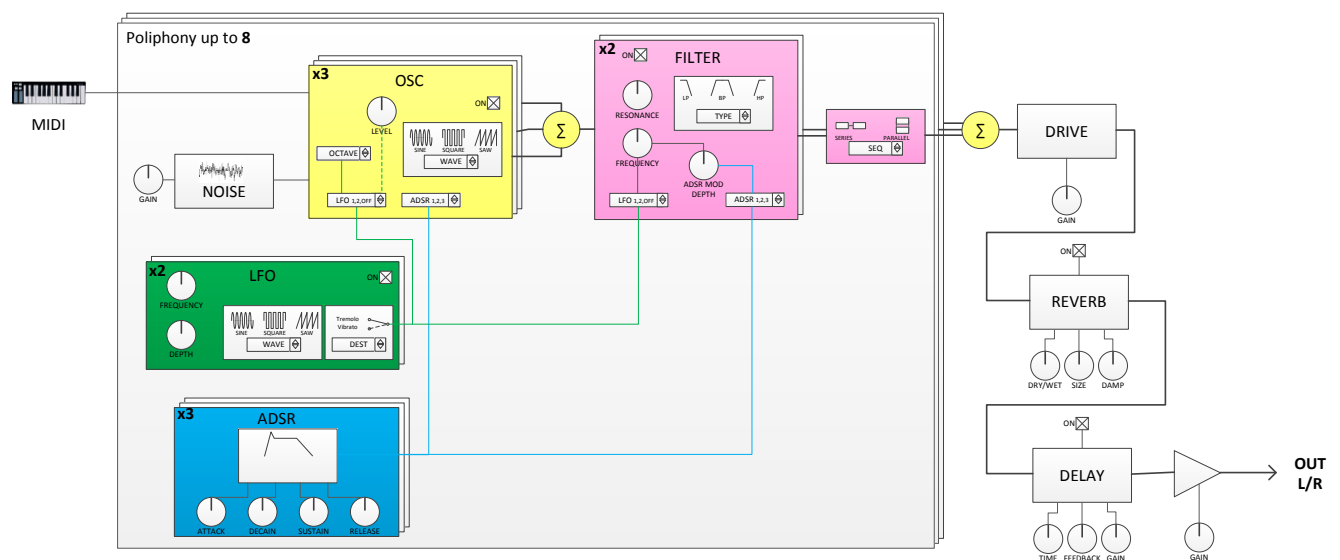tinySynth is a polyphonic instrument that is capable to play polyphony up to 8 voices.

Figure 3-1: tinySynth signal flow

Once played a key on the keyboard, a MIDI message is transmitted to the synth that let the oscillators to produce a waveform. There are three oscillators, capable to reproduce three different waves, which are sine, square and saw tooth waves. LFOs and Envelope Generators can be added in this point, in order to create vibrato and tremolo effects. After the Oscillators section, the signal pass through the Filters Section, where there are two filters, capable of being combined in series or in parallel. Once again in this point of the signal flow LFOs and Envelope Generators can be assigned

to filters, so to shape the sounds, and create filters open/close effects. After the filters section there is the signal is now reaching the FX section, in where it is possible to add three different types of effects, which are Reverb and Delay.

Finally the signal reaches the output section, where noise, and drive can be added to the final sound result, in combination of gain changing.

4 TINYSYNTH GUI

Figure 4-1: tinySynth GUI

The initial sound is produced by the oscillators section. In here, three oscillators are available, each of them can be activated, or de-activated, by an individual switch on the right top corner of every Oscillator.

The parameters that can be managed on the Oscillators are:

- Type of Wave: Sine, Square, Saw.

- Pitch: Divided in Octave and Semitones.

- Gain.

- Possibility to assign an Envelope Generator, or LFO on the Oscillator, just by clicking the interested feature, and selecting which one of them to use.

When assigning LFO's, it is important to set up the LFO section properly. In fact, it is not enough just the selection of which LFO is wanted to be used in the Oscillators section, but it is required to choose the mode, which can be Tremolo, or Vibrato, and the form of the LFO that can be Sine, Square, or Saw Tooth.

Once done that, it is possible to manage the frequency and the depth of the LFO, so to affects the sound produced by the Oscillators.

There are two filters on tinySynth. To activate them, the user needs to change the type block from off to one of the filter available on the synthesizer, which are LPF, HPF and BPF. Once decided the type of filters, it is possible to choose a combination between the two of them, which are series or parallel. It is possible to switch between these two options, by selecting the sequence block in the filter n° 2.

The parameters available on the filters are: frequency, and resonance.

There is the possibility also to assign LFO's and Envelope Generator on the filters, just by clicking on the respective blocks.