Granular synthesis for foley sounds

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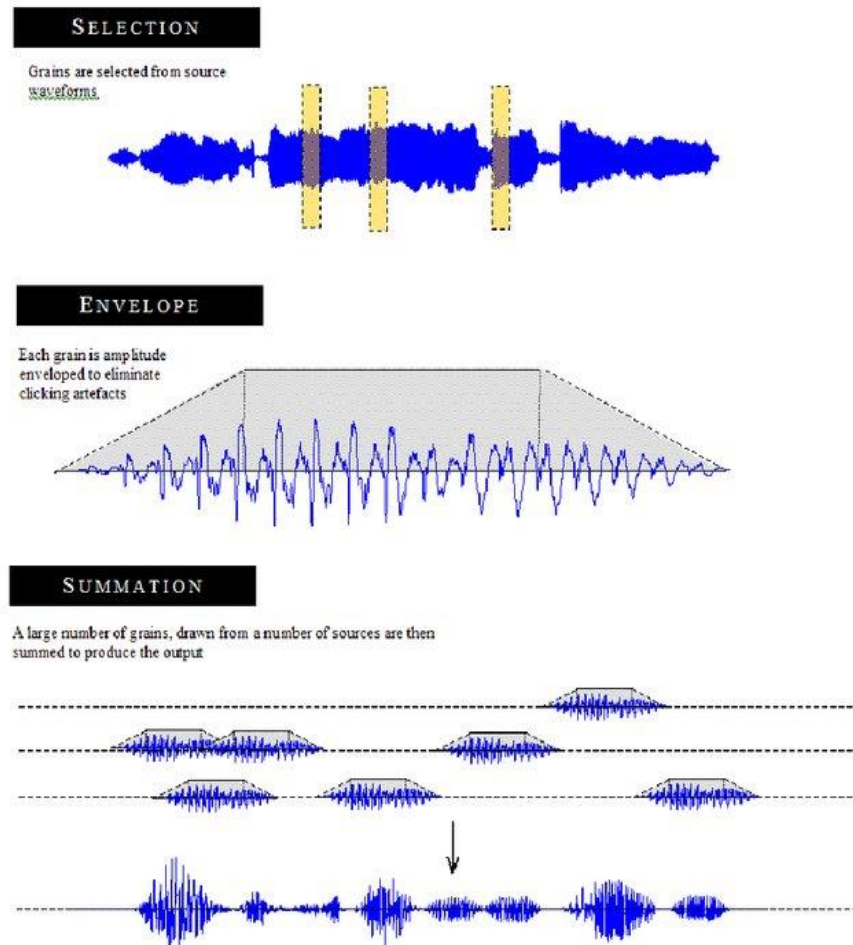*Alessandra Moro*
Elia Pirrello

POLITECNICO
MILANO 1863

Introduction to the grain synthesis

SELECTION

Grains are selected from source waveforms.

ENVELOPE

Each grain is amplitude enveloped to eliminate clicking artefacts

SUMMATION

A large number of grains, drawn from a number of sources are then summed to produce the output

- Manipulate small fragments of sound called "grains"

- Allows mixing any pair of samples together, from a selection of 13 different sound samples

- It can be controlled by parameters like grain duration, granular drift and frequency

Implementation

SynthDef

- `Phasor.ar` → phase
- `BufRD.ar` → read sound and play in real time
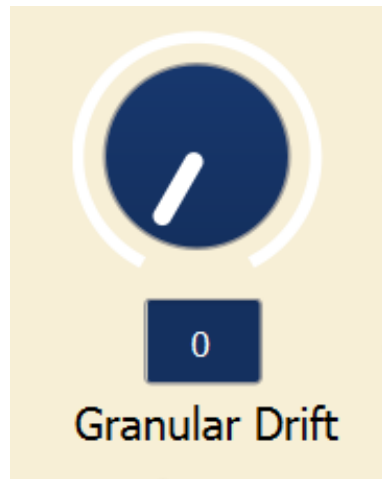- `Pitchshift.ar` → change frequency
- `Grain.In` → granulation
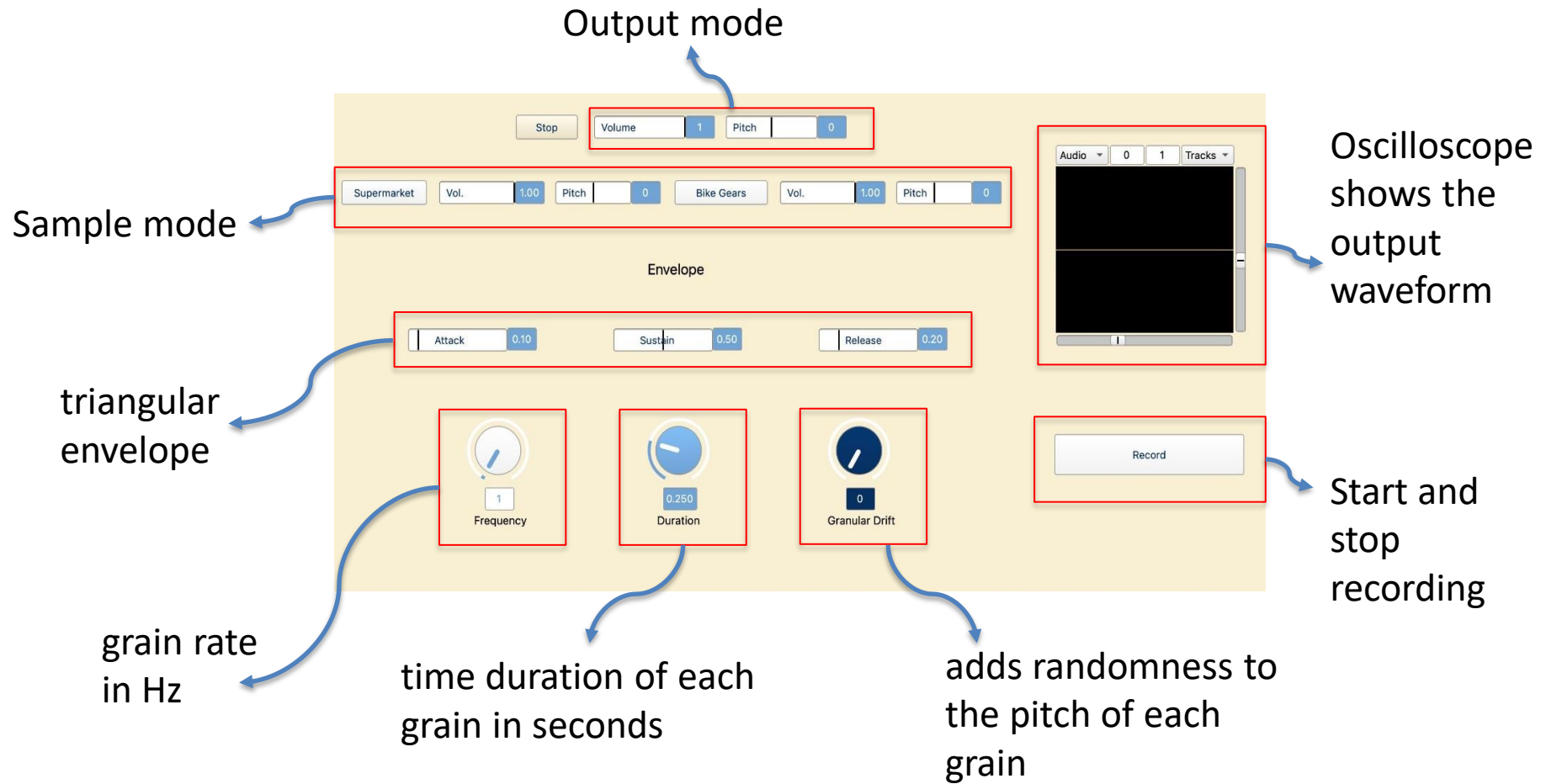- `Limiter.ar` → prevent the signal from clipping

Implementation

Granular Drift

Taking grains over time

Set of grains out of tune with each other

Randomness of grain intonation

The GUI

Output mode

Sample mode

triangular envelope

grain rate in Hz

Stop | Volume | 1 | Pitch | 0

Supermarket | Vol. | 1.00 | Pitch | 0 | Bike Gears | Vol. | 1.00 | Pitch | 0

Envelope

Attack | 0.10 | Sustain | 0.50 | Release | 0.20

Audio | 0 | 1 | Tracks

Record

Frequency | 1

Duration | 0.250

Granular Drift | 0

Oscilloscope shows the output waveform

Start and stop recording

time duration of each grain in seconds

adds randomness to the pitch of each grain

Conclusions

Realistic examples of foley sounds were created:

- Helicopter
- foot steps
- hail on the window
- a horror factory ambiance
- the distinct sound of a mining cart moving

`Grain.In` function was not as adjustable as we expected

Despite this limitation, incorporating pitch shifters and a limited number of audio samples has resulted in pleasing timbral variations in the outcomes