

Session 4

Envelope generator, east coast techniques

VA309 Modular Sound Synthesis @ EKA
Aubery Lis

Informational / Organisational

Coursework 1 deadline next week!

Did you receive the email with the task?

Coursework 2 handed out tomorrow

Same story as before: you will find it in your email inbox.

Recap of previous sessions

- What two engineers came up with the two main synthesis paradigms of the 1960s USA? How are the approaches called? What are the key differences? Which one turned more popular, and why?

Recap of previous sessions

- What modules is a usual east coast style audio path made out of?

Recap of previous sessions

- What are harmonics?
- Can any sound be described by its harmonics?
- How the harmonic content relate to the perceived sound and the waveshape?
- How can one manipulate harmonics? Is it any useful?
- What is a filter? What is cutoff and resonance?
- Do we want to filter a harmonically rich or simple sound?

Today

- First half: envelope generator
- Second half: animating the VCF, east coast tricks

Envelope generator

- **Generally**, outputs a signal that rises up and falls down upon receiving a **pulse** (e.g. gate signal from a keyboard, squarewave LFO, ...)
- Mainly used as CV to control other modules and create timed musical events
- Speed of rising, falling, etc are user-adjustable
- Usually, **an envelope stays at 0 volts until a gate is received**. Then it completes its routines and returns to 0.
- **Goes by other names**: function generator, contour, slope generator,

Attack-Release envelope

- The simplest one has two sections: attack and release.
- The voltage at the output rises to a set maximum upon receiving a pulse
- When the high logic signal is gone, the output goes back to 0 volts
- Attack and release speeds adjusted by user
- Such envelope is called an attack-release (**AR**) envelope.

(to emulate on an ADSR: Ax D0 S10 Rx)

Envelope



[image 1 - paia 2720 function generator, mid-70s]

[image 2 – music from outer space synth-diy experimenter board, 2010s]

ADSR envelope

- It is a **four stage envelope** that has four controls: attack time, decay time, sustain level and release time.
- Presented by Bob Moog in his original modular system, back in mid 60s.
- The **most successful envelope concept** to exist so far
- Moog called the controls T1, T2, E_{sus} and T3 respectively: later, Arp company gave the concept its famous “ADSR” name.

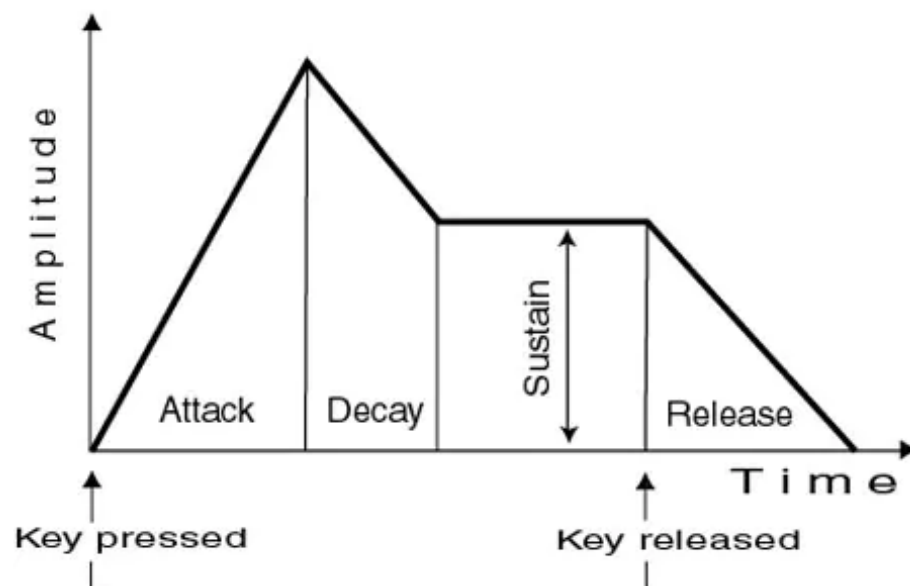
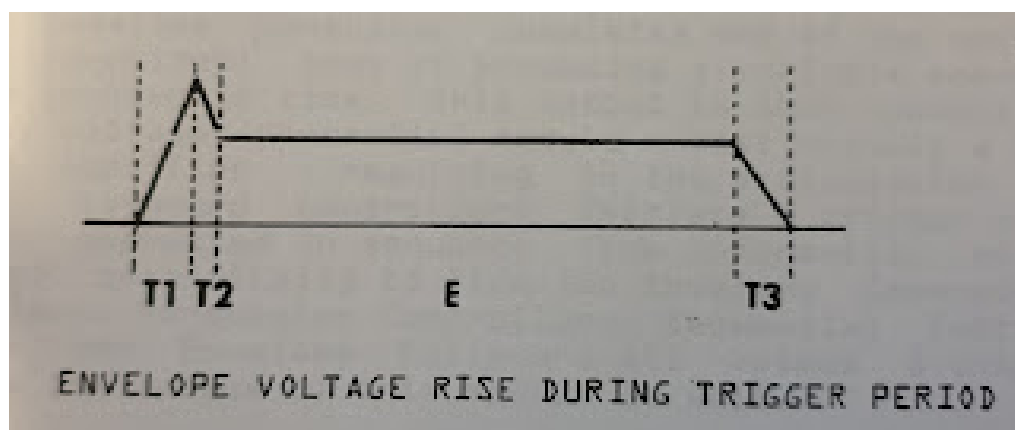
[image]



The 4 phases of an ADSR envelope

- **Attack:** the gate has just been received and the output rises to a set maximum voltage within time set by the attack control.
- **Decay:** after the output reaches peak, it starts sliding back down to a sustain level set by the user. The slide happens within time set by the decay control.
- **Sustain:** after the decay phase is over, while the gate is held high, the envelope output will sit at a positive voltage set by the sustain control.
- **Release:** once the gate is no longer held, the envelope slides to 0 within time set by the release control

The 4 phases of an ADSR envelope



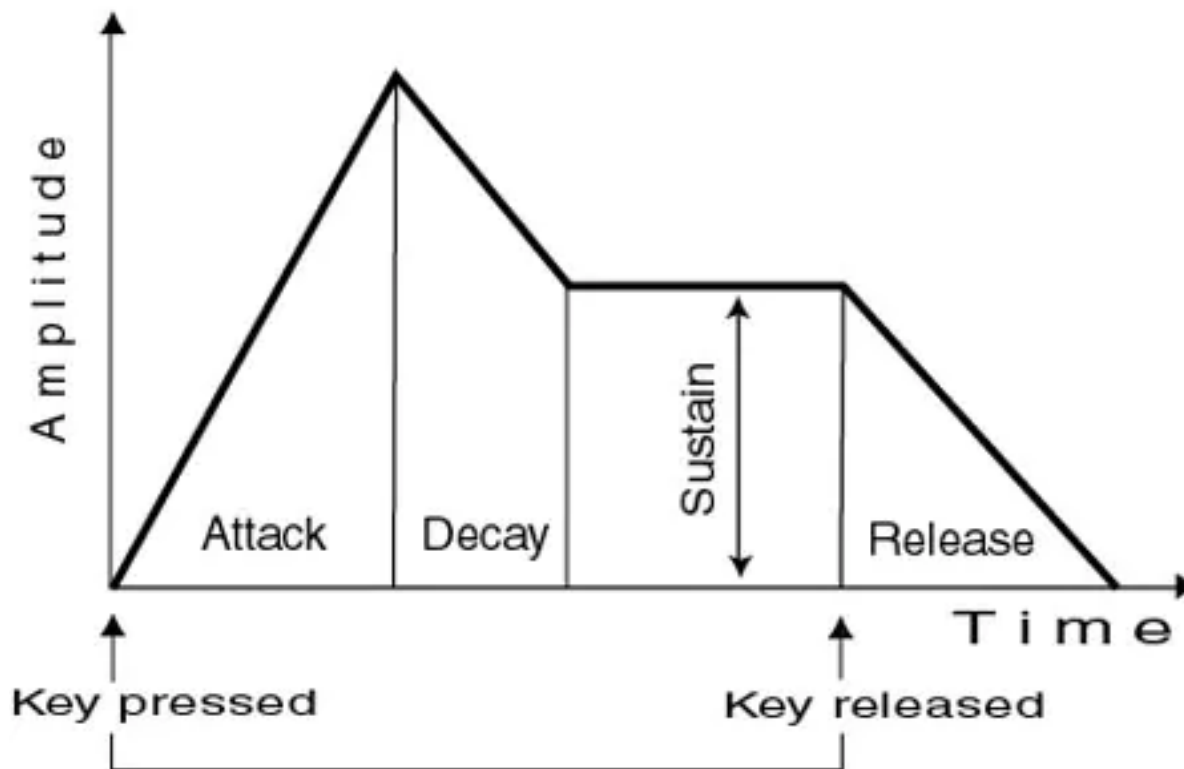
[image 1] [image 2]

Why is it better?

- The ADSR envelope sits very nicely between too simple and too complex.
- The sustain setting dramatically changes the character of the result, making it easily expressive
- It **instantly** allows for a lot of different envelope shapes, including but *not* limited to both the **AR** and **AD** envelopes.

Hearing exercise!

- I dial in an envelope
- You try to guess what settings I used! (e.g. A0 D5 S5 R0)



Animating the VCF

- In classic east coast style approach, the filter is the heart of your patch. It's what colours the sound the most
- A VCF has voltage control over parameters that dramatically alter the sound, and that can be used to add dynamics
- There are two classic modulation sources: the envelope and the LFO
- Don't forget that you still can (and should) modulate anything with anything!

Other east coast tricks:

- LFO to VCO PWM for chorus-like effect
- Layer the VCOs. Bonus for non-octave intervals (e.g. fifths)
- VCO output to VCF cutoff CV for harsh tones
- Noise to VCO CV for sandy tones
- VCF to track the 1v/o keyboard along with the VCO
- Using a ring modulator and/or a suboctaver

Exercise: animate the filter & use an east coast sound trick!

