Digital Signal Processing

Seminar 1

Sound synthesis of clarinet

April 2022

1.Introduction

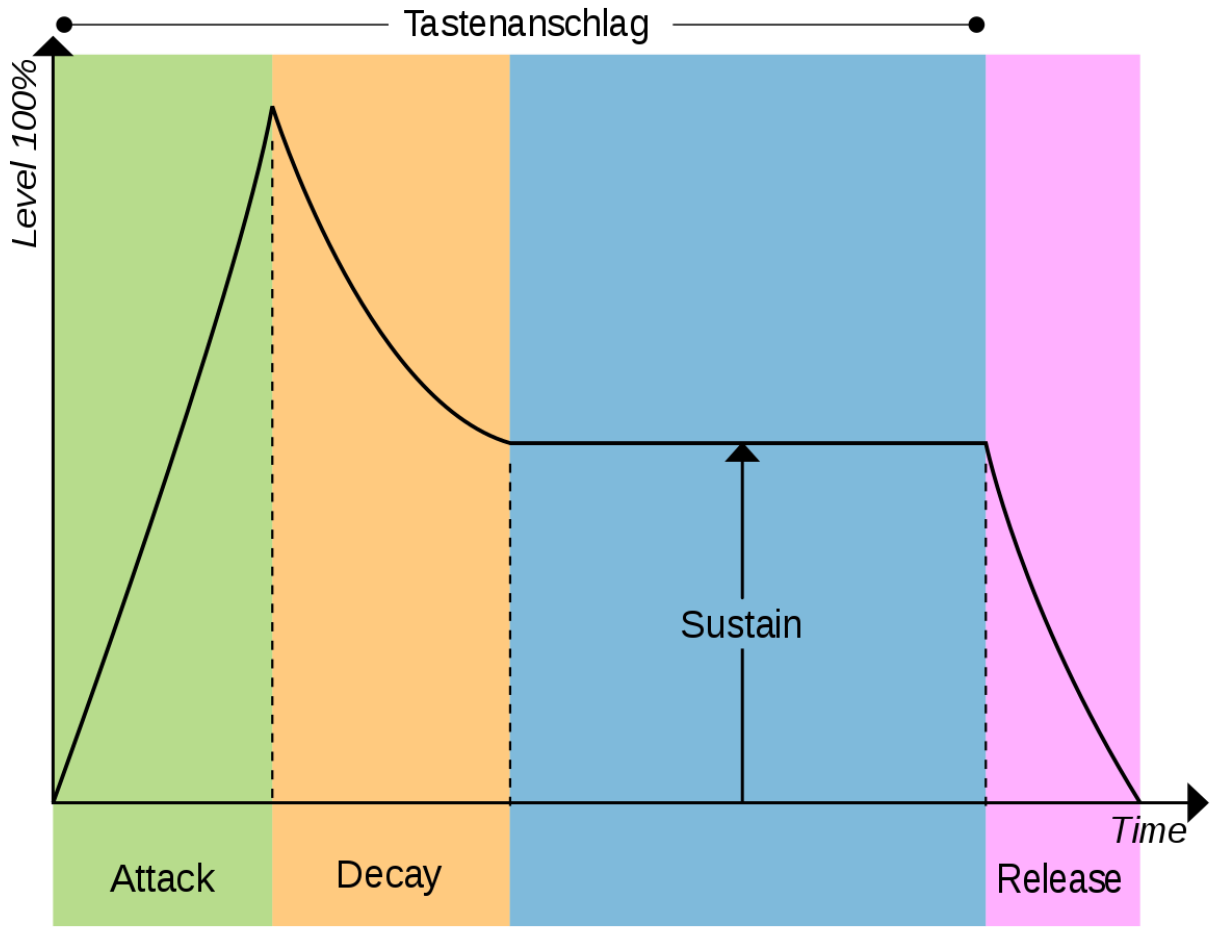
The clarinet itself is a important wind-blowing instrument which is used in weddings(in Macedonia),celebrations etc. I chose this topic because I had necessity to improve clarinet sound in the digital world. Second reason is because at the past I used to produce music and mix music. It contains cosine function like

$$y(n) = \cos(\omega * n) + 0.375 * \cos(3 * \omega * n) + 0.581 * \cos(5 * \omega * n) + 0.382 * \cos(7 * \omega * n) + 0.141 * \cos(9 * \omega * n) + 0.028 * \cos(11 * \omega * n) + 0.009 * \cos(13 * \omega * n).$$

where $\omega = 2 * \pi * F0$

Fs , $F0$ is base tone frequency and FS is sampling frequency.

With help of ADSR(Attack,Decay,Sustain,Release) we need to be more authentic than that cosine function above.



Attack - The time it takes for the note to reach the maximum level.
• Decay - The time it takes for the note to go from the maximum level to sustain level.
• Sustain - The level while the note is held.
• Release - The time it takes for the note to fall from the sustain level to zero (silence) when
released.

2.Methods

I used MATLAB because is more user-friendly and has bigger community(Mathworks). I created function syntha.m as synth(fb,num,fs) tb = base frequency, num is samples vector according to fs. with help of that variables I created omega and put it respectably to the y function. Then I created the four components(A, D, S, R) as linespace with various configuration to be as same as clarinet.wav example. Then I put them sequentially in vector named ADSR. Then I made another vector x which consists zeros as the length of y function. There I put ADSR values(linespace) in that vector. At the end I created variable named tone which y function multiples which each one(variable x).

3.Results

I was delighted when I heard clarinet sound with the help of my function. I also made simple melody of Baby Shark and was thrilled. To proof I also asked several friends in order to confirm of my results. They definitely said “Yes”.

4.Discussion

I think It would be better to have like Midi-synthesizer and to implement it there or to have clarinet like device and do the same thing. For more discussion questions are welcome.

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