

# Lab 1:Elementary Music Synthesis

Jeremy Liem, Fabian Sutandyo

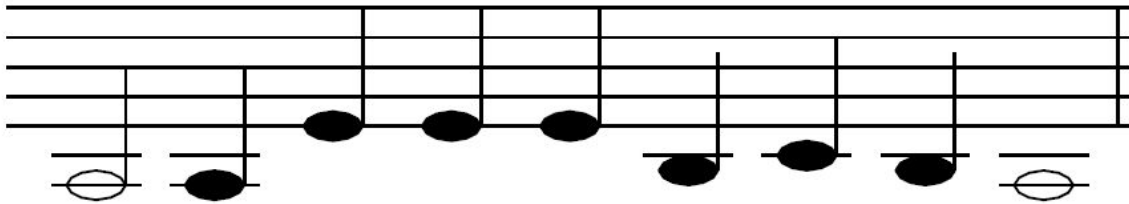
EE341 Discrete Time Linear Systems

## Introduction

This lab is designed to create and play the musical score, Scarborough Fair. This lab have mainly 3 exercises. Exercise 1 asks us to play the musical score with a pause in between the songs. In exercise 2, we used ADSR to be able to improve the quality of the sound. In exercise 3, we are asked to create overlap between the notes of the musical score to be able to produce a better sound. All of this is achieved using MATLAB. All the exercises are put into 1 file with comments seperating each exercise.

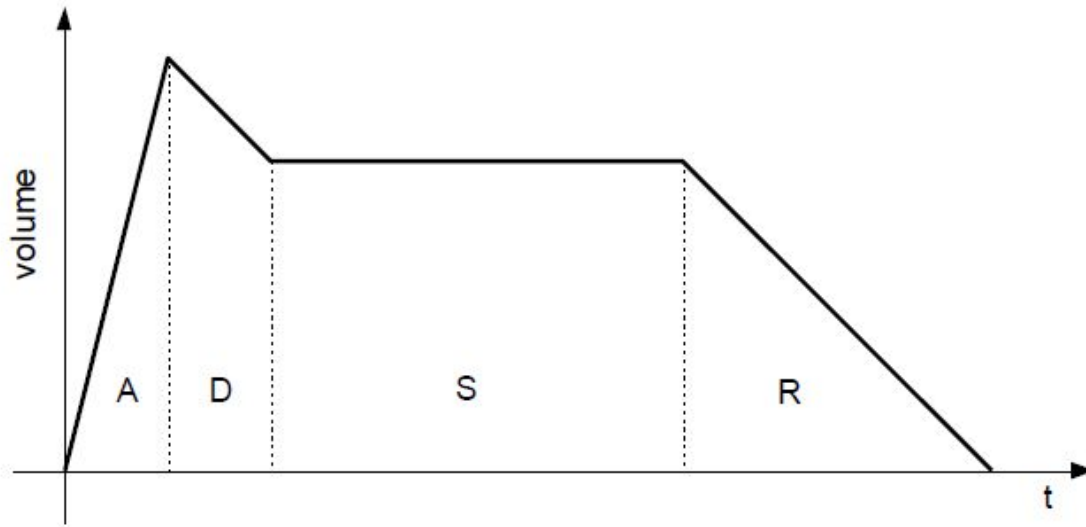
## Assignment 1

We successfully synthesize the figure below using  $F_s = 8000$ . First, we define the frequency of each note A,B,C, and D. Secondly, we create time sample vector for whole note, half note, and fourth note. Lastly, using the information above, we make the sinusoidal function for each note in figure below and concatenate all of these function with a pause in between each of the notes. The pause is a zero vector with a length of 1000.



## Exercise 2

This exercise is a continuation from the first exercise. In this exercise, we were able to improve the sound by using ADSR. We used the linspace function to create the function ADSR in the figure below. We created the ADSR for each of the time samples. We multiplied each of the notes with corresponding ADSR. (Half Note multiplied with ADSR for 8 kHz, and so on). Then we concatenated each of the new notes like the song in exercise 1. We also included the pause between each of the notes like in the previous exercise.



### Assignment 3

For this assignment, we first create a zeros vector that has length of 50000. After that, we create a time period in our vector to define which signal to play on certain time value. In addition, we also make the notes slightly overlap to each other in order to improve the sound quality. After a little bit of experiment we decide to use 300 overlap range since it's provide the best quality compared to 1000, 500, and 100 overlap range. For example, because the first note is a half note, it's is played from count 1 to 8000 ( $Z(1:8000)$ ) and then when  $Z(7701)$ , the program will also play the second note until  $Z(11700)$  since the second note is a fourth note that has 1 count or 4000 samples. The overall result is a smoother transition between notes and we were therefore able to improve the sound quality.

### Conclusion

In conclusion, we created each notes in the Scarborough fair. We added a pause between each notes and concatenated each notes. For the second part, we multiplied each notes with ADSR and the result is that we were able to improve the sound quality. In the third exercise, we were able to improve the quality of the sound by overlapping the notes. We used an overlap of 300 in this case.