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function makeSong()
%%    By YI-WEN CHEN, 2018 / Jarvus Studio
%    1. According to Piano key frequencies (https://en.wikipedia.org/wiki/Piano\_key\_frequencies),
%    we can create its pitch by fundamental frequency.
%    2. Play twinkle twinkle little star as an example.
%    Sessions Overview:
%    http://jarvus.dragonbeef.net/note/noteAudio.php

fs = 44100;

% rest
zero = rest(4,fs);    % 1.0 sec
zeroh = rest(8,fs);   % 0.5 sec
zerohh = rest(16,fs); % 0.25 sec

% eighth note as 0.5 sec
do = key(52,8,fs); %do 1
re = key(54,8,fs); %re 2
mi = key(56,8,fs); %mi 3
fa = key(57,8,fs); %fa 4
so = key(59,8,fs); %so 5
la = key(61,8,fs); %la 6
si = key(63,8,fs); %si 7

% quarter note as 1 sec
do_4 = key(52,4,fs); %do 1
re_4 = key(54,4,fs); %re 2
mi_4 = key(56,4,fs); %mi 3
fa_4 = key(57,4,fs); %fa 4
so_4 = key(59,4,fs); %so 5
la_4 = key(61,4,fs); %la 6
si_4 = key(63,4,fs); %si 7

% make a song
line1 = [ do do so so la la so_4];
line2 = [ fa fa mi mi re re do_4];
line3 = [ so so fa fa mi mi re_4];
line4 = [ so so fa fa mi mi re_4];
line5 = [ do do so so la la so_4];

line6 = [ fa fa mi mi re re do_4];

song = [line1 line2 line3 line4 line5 line6];
% plot(song)
sound(song,fs,24);
% audiowrite('star.wav',song,fs,'BitsPerSample',32);

function wave = key(p, n, fs)
    t = 0:1/fs:4/n;
    idx = 440*2^((p-49)/12);

    %    method 1 - orginal
    %    wave = (sin(2*pi*idx*t));

    %    method 2 - exponential decreasing
    %    tt = 4/n:-1/fs:0;
    %    wave = (sin(2*pi*idx*t)).*exp(tt);
    %    wave = wave./max(wave);

    %    method 3 - triangle decreasing
    mid = (t(1)+t(end))/2;
    tri = -(abs(t-mid)-mid);
    tri = tri./max(tri);
    wave = (sin(2*pi*idx*t)).*tri;

    %    plot(wave)

function wave = rest(n,fs)
    t = 0:1/fs:4/n;
    tt = 4/n:-1/fs:0;
    wave = 0*sin(2*pi*t).*exp(tt);

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