Institute of Engineering and Technology

Signals & Systems_2015

Automatic Composition

(Scilab)

Guided By

Prof. Ashok Ranade

Group Members

AMEE BHUVA(1401009)

SUBHASHI DOBARIYA(1401012)

Outline

- **Project Synopsis**
- **Composition of Known Song**
  - Explanation
  - Coding
- **Manual Compositions**
  - **Ragas**
- Explanation
- Coding
- **Automatic Composition**
  - Explanation
  - Coding

Project Synopsis:

- Our project is about composing music by doing composing in scilab.
- To achieve this, we started the first assignment from the very basic level.
- In the next assignment, we composed a known (Bollywood) song “mere haath mein tera haath ho sari jannte mere saath hoo” from the existing notations from internet. We found the western notations from internet and after converting it into Indian notation, we composed our song.
- In our next compositing we did manual composition. For that, we first composed lyrics and for that lyrics we composed the tune in 4/4 measure.
- After that, we tried the composition using chords.
- In the next part, we tried to do automatic composition for happy, sad and romantic moods. We did it for different measures: 3/4, 4/4 and 6/4.
- At last, we attempted to add GUI in our composition and took all the inputs from the user using GUI.

Composition of Known Song:

- In this project, we have to compose any movie song according to their notation.
- First we select a known (Bollywood) song “mere haath mein tera haath ho sari jannte mere saath hoo” and then find its notations from the internet.
- What we found was the western notation.
- So we converted into the Indian notation.
- In coding d1 is time duration of note.
- So the note having time duration d1 will last for 0.5 seconds.
- And the note having d1*2 and d1/2 time duration will last for 1 and 0.25 seconds respectively.
- The time signature for our song is 4/4 (for most of the measures).

Coding:

```
clear;
function tone=noteG(s, n, d)
    //s denotes saptak (1,2,3).
    //n denotes the note number
    //s =2 and n =0 is the base note  number.This will generate madhya
    saptak Sa

if s == 1
     N = 2^(n/12);
elseif s == 2
    N = 2*2^(n/12);
else
    N = 4*2^(n/12);
end

f = 350; f1 = f*N; t = 0:1/22050:d;
a = 0.8*exp(-t/(0.5*d))+ 0.1*sin(6*%pi*t/d);
S = 0.5*sin(2*%pi*f1*t )+ 0.2* sin(4*%pi*f1*t )+ 0.1* sin(6*%pi*f1*t)+
0.05* sin(8*%pi*f1*t )+ 0.05* sin(10*%pi*f1*t );

tone = a.*S;
endfunction

d1 = 0.4; inter = 0*[0:1/22050:d1]
S1 = noteG(2,0,d1);
S1t = noteG(3,0,d1);
S1td = noteG(3,0, 2*d1);
R1 = noteG(2,1,d1);
R2 = noteG(2,2,d1);
R2d = noteG(2,2,2*d1);
G1 = noteG(2,3,d1);
G1d = noteG(2,3,2*d1);
G2 = noteG(2,4,d1);
M1 = noteG(2,5,d1);
M1d = noteG(2,5,2*d1);
M2 = noteG(2,6,d1);
G2d=noteG(2,4,2*d1);
M2d= noteG(2,6,2*d1);
```

```
D2=noteG(2,9,d1);
D2d=noteG(2,9,2*d1);
M2h=noteG(2,6,d1/2);
D2h=noteG(2,9,d1/2);
 P = noteG(2,7,d1);
Pd = noteG(2,7,2*d1);
Ph = noteG(2,7,d1/2);
D1 = noteG(2,8,d1);
D2h = noteG(2,9,d1/2);
N1 = noteG(2,10,d1);
N2 = noteG(2,11,d1);

py1 = [ S1 Pd P D1 M1    S1 P  P N1 D1 M1]; //C G  G G#  F    C G  G A#
G#  F

py2 = [ S1 M1    M1 P G1   G1 R1 M1 G1d R1 S1]; //C F   F G D#    D#
C# F D#  C# C

py3 = [ Pd S1t S1 R2d N1 P     S1 S1 G1 R2 N1];//G  C  C D  A# G    C   C
D# D A#

py4 = [ P N1 N1 S1 N1 D1 D1 D1 S1td N1 D1 P];//G A# A# C A#  G#  G#
G# C  A# G# G

py5 = [S1 R2 S1 N1 D2 P M1d P inter S1 R2 S1 inter N1 D2 M1 D2d
P];//C D C A# A G F  G   C D C   A# A F A  G

py6 = [P N1 N1 D2 P G1 inter R2d G1 R2 S1];//G A#  A# A G D#   D  D#
D C

py7 = [ S1 R2 S1 N1 D2 P M1d P inter S1 R2 R2 S1 N1 D2 M1 D2d P];
//C D C A# A G F  G   C D D C A# A F A  G

py8 = [ P N1 N1 D2d P M1 inter G1 G1 R1 R1 S1];//G A#  A# A  G F    D#
D# C# C# C

py9 = [ S1 Pd P M1d M1 inter S1 P inter inter P N1 D1 M1];//C G   G F  F
C G      G A# G# F

py = [ py1 py2       py1 py2  ]; sound(py);
```

Manual Compositions:

Ragas (Bageshri):

Explanation:

- In this assignment we have to compose any song of the RAGA given to our group.
- Raga for our group is “BAGESHRI”.
- For this raga we found Indian notation.
- Vadi and Samvadi
  - ✓ Vadi : M
  - ✓ Samvadi : S
- Aroha and Avroh
  - ✓ Aroha : N1 S1 G1 M1 D2 N1 S1
  - ✓ Not used notes (Varjit) : R, P
  - ✓ Avroh : S1 N1 D2 M1 G1 R2 S1
  - ✓ Not used notes (Varjit) : P
- Pakad : D1 N1 S1 M1
  G1 M1 D2 M1 G1
  M1 G1 R2 S1
- Shuddh Notes : S, R, M, D
- Komal Notes : G, N
- Then we composed for three time measures 3/4, 4/4 and 6/4.

Coding:

✓ For time signature 3/4:

```
clear;
function
tone=noteG(s, n, d)
 //s denotes saptak (1,2,3). n denotes the
 //note number s =2 and n =0 is the base note
 // number.This will generate madhyasaptakSa

if s==1
   N=2^(n/12);

elseif s==2
   N=2*2^(n/12);

else
   N=4*2^(n/12);
end

f=130;
f1=f*N;
t=0:1/22050:d;
a=0.8*exp(-t/(0.5*d))+0.1*sin(6*%pi*t/d);
S=0.5*sin(2*%pi*f1*t)+0.2*sin(4*%pi*f1*t)+0.1*sin(6*%pi*f1*t)+0.05*sin(8*%pi*f
1*t)+0.05*sin(10*%pi*f1*t);

tone=a.*S;
endfunction
// d1 denotes the duration of the note. The following statement sets it to 0.4 seconds
// d1 can be set to other values to change the tempo
d1=0.5;
// inter denotes the silence of d1 seconds.

inter=0*[0:1/22050:d1];

S1=noteG(2,0,d1);S1d=noteG(3,0,2*d1);S1h=noteG(2,0,d1/2);
R2=noteG(2,2,d1);R2d=noteG(2,2,2*d1);R2h=noteG(2,2,d1/2);
G1=noteG(2,3,d1);G1d=noteG(2,3,2*d1);G1h=noteG(2,3,d1/2);
M1=noteG(2,5,d1);M1d=noteG(2,5,2*d1);M1h=noteG(2,5,d1/2);
D2=noteG(2,9,d1);D2d=noteG(2,9,2*d1);D2h=noteG(2,9,d1/2);
N1=noteG(2,11,d1);N1d=noteG(2,11,2*d1);N1h=noteG(2,11,d1/2);

//[N1 S1 G1 M1 D2 N1 S1]; //aaroha
//[S1 N1 D2 M1 G1 R2 S1]; // avaroha
//[D2 N1 S1 M1 inter G1 M1 D2 M1 G1 inter M1 G1 R2 S1]; //pakad
```

```
y1=[S1G1d,S1hG1hM1d];
y2=[M1hD2hN1d,N1S1d];
y3=[S1N1d,S1hN1hD2d];
y4=[D2hM1hD2hM1hG1];
y5=[M1hG1hR2d,R2S1d];

y=[y1intery2intery3intery4intery5];

sound(y)
```

✓ For time signature 4/4:

```
clear;
function
tone=noteG(s, n, d)
//s denotes saptak (1,2,3). n denotes the
//note number s =2 and n =0 is the base note
// number.This will generate madhyasaptakSa

if s==1
   N=2^(n/12);

elseif s==2
   N=2*2^(n/12);

else
   N=4*2^(n/12);
end

f=130;
f1=f*N;
t=0:1/22050:d;
a=0.8*exp(-t/(0.5*d))+0.1*sin(6*%pi*t/d);
S=0.5*sin(2*%pi*f1*t)+0.2*sin(4*%pi*f1*t)+0.1*sin(6*%pi*f1*t)+0.05*sin(8*%pi*f
1*t)+0.05*sin(10*%pi*f1*t);
tone=a.*S;
endfunction
// d1 denotes the duration of the note. The following statement sets it to 0.4 seconds
// d1 can be set to other values to change the tempo
d1=0.4;
// inter denotes the silence of d1 seconds.
inter=0*[0:1/22050:d1];

S1=noteG(2,0,d1);
S1m=noteG(1,0,d1);
R2=noteG(2,2,d1);
```

```
R2m=noteG(1,2,d1);
G1=noteG(2,3,d1);
G1m=noteG(1,3,d1);
M1=noteG(2,5,d1);
D2=noteG(2,9,d1);
D2m=noteG(1,9,d1);
N1m=noteG(1,11,d1);
N1=noteG(2,11,d1);

//[N1 S1 G1 M1 D2 N1 S1]; //aaroha
//[S1 N1 D2 M1 G1 R2 S1]; // avaroha
//[D2 N1 S1 M1 inter G1 M1 D2 M1 G1 inter M1 G1 R2 S1]; //pakad

y1=[M1N1mD2mS1D2G1N1M1];
y2=[S1N1D2G1N1S1N1mG1];
y3=[N1mS1M1R2G1D2N1R2];
y4=[N1mS1M1R2G1D2N1G1];

y=[y3intery2intery1intery4];

sound(y)
```

✓ For time signature 6/4:

```
clear;
function
   tone=noteG(s, n, d)

//s denotes saptak (1,2,3). n denotes the
//note number s =2 and n =0 is the base note
// number.This will generate madhyasaptakSa

if s==1
   N=2^(n/12);

elseif s==2
   N=2*2^(n/12);

else
   N=4*2^(n/12);
End

f=130;
f1=f*N;
t=0:1/22050:d;
a=0.8*exp(-t/(0.5*d))+0.1*sin(6*%pi*t/d);
```

```
S=0.5*sin(2*%pi*f1*t)+0.2*sin(4*%pi*f1*t)+0.1*sin(6*%pi*f1*t)+0.05*sin(8*%pi*f1*
t)+0.05*sin(10*%pi*f1*t);
  tone=a.*S;
  endfunction
  // d1 denotes the duration of the note. The following statement sets it to 0.4 seconds
  // d1 can be set to other values to change the tempo
  d1=0.4;
  // inter denotes the silence of d1 seconds.
  inter=0*[0:1/22050:d1];

  S1=noteG(2,0,d1);
  S1h=noteG(2,0,d1/2);
  R2=noteG(2,2,d1);
  R2h=noteG(2,2,d1/2);
  G1=noteG(2,3,d1);
  G1h=noteG(2,3,d1/2);
  M1=noteG(2,5,d1);
  M1h=noteG(2,5,d1/2);
  D2=noteG(2,9,d1);
  D2h=noteG(2,9,d1/2);
  N1m=noteG(1,11,d1);
  N1mh=noteG(1,11,d1/2);
  N1=noteG(2,11,d1);
  N1h=noteG(2,11,d1/2);

  //[N1 S1 G1 M1 D2 N1 S1]; //aaroha
  //[S1 N1 D2 M1 G1 R2 S1]; // avaroha
  //[D2 N1 S1 M1 inter G1 M1 D2 M1 G1 inter M1 G1 R2 S1]; //pakad

  y1=[N1mN1mS1hM1hG1hM1hD2D2N1hN1hD2hM1h];
  y2=[M1hM1hD2G1M1hM1hG1hG1hG1R2S1hS1h];
  y3=[N1mhN1mhS1G1M1hM1hN1mhN1mhS1G1M1hM1h];
  y4=[S1hS1hN1D2hD2hM1G1hG1hG1R2hR2hS1];

  y=[y1intery2intery3intery4];

  sound(y)
```

ADSR:

Here, in the ADSR composition we have made the tune of jingle bells.

```
clear;
function tone=noteG(s, n, d)

//s denotes saptak (1,2,3). n denotes the
//note number s =2 and n =0 is the base note
// number.This will generate madhya saptak Sa

if s == 1
    N = 2^(n/12);

elseif s == 2
    N = 2*2^(n/12);

else
    N = 4*2^(n/12);
end

f = 250;
f1 = f*N;
t = 0:1/22050:d;
//a =0.8* exp(-t/1.5*d) //+ 0.2*sin(6*%pi*t/d);
//a = (5*t/d).*a;

T = length(t);
T1 = round(0.02*T);
T2 = round(0.04*T);
T3 =  round(0.88*T);

L1 = linspace(0,1,T1);
L2 = linspace(1,1,T2);
L3 = linspace(1,0.9,T2);
L4 = linspace(0.9, 0.45,T3);
L5 = linspace(0.45,0,T1);

a = [L1 L2 L3 L4 L5 ];
A = length(a);

if T > A then
   diff = T-A;

   for i = 1:diff
      a = [a 0];
```

```
    end


elseif  T < A then
        diff = A-T;

        for i = 1:diff
            t = {t 0};
        end

end

Tnew = length(t);
Anew = length(a);

//disp(Tnew);
//disp(length(Anew));

S = sin((2*%pi*f1*t + a.*sin(4*%pi*f1*t) ))
//S = 0.25*S
;

tone = a.*S;
//c = ffilt("hp",100, 50/22050);
//tone = filter(c,1,tone);

endfunction

// Raag Bhoop melody
funcprot(0) ;
stacksize('max');

d1 = 0.4;
inter = 0*[0:1/22050:d1];
inter1 = 0*[0:1/22050:0.1*d1];

S1 = noteG(2,0,d1);
S1t = noteG(3,0,d1);
S1th = noteG(3,0,d1/2);
S1h = noteG(2,0,d1/2);
S1td = noteG(3,0, 2*d1);
S14 = noteG(2,0, 4*d1);
R1 = noteG(2,1,d1);
R2 = noteG(2,2,d1);
R2h = noteG(2,2,d1/2);
R1d = noteG(2,1,2*d1);
```

```
R2th = noteG(3,2,d1/2);
R24 = noteG(2,1,4*d1);G1 = noteG(2,3,d1);
G2 = noteG(2,4,d1);
G2h = noteG(2,4,d1/2);
G2t = noteG(3,4,d1);
G1d = noteG(2,3,2*d1);
G2th = noteG(3,4,d1/2);
G2td = noteG(3,4,2*d1);
M1 = noteG(2,5,d1);
M2 = noteG(2,6,d1);
M2d = noteG(2,6,2*d1);
M2h = noteG(2,6,d1/2);
M1d = noteG(2,5,2*d1);
M1h = noteG(2,5,d1/2);
M1th = noteG(3,5,d1/2);
P = noteG(2,7,d1);
Pd = noteG(2,7,2*d1);
Ph = noteG(2,7,d1/2);
Pth =  noteG(3,7,d1/2);
D1 = noteG(2,8,d1);
D2 = noteG(2,9,d1);
D2d = noteG(2,9,2*d1);
D2h = noteG(2,9,d1/2);
D24 = noteG(2,9,4*d1);
N1 = noteG(2,10,d1);
N2 = noteG(2,11,d1);
N2h = noteG(2,11,d1/2);
N2m = noteG(1,11,d1);
N2d = noteG(2,11,2*d1);
D2m = noteG(1,9,d1);
R2t = noteG(3,2,d1);
S1td = noteG(3,0,2*d1);
R2d = noteG(2,2,2*d1);
G2d = noteG(2,4,2*d1);
G24 = noteG(2,4,4*d1);
R1t = noteG(3,1,d1);
R1td = noteG(3,1,2*d1);
R2td = noteG(3,2,2*d1);
S1d = noteG(2,0,2*d1)
y1 = [G2 G2 G2d   G2 G2 G2d   G2 P R2 R2   G24];//1
y2 = [M1 M1 M1 M1   M1 G2 G2 G2   G2 R2 R2 G2   R2d Pd];//2
y3 = [G2 G2 G2d   G2 G2 G2d   G2 P R2 R2   G24];//3
y4 = [M1 M1 M1 M1   M1 G2 G2 G2   P P M1 R2   S14];//4
y = [ y1 y2 y3 y4];

sound(y)
```

Automatic Composition:

Explanation:

- We have done automatic composition for happy, sad and automatic compositions.
- Taking user as our focus, we first ask as for what mood they want to generate automatic composition: Happy, sad or romantic.
  By default, we have taken the tempo as 0.4 for happy,0.5 for sad and romantic composition.
- We have executed this using GUI in Scilab.
- Now for the automatic composition, we have generated the notes randomly.
- This means that taking different but non-automatic tempo, we have generated the 'n' and 's' parameters randomly and then fixed the sequence of these notes to generate a measure and a line.
- For example, we have generated some full notes, half notes, quarter notes, etc. randomly. Now for 6/4 measure, we can generate a line taking a sequence of 6 quarter, (2 half and 1 quarter 2 eighth), (4 quarter and 1 half), (1 full and 2 quarter) notes.
- So for the automatic composition, we generate the 'n' between 0 and 11 until 'n' for major note (n=1, n=3, n=6, n=8, n=10) is not generated.
- We then generate 's' between 0 and 2.
- For sad composition, we generate 's' as 0 or 1 while there is no restriction in the generation of 'n'.
- For romantic composition, all the 'n' and 's' are allowed.
- For that, for the first four lines, for all the compositions, we generate 'n' until 'n' between 0 and 5 is not generated.
- Similarly for the last four lines, we generate 'n' until 'n' between 6 and 11 is not generated.
- We made a set of note for different emotions and the we used to called it randomly with random() function of Scilab.
- The code for the same is attached with the folder given along with.