
Table of Contents

.....	1
Major Key Profiles	1
Minor Key Profiles	2
Correlation Coefficient Calculation	2

```
clear all;
close all;
```

Major Key Profiles

```
key =
    ["C", "C#", "D", "D#", "E", "F", "F#", "G", "G#", "A", "A#", "B"];

%Major Profiles
%[C, C#, D, D#, E, F, F#, G, G#, A, A#, B]
C_major = [6.35 2.23 3.48 2.33 4.38 4.09 2.52 5.19 2.39 3.66 2.29
2.88];
C_sharp_major = [2.88 6.35 2.23 3.48 2.33 4.38 4.09 2.52 5.19 2.39
3.66 2.29];
D_major = [2.29 2.88 6.35 2.23 3.48 2.33 4.38 4.09 2.52 5.19 2.39
3.66];
D_sharp_major = [3.66 2.29 2.88 6.35 2.23 3.48 2.33 4.38 4.09 2.52
5.19 2.39];
E_major = [2.39 3.66 2.29 2.88 6.35 2.23 3.48 2.33 4.38 4.09 2.52
5.19];
F_major = [5.19 2.39 3.66 2.29 2.88 6.35 2.23 3.48 2.33 4.38 4.09
2.52];
F_sharp_major = [2.52 5.19 2.39 3.66 2.29 2.88 6.35 2.23 3.48 2.33
4.38 4.09];
G_major = [4.09 2.52 5.19 2.39 3.66 2.29 2.88 6.35 2.23 3.48 2.33
4.38];
G_sharp_major = [4.38 4.09 2.52 5.19 2.39 3.66 2.29 2.88 6.35 2.23
3.48 2.33];
A_major = [2.33 4.38 4.09 2.52 5.19 2.39 3.66 2.29 2.88 6.35 2.23
3.48];
A_sharp_major = [3.48 2.33 4.38 4.09 2.52 5.19 2.39 3.66 2.29 2.88
6.35 2.23];
B_major = [2.23 3.48 2.33 4.38 4.09 2.52 5.19 2.39 3.66 2.29 2.88
6.53];

major_profiles =
    [C_major;C_sharp_major;D_major;D_sharp_major;E_major;F_major;F_sharp_major;G_majo
major_profiles = major_profiles';
major_mean = mean(major_profiles);
major_mean = major_mean(1);

% figure(1);
% bar(C_major, 0.4, 'k');
```

```

% set(gca,'xticklabel',{'C', "C#", "D", "D#", "E", "F", "F#", "G",
    "G#", "A", "A#", "B"});
% title('C Major Key Profile');
% text([1:length(C_major)], C_major',
    num2str(C_major', '%0.2f'),'HorizontalAlignment','center','VerticalAlignment','bot

```

Minor Key Profiles

```

%[C, C#, D, D#, E, F, F#, G, G#, A, A#, B]
C_minor = [6.33 2.68 3.52 5.38 2.6 3.53 2.54 4.75 3.98 2.69 3.34
    3.17];
C_sharp_minor = [3.17 6.33 2.68 3.52 5.38 2.6 3.53 2.54 4.75 3.98 2.69
    3.34];
D_minor = [3.34 3.17 6.33 2.68 3.52 5.38 2.6 3.53 2.54 4.75 3.98
    2.69];
D_sharp_minor = [2.69 3.34 3.17 6.33 2.68 3.52 5.38 2.6 3.53 2.54 4.75
    3.98];
E_minor = [3.98 2.69 3.34 3.17 6.33 2.68 3.52 5.38 2.6 3.53 2.54
    4.75];
F_minor = [4.75 3.98 2.69 3.34 3.17 6.33 2.68 3.52 5.38 2.6 3.53
    2.54];
F_sharp_minor = [2.54 4.75 3.98 2.69 3.34 3.17 6.33 2.68 3.52 5.38 2.6
    3.53];
G_minor = [3.53 2.54 4.75 3.98 2.69 3.34 3.17 6.33 2.68 3.52 5.38
    2.6];
G_sharp_minor = [2.6 3.53 2.54 4.75 3.98 2.69 3.34 3.17 6.33 2.68 3.52
    5.38];
A_minor = [5.38 2.6 3.53 2.54 4.75 3.98 2.69 3.34 3.17 6.33 2.68
    3.52];
A_sharp_minor = [3.52 5.38 2.6 3.53 2.54 4.75 3.98 2.69 3.34 3.17 6.33
    2.68];
B_minor = [2.68 3.52 5.38 2.6 3.53 2.54 4.75 3.98 2.69 3.34 3.17
    6.33];

minor_profiles =
    [C_minor;C_sharp_minor;D_minor;D_sharp_minor;E_minor;F_minor;F_sharp_minor;G_minor
minor_profiles = minor_profiles';
minor_mean = mean(minor_profiles);
minor_mean = minor_mean(1);

% figure(2);
% bar(C_minor, 0.4, 'k');
% set(gca,'xticklabel',{'C', "C#", "D", "D#", "E", "F", "F#", "G",
    "G#", "A", "A#", "B"});
% title('C Minor Key Profile');
% text([1:length(C_minor)], C_minor',
    num2str(C_minor', '%0.2f'),'HorizontalAlignment','center','VerticalAlignment','bot

```

Correlation Coefficient Calculation

```

%12-values vector with each value representing the total duration of a
    pitch class in the piece
input_vector = [0 0 .25 0 0 0 0 .75 0 .5 0 .5];

```

```

input_mean = mean(input_vector);

% figure(3);
% bar(input_vector, 0.4, 'k');
% set(gca,'xticklabel',{'C', "C#", "D", "D#", "E", "F", "F#", "G",
    "G#", "A", "A#", "B"});
% title('Duration of Each Key in the Song Snipit of Yankee Doodle');
% text([1:length(input_vecotr)], input_vecotr',
    num2str(input_vecotr','%0.2f'),'HorizontalAlignment','center','VerticalAlignment'

max_r = -2;
key_index = 0;
major_or_minor = 'major';
for y = 1:12
    numerator_sum = 0;
    for x = 1:12
        numerator_sum = numerator_sum + (input_vector(x)-
input_mean)*(major_profiles(x,y)-major_mean);
    end

    input_sum = 0;
    for x = 1:12
        input_sum = input_sum + (input_vector(x)-input_mean).^2;
    end

    major_sum = 0;
    for x = 1:12
        major_sum = major_sum + (major_profiles(x,y)-major_mean).^2;
    end

    r = numerator_sum/sqrt(input_sum*major_sum);

    if r > max_r
        max_r = r;
        key_index = y;
    end
end

for y = 1:12
    numerator_sum = 0;
    for x = 1:12
        numerator_sum = numerator_sum + (input_vector(x)-
input_mean)*(minor_profiles(x,y)-minor_mean);
    end

    input_sum = 0;
    for x = 1:12
        input_sum = input_sum + (input_vector(x)-input_mean).^2;
    end

    minor_sum = 0;
    for x = 1:12
        minor_sum = minor_sum + (minor_profiles(x,y)-minor_mean).^2;
    end

```

```
r = numerator_sum/sqrt(input_sum*minor_sum);  
  
if r > max_r  
    max_r = r;  
    key_index = y;  
    major_or_minor = 'minor';  
end  
end  
  
fprintf('The song is in %s %s', key(key_index), major_or_minor);  
  
The song is in G major
```

Published with MATLAB® R2020a