I. Source Code of the Music Synthesis

```
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#CPE 4 - 2
#Jingle Bells, Music Synthesis
#2022-12-18

clc;
clf;
clear all;
close all;

fs = 44100;

# Time Stamp
te=0:(1/fs):0.25;
tq=0:(1/fs):0.5;
ttq=0:(1/fs):0.75;
th=0:(1/fs):1.0;
tth=0:(1/fs):1.5;
tw=0:(1/fs):2.0;

# Alphabet | Octave | Note

#4th Octave

#Quarter Notes
D4Q=sin(2*pi*294*te);
B4Q=sin(2*pi*494*te); #0.25
A4Q=sin(2*pi*440*te);
G4Q=sin(2*pi*392*te);
E4Q=sin(2*pi*330*te);
G4Q2=sin(2*pi*392*tq)
B4Q2=sin(2*pi*494*tq); #0.50
A4Q2=sin(2*pi*440*tq);

#Half Notes
D4H=sin(2*pi*294*th);
E4H=sin(2*pi*330*th);
F4H=sin(2*pi*349*th);
B4H=sin(2*pi*494*th);
G4H=sin(2*pi*392*th);

#5th Octave

#Quarter Notes
C5Q=sin(2*pi*524*te);
D5Q=sin(2*pi*587*te);
E5Q=sin(2*pi*659*te);
D5Q2=sin(2*pi*587*tq);

#Scores
scoreA=[D4Q,B4Q,A4Q,G4Q,D4H];
scoreB=[D4Q,B4Q,A4Q,G4Q,E4H];
scoreC=[E4Q,C5Q,B4Q,A4Q,F4H];
scoreD=[D5Q,D5Q,C5Q,A4Q,B4H];
scoreE=[E4Q,C5Q,B4Q,A4Q,D5Q,D5Q,D5Q,D5Q];
scoreF=[E5Q,D5Q,C5Q,A4Q,G4Q2,D5Q2];
scoreG=[B4Q,B4Q,B4Q2,B4Q,B4Q,B4Q2];
```

```
scoreH=[B4Q,D5Q,G4Q,A4Q,B4H];
scoreI=[C5Q,C5Q,C5Q,C5Q,C5Q,B4Q,B4Q,B4Q];
scoreJ=[B4Q,A4Q,A4Q,B4Q,A4Q2,D5Q2];
scoreK=[D5Q,D5Q,C5Q,A4Q,G4H];

#Lines
lineA=[scoreA,scoreB,scoreC,scoreD,scoreA,scoreB,scoreE,scoreF]
;
lineB=[scoreG,scoreH,scoreI,scoreJ,scoreG,scoreH,scoreI,scoreK]
;
lineC=[scoreG,scoreH,scoreI,scoreJ,scoreG,scoreH,scoreI,scoreK,
scoreI,scoreK];

#Full Song
fullsong=[lineA,lineB,lineA,lineC];

#Run
soundsc(fullsong,fs);
```

II. Formulas

The sampling frequency is set to 44100.

```
fs = 44100;
```

The set of lines below is composed of the time stamp where 1 beat is equal to $0.5\ seconds$ for $\frac{4}{4}$ time signature. S

```
# Time Stamp
te=0:(1/fs):0.25;
tq=0:(1/fs):0.5;
ttq=0:(1/fs):0.75;
th=0:(1/fs):1.0;
tth=0:(1/fs):1.5;
tw=0:(1/fs):2.0;
```

The set of codes below is composed of notes that falls under the 4th Octave. I separate the quarter and half notes so determining the note to be used will be easy. I named the variables in a way that it can be understood easily by just looking at it. For instance, `D4Q` is a 4th Octave D Quarter note while `G4H` is a 4th Octave G Half note. As for the formula, I simply followed the instruction given.

$$variable_{name} = \sin\left(2 * sin * note_{value} * timestamp\right)$$

```
# Alphabet | Octave | Note

#4th Octave

#Quarter Notes
D4Q=sin(2*pi*294*te);
B4Q=sin(2*pi*494*te); #0.25
A4Q=sin(2*pi*440*te);
G4Q=sin(2*pi*392*te);
E4Q=sin(2*pi*330*te);
G4Q2=sin(2*pi*392*tq)
B4Q2=sin(2*pi*494*tq); #0.50
A4Q2=sin(2*pi*440*tq);
```

```
#Half Notes
D4H=sin(2*pi*294*th);
E4H=sin(2*pi*330*th);
F4H=sin(2*pi*349*th);
B4H=sin(2*pi*494*th);
G4H=sin(2*pi*392*th);
```

The set of lines below are used for the 5th Octave notes. No other notes are used aside from Quarter note.

```
#5th Octave

#Quarter Notes
C5Q=sin(2*pi*524*te);
D5Q=sin(2*pi*587*te);
E5Q=sin(2*pi*659*te);
D5Q2=sin(2*pi*587*tq);
```

III. Song Lyrics

Jingle Bells

Dashing through the snow

In a one-horse open sleigh

O'er the fields we go

Laughing all the way

Bells on bobtail's ring

Making spirits bright

What fun it is to ride and sing

A sleighing song tonight, oh!

Jingle bells, jingle bells

Jingle all the way

Oh, what fun it is to ride

In a one-horse open sleigh, hey!

Jingle bells, jingle bells

Jingle all the way

Oh, what fun it is to ride

In a one-horse open sleigh

Now the ground is white

Go it while you're young

Take the girls tonight

Sing this sleighing song

Get a bobtailed bay

Two forty for his speed

And hitch him to an open sleigh

And you will take the lead

Oh, jingle bells, jingle bells

Jingle all the way

Oh, what fun it is to ride

In a one-horse open sleigh, hey!

Jingle bells, jingle bells

Jingle all the way

Oh, what fun it is to ride

In a one-horse open sleigh

Oh, what fun it is to ride

In one horse open sleigh!

IV. Description

In essence, the "Jingle Bells" song tells the story of Santa Claus' Christmastime antics as he pulls his sleigh.

The lyrics to the song "Jingle Bells" were written in 1857 by English lyricist James Lord Pierpont as a song of thankfulness. We're as confused about how and why it was intended to be a Thanksgiving song as you are. The song developed into a cultural classic Christmas song over time.

How, why, or when the song's title changed from its original "One Horse Open Sleigh" by James Lord Pierpont is part of its enigmatic past.

The original song performances from 1889 are thought to be extinct at this time. The Beatles, Boney M., The Carpenters, Ella Fitzgerald, The Lennon Sisters, Dean Martin, Dolly Parton, Smokey Robinson and the Miracles, Frank Sinatra, and a host of other artists have all performed the song on their albums.

To know more about the creation process of the music synthesis, visit the link https://github.com/Tristaaaaan/MusicSynthesis.git.

V. Others

A. Piano Notes