

Music theory concepts for melody generation

Valerio Velardo

Melody

- Sequence of notes and rests



Melody

- Sequence of notes and rests



Note = Pitch + Duration

Pitch

- Indicates how high/low a note is

Pitch

- Indicates how high/low a note is



Pitch

- Indicates how high/low a note is



Pitch

- Indicates how high/low a note is

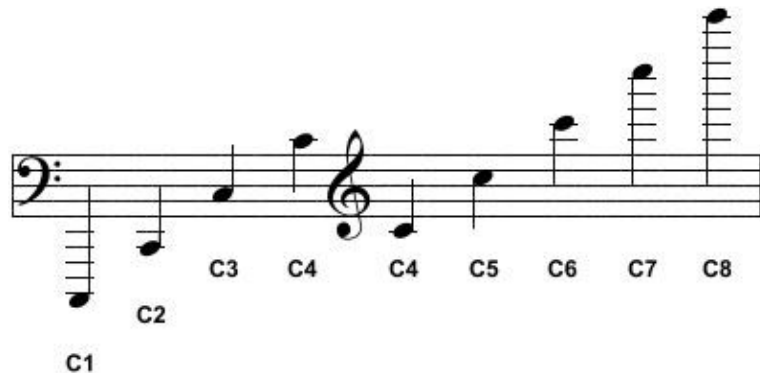
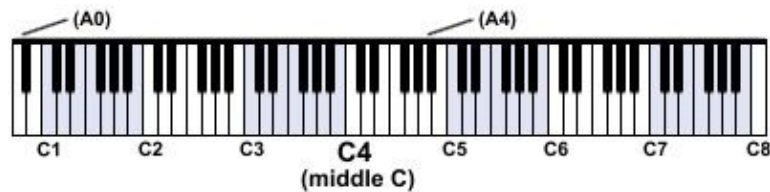


Scientific pitch notation

- Note name + octave
- E.g., C3, D4, A1

Scientific pitch notation

- Note name + octave
- E.g., C3, D4, A1



Melody





MIDI note notation

- MIDI is a protocol to play, edit and record music

MIDI note notation

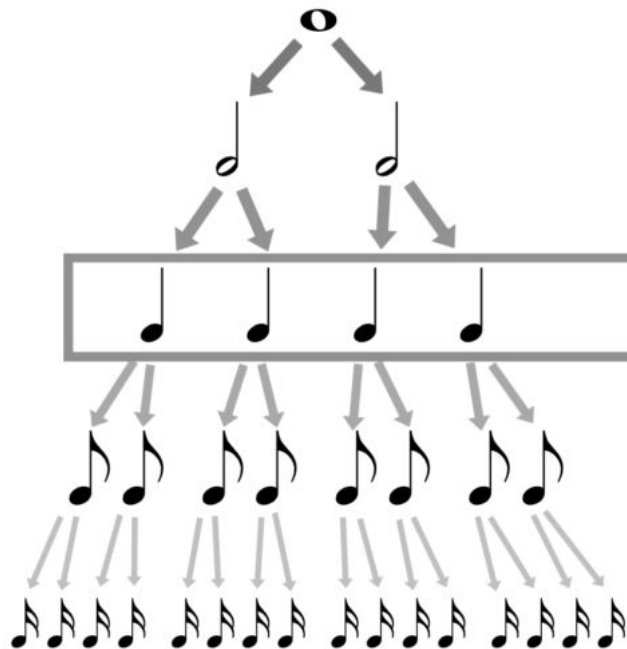
- MIDI is a protocol to play, edit and record music
- Map note names to numbers
- C4 = 60

Melody

A musical notation for a melody in 4/4 time. The melody consists of 10 notes: C4, D4, E4, E4, F4, D4, G4, E4, D4, and C4. The notes are written on a single staff with a treble clef. The first measure contains the first four notes (C4, D4, E4, E4) and the second measure contains the remaining six notes (F4, D4, G4, E4, D4, C4). The notes are connected by a horizontal line, indicating they are part of a single melodic phrase. Below the staff, the notes are labeled with their MIDI numbers: 60, 62, 64, 64, 65, 62, 67, 64, 62, and 60.

Note	MIDI Number
C4	60
D4	62
E4	64
E4	64
F4	65
D4	62
G4	67
E4	64
D4	62
C4	60

Note values



1 whole note = 4 beats

1 half note = 2 beats

1 quarter note = 1 beat

1 eighth note = $\frac{1}{2}$ a beat

1 sixteenth note = $\frac{1}{4}$ a beat

Melody



Melody



Duration in # beats:

4

4

Time signature

beats in a bar



Type of note which equals 1 beat

The image shows a musical staff in treble clef with a 4/4 time signature. The top '4' is enclosed in a pink box and the bottom '4' is enclosed in a green box. The staff contains a sequence of notes: a quarter note, a quarter note, a half note, a quarter note, a quarter note, a half note, a quarter note, a quarter note, and a final quarter note followed by a double bar line. The notes are all quarter notes, which are indicated by the green box around the bottom '4' of the time signature.

Time signature

Time Signature


$\frac{3}{2}$


$\frac{3}{4}$


$\frac{3}{8}$


$\frac{3}{16}$

Beat Duration


$\frac{2}{2}$ = 

$\frac{4}{4}$ = 


$\frac{8}{8}$ = 


$\frac{16}{16}$ = 

Number of Beats

$\frac{3}{2}$ = 

$\frac{3}{4}$ = 

$\frac{3}{8}$ = 

$\frac{3}{16}$ = 

Key

- Group of pitches (i.e., *scale*) that forms the centre of a piece
- Tonic + mode
- E.g., C maj, D min

Tonic note

- Pitch that provides sense of arrival
- Centre of gravity
- Often found at the beginning/end of a piece

Tonic note

- Pitch that provides sense of arrival
- Centre of gravity
- Often found at the beginning/end of a piece

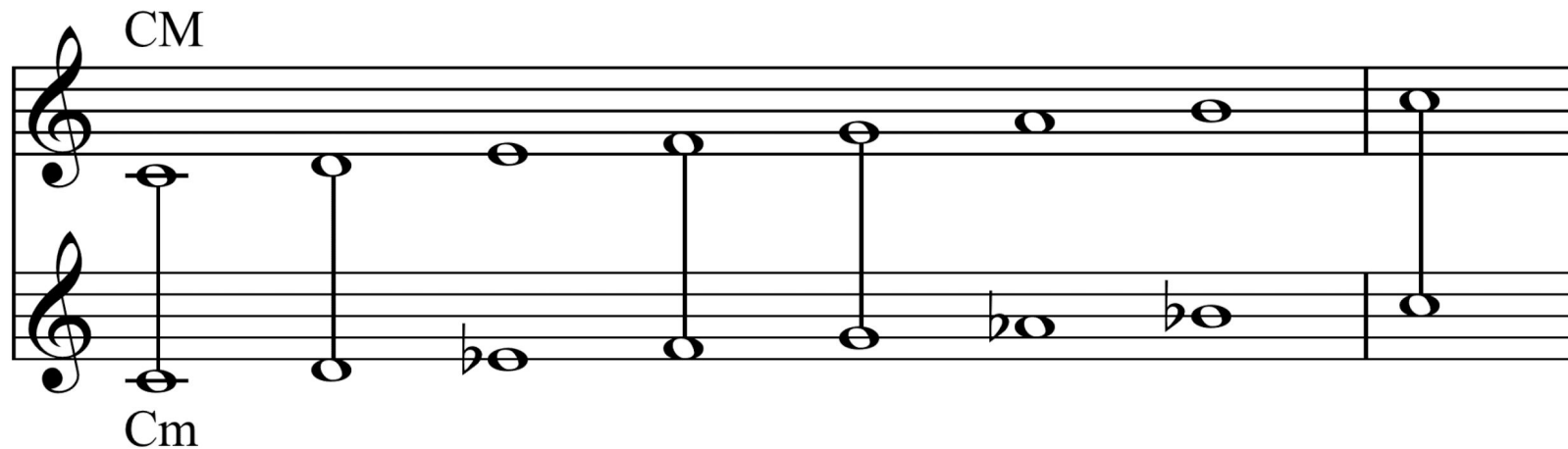


Tonic note

- Pitch that provides sense of arrival
- Centre of gravity
- Often found at the beginning/end of a piece



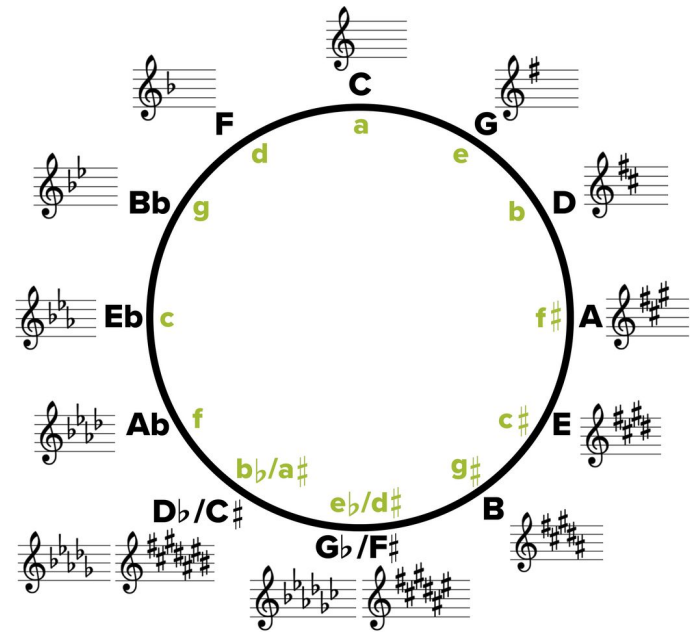
Major/minor scale



keys

12 notes x 2 modes = 24 keys

keys



Transposition

- Moving collection notes up/down by a given interval
- Change key
- Musical content remains the same

Music representation



Music representation: Idea 1

- Sequence
- Pitch/duration info for each note
- E.g., [(C4, 1), (D4, 1), ...]

Music representation: Idea 1

- Sequence
- Pitch/duration info for each note
- E.g., [(C4, 1), (D4, 1), ...]



Music representation: Idea 2

- Time series
- Sample melody at each 16th note
- Each step = 16th note
- Log MIDI note when note occurs
- Use “_” symbol for held notes
- Use “r” symbol for rest

Time series representation: Example

- 4/4 time signature
- 16 samples per bar
- 4 samples per quarter note



Time series representation: Example

["60", "_", "_", "_",



Time series representation: Example

```
[ "60", "_", "_", "_",
```

“62”, “_”, “_”, “_”,



Time series representation: Example

["60", "_", "_", "_",
"62", "_", "_", "_",
"64", "_", "64", "_",



Time series representation: Example

["60", "_", "_", "_",
"62", "_", "_", "_",
"64", "_", "64", "_",
"65", "_", "62", "_",
...]



Preparing melodies for LSTM ingestion

Time series representation



Map time series representation to integers



One-hot encoding

What next?

- Preprocess folk song dataset