

# From Graphical Scores to Sound Input and Output

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Music 253/CS 275A  
Stanford University

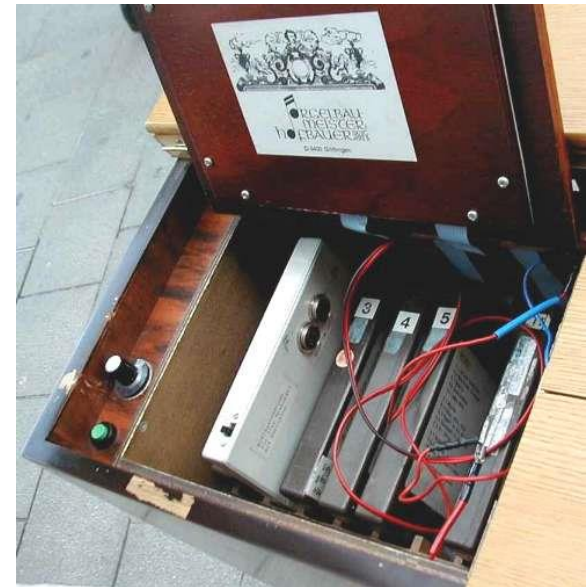
# Hardware properties of MIDI

- Eight-bit architecture
- Files are binary
- Highly standardized



Harmonipan

Street-organ controller



# Guido: Pitch and duration components in input

**Data**  
representation  
stored

Note duration  
Note prolongation  
Octave number  
Pitch inflection

**Pitch (key no.)**

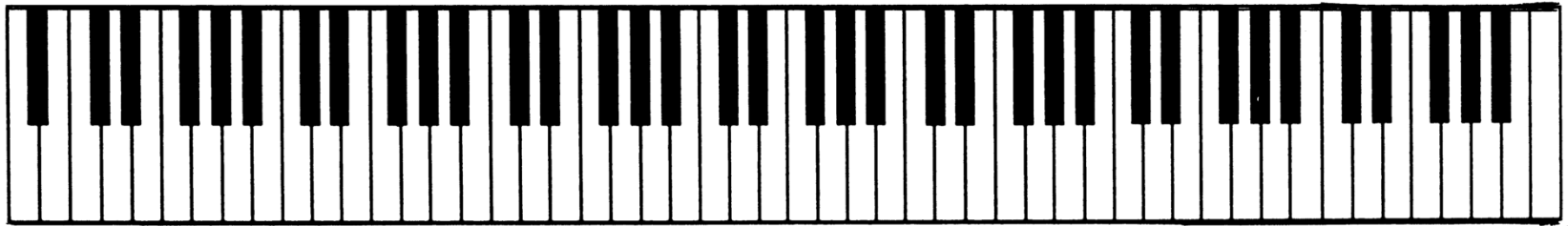
The screenshot displays the Guido software interface. At the top, a zoom control is set to 50%. Below it, a text box contains the musical notation: `[ c0/4 d0/4 e0/4 c0/4 c0/4 d0/4 e0/4 c0/4 ]`. The title "FrereJacques" is centered below the notation. A horizontal bar below the notation shows note durations and prolongations, with a red box highlighting the first note. Below this, a piano keyboard is shown with a red box highlighting the first key. A control panel at the bottom includes buttons for "rest", "send", "auto load" (checked), and "page settings". Arrows point from the keyboard to the time markers 48, 60, and 72.



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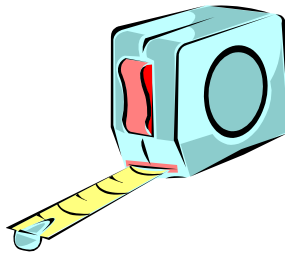
# PITCH IN RELATION TO MIDI

# The MIDI pitch interface



## Keysolut (MIDI C'S)

- 36
- 48
- 60
- 72
- 84

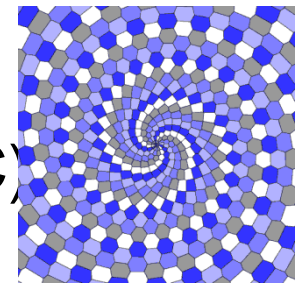


Number line rep.

## Octaves

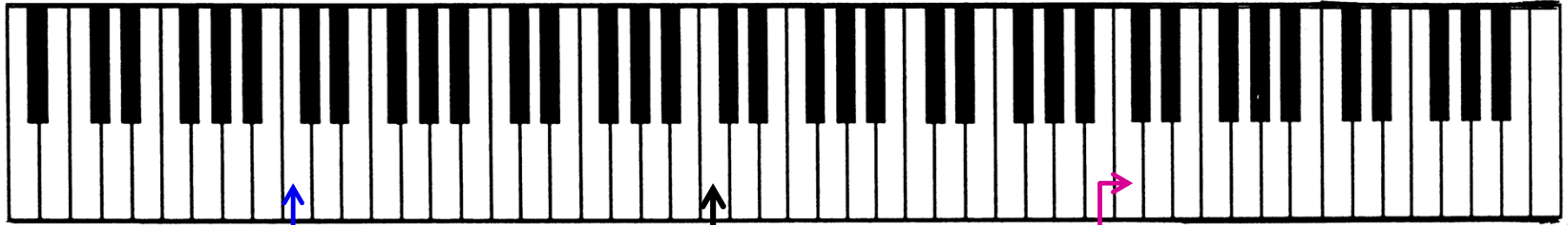
(Human being)

- CC #
- C )
- c (Middle C)
- c'
- c''



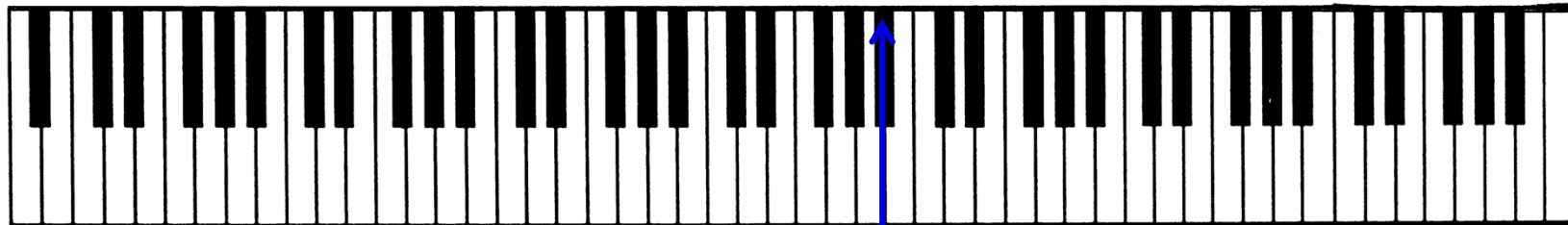
Cyclical rep./Bb

# “Pitch” = key number



- Absolute (MIDI C's)
  - 36 etc.
  - 48 C 8ve below Middle C
  - 60 Middle C
  - 72 C 8ve above Middle C
  - 84 etc.

# Key-number pitch is *absolute* tonal music notation is *relative*



## □ Absolute key number

- 36 etc.
- 48 C 8ve below Middle C
- 60 Middle C
- 72 C 8ve above Middle C
- 84 etc.

## □ Absolute pitch = “70”

Pitch names are **contextual**

*A#/Bb*

*Guido: separation of  
name and inflection*

- CC
- C
- c (Middle C)
- c'
- c''

# Pitch in MIDI transcription

[Composer]

Track 1

Track 2

Track 3

6

6

6

6

The image displays a MIDI transcription of a musical piece, showing three tracks. Track 1 is empty. Track 2 contains a complex melodic line with many accidentals. Track 3 is empty. The notation is in common time and features a key signature of two flats. The first system shows the beginning of the piece, and the second system shows a continuation of the melodic line. The notation is in common time and features a key signature of two flats. The first system shows the beginning of the piece, and the second system shows a continuation of the melodic line.



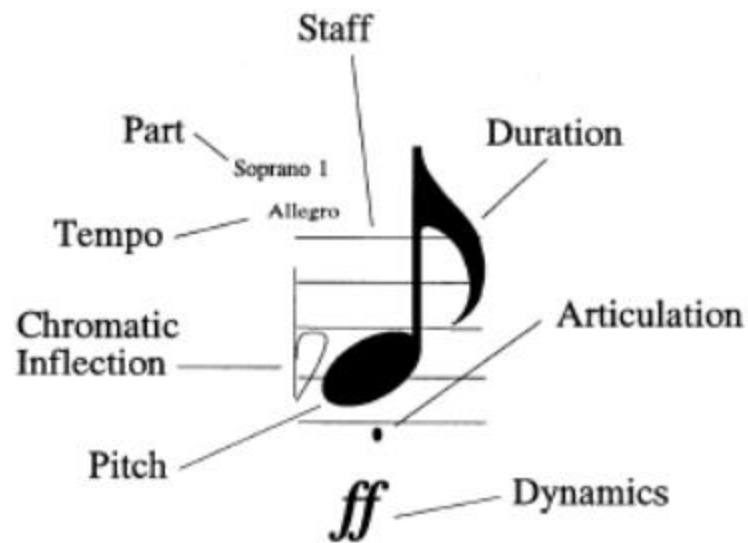


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# DURATION IN RELATION TO MIDI

# Sound-related features

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# The MIDI duration interface

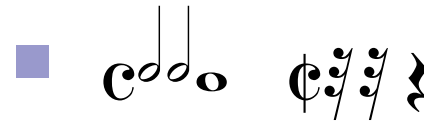
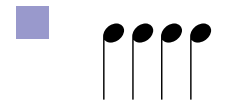
## Clock time (absolute)



- Clock ticks/measure (120, 192, 240)
- Ticks/quarter note (30, 48, 60)

Linear rep.

## Intuitive time (relative)



Hierarchical rep.



# MIDI data organization (sound)

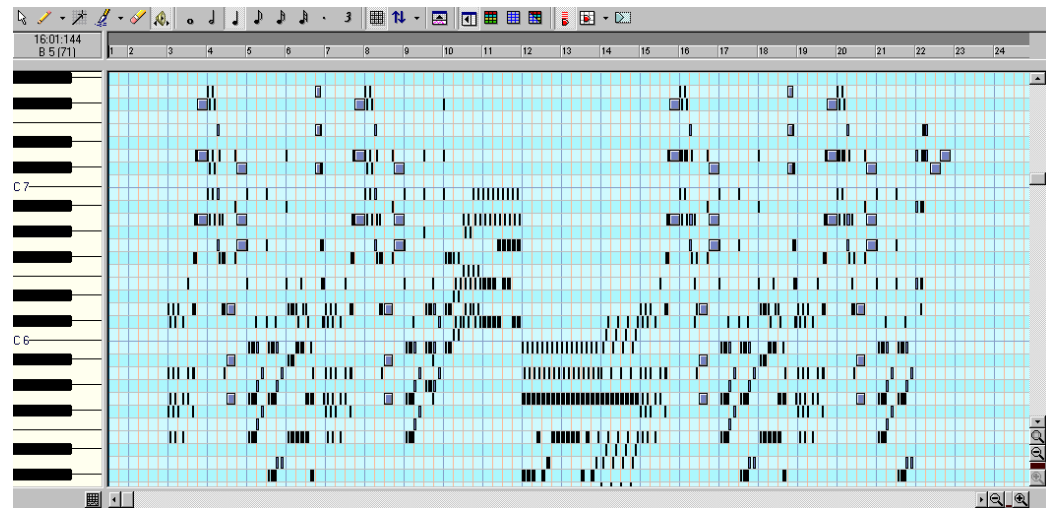
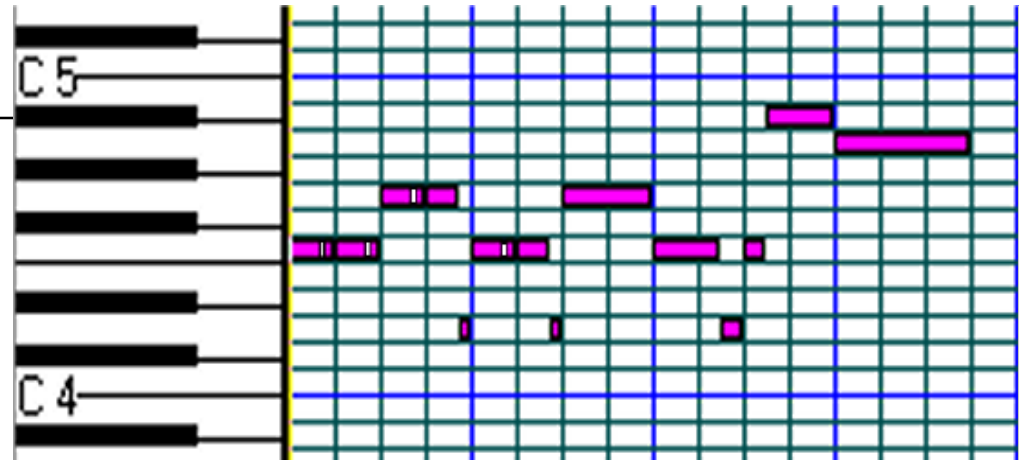
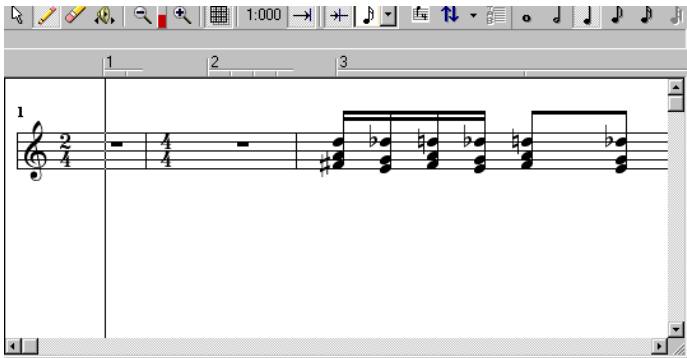
**Event-based** system

Part- major systems

The image displays a musical score for a string quartet and a clarinet. The instruments are listed on the left: *clarinet in A*, *violino I*, *violino II*, *viola*, and *violoncello*. The score is written in 2/4 time with a key signature of one sharp (F#). A vertical yellow highlight is placed over a specific event in the *clarinet in A* part, which occurs in the third measure of the first system. This event is a sixteenth-note run. The rest of the score shows the string parts with various dynamics and articulations.

# Sequencers

- Piano roll
- Event list
- Staff notation
- Virtual keyboard



# Clock-time in MIDI Event List

## Absolute (machine)

- Clock ticks/measure (120, 192, 240)
- Ticks/quarter note (30, 48, 60)

Trk	HMSF	MBT	Ch	Kind	Data		
1	00:00:01:16	2:01:000	1	Control	7-Volume	63	
1	00:00:01:16	2:01:000	1	Patch	Normal	---	Acoustic Grand Pian
1	00:00:01:16	2:01:000	1	Control	91-External Effects depth	64	
1	00:00:01:16	2:01:000	1	Control	7-Volume	63	
1	00:00:01:18	2:01:030	1	Control	7-Volume	62	
1	00:00:01:18	2:01:030	1	Control	7-Volume	64	
1	00:00:01:18	2:01:030	1	Control	7-Volume	64	
1	00:00:01:19	2:01:050	1	Control	7-Volume	64	
1	00:00:01:19	2:01:050	1	Control	7-Volume	66	
1	00:00:01:20	2:01:060	1	Control	7-Volume	66	
1	00:00:01:21	2:01:080	1	Control	7-Volume	67	
1	00:00:02:14	2:02:000	1	Patch	Normal		1 Flute
1	00:00:04:09	2:04:000	1	Control	0	0	
1	00:00:04:09	2:04:000	1	Control	32	1	
1	00:00:05:07	3:01:000	1	Note	D 6	100	60
1	00:00:05:07	3:01:000	1	Note	A 5	100	60
1	00:00:05:07	3:01:000	1	Note	F#5	100	60
1	00:00:05:14	3:01:120	1	Note	D#6	100	60
1	00:00:05:14	3:01:120	1	Note	G 5	100	60
1	00:00:05:14	3:01:120	1	Note	E 5	100	60
1	00:00:05:21	3:01:240	1	Note	D 6	100	60
1	00:00:05:21	3:01:240	1	Note	A 5	100	60
1	00:00:05:21	3:01:240	1	Note	F#5	100	60
1	00:00:05:28	3:01:360	1	Note	D#6	100	60
1	00:00:05:28	3:01:360	1	Note	G 5	100	60
1	00:00:05:28	3:01:360	1	Note	E 5	100	60
1	00:00:06:05	3:02:000	1	Note	D 6	100	60
1	00:00:06:05	3:02:000	1	Note	A 5	100	60
1	00:00:06:05	3:02:000	1	Note	F#5	100	60
1	00:00:06:18	3:02:240	1	Note	D#6	100	60
1	00:00:06:18	3:02:240	1	Note	G 5	100	60
1	00:00:06:18	3:02:240	1	Note	E 5	100	60
1	00:00:07:02	3:03:000	1	Note	E 6	100	60
1	00:00:07:02	3:03:000	1	Note	A 5	100	60
1	00:00:07:02	3:03:000	1	Note	G 5	100	60
1	00:00:07:16	3:03:240	1	Note	D 6	100	60
1	00:00:07:16	3:03:240	1	Note	A 5	100	60
1	00:00:07:16	3:03:240	1	Note	F#5	100	60
1	00:00:07:20	3:03:300	1	Note	F#6	100	60
1	00:00:07:20	3:03:300	1	Note	D 6	100	60
1	00:00:07:20	3:03:300	1	Note	A 5	100	60
1	00:00:07:23	3:03:360	1	Note	A 6	100	60
1	00:00:07:23	3:03:360	1	Note	F#6	100	60
1	00:00:07:23	3:03:360	1	Note	D 6	100	60
1	00:00:07:26	3:03:420	1	Note	D 7	100	60
1	00:00:07:26	3:03:420	1	Note	A 6	100	60
1	00:00:07:26	3:03:420	1	Note	F#6	100	60
1	00:00:08:00	3:04:000	1	Note	F#7	100	1:000



## Midi time stamps

# Practical consequences of time precision

“Lili Marleen” via MIDI



Lili Marlen'

<http://ingeb.org> Norbert Schulze 1937



The image displays a musical score for the song "Lili Marleen" by Norbert Schulze (1937). The score is presented in three systems, each with a vocal line (treble clef) and a piano accompaniment (grand staff). Vertical red lines are drawn through the score, marking specific time points across all staves. The first system includes the URL <http://ingeb.org> and the composer's name "Norbert Schulze 1937". The second system shows the piano accompaniment with chords and bass lines. The third system includes first and second endings, marked "1. 4." and "5." respectively.

Internet Archive:

<https://archive.org/details/LiliMarleen-01-40> (55 versions; Select No. 9)