MIDI and extended pitches

Tuning and Temperament
“Pitch”: Notated pitch *relative* to key

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

- Absolute pitch = “90”

Pitch names are *contextual* "F#/Gb/E##"
MIDI: Tuning, temperament, expression

• Max Mathews, CCRMA: Radio Baton (emphasized expression—tempo, dynamics)
  • https://www.youtube.com/watch?v=3ZOzUVD4oLg
Pitch and timbre: Music V and CSound

• **Approaches that define sounds**
  - **Music V:** Max Mathews (Bell Labs, 1960s, 1970s)
  - **Csound:** Barry Vercoe (MIT, 1980s, 1990s)
    - score
    - scot
  - **Strengths:**
    - decimal system using *cents* *(frequency)*
    - Instruments can be arbitrary (scot)
    - Arbitrary objects can be encoded *(pling command)*

Tutorial: [https://www.youtube.com/watch?v=rkBIUrJoJ3Y](https://www.youtube.com/watch?v=rkBIUrJoJ3Y)
Shortcomings: tuning, Temperament

**Pitch**

- Non-Western
- Non-equitably tempered
- Interpretation of accidentals (inflections)

Modes vs. chromatic scale
Mapping (or not) to the chromatic scale

- Diatonic=8 tones
- **C**hromatic=12 tones
- Pentatonic=5 tones

Lady playing tanpura, c. 1735
MIDI vis-à-vis Notation

• Enharmonic accuracy hard to guarantee when input is MIDI-based
• Inherent non-alignment of key numbers vis-à-vis note names
• One more bit-based MIDI extension: Hewlett’s MIDIPlus
• See
Hewlett’s MIDI Plus for accurate tonal notation
(How to make MIDI enharmonically accurate)

• **Method**
  Reassign two bits from velocity byte

Complements Base-40 music arithmetic (8th week)

Method for enharmonic accuracy

Key number = 90
Note name depends on context
Captured bit specifies name:
  00 not known
  01 Gb
  10 F#
  11 Ex (E##)

Pitch names are contextual
F#/Gb/E##

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MIDI Plus
(How to make MIDI enharmonically accurate)

• **Method**
  Reassign two bits from velocity byte

Non-equal temperament

- Baroque tunings
  - “Just” intonation
  - Meantone
  - Werckmeister III

- Arbitrary 8ve arrangements (“short octaves”, split keys)
Vicentino’s enharmonic harpsichord (pitch equivalents in cents)

Music for enharmonic harpsichord (from c. 1550) by Martino Pesenti (c. 1650)
Roland digital harpsichord series (1988--)

Three modes
  Equal-tempered
  Meantone
  Werckmeister III
Two acoustic contexts
  Room
  Hall
Two “instruments”
  Organ
  Harpsichord
Five “stops”
  Harpsichord 1-manual
  Harpsichord 2-manual
  Flemish
  Lute
  ...

https://www.youtube.com/watch?v=zZSlHVifRps
MIDI in use: Historical vs digital harpsichords

• Original 16th-century instrument: National Music Museum, Vermilion, SD
  • https://www.youtube.com/watch?v=aq9iwjyq6u0

• Alteration of tuning, temperament
  • https://www.youtube.com/watch?v=W2gOI1p_0iM [Vallotti tuning, English Renaissance music]

• Split keys, Renaissance harpsichords:
  • https://www.youtube.com/watch?v=D0OveRacKH0