Using `textmidi`

The textmidi language to MIDI translator

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1 Overview

The `textmidi` program translates a text representation of a standard MIDI (Musical Instrument Digital Interface) file into a binary standard MIDI file. Using `textmidi`, it is possible to write very precise MIDI files, with delays down to the MIDI tick, in a way that GUI-based tools may not offer. Previously-created MIDI files may be converted into `textmidi` language using the `miditext` tool, and then edited for re-translation by `textmidi`. The goal of `textmidi` and `miditext` together is to permit the specification of any musical events that are permitted by the MIDI 1.1 spec's chapter on Standard MIDI Files. SysEx (system exclusive) is also supported, as are all three filetypes (single track, multitrack and multi-sequence).

No attempt is made in `textmidi` to support either MIDI show control or machine control.

MIDI Running-status is used, but resets if a non-channel voice command interrupts the stream. `miditext` permits input files to use running-status more freely.

1.1 What is textmidi?

The program `textmidi` reads a text representation of a standard MIDI file in what is called here "textmidi" language, and converts it to a standard MIDI file, which is binary. Each item in the text file corresponds to a sequence of command bytes in the binary MIDI file, more or less.

Developing MIDI files as text in textmidi language can offer advantages in that text files can readily be hand-edited, automatically-generated, searched with search tools, and enriched with macro processors, such as m4.

`textmidi` is a language translator for the `textmidi` language. It does not create or use graphical musical scores. `textmidi` does not record or play over a MIDI interface.

1.2 MIDI Summary

Standard MIDI files are generally used to represent conventionally scored music, usually instrumental music. MIDI is a means of connecting electronic instruments, sequencers, and computers: A current-loop connection is defined but USB is often used today. MIDI is also a sort of industrial control protocol which assigns (at least) numbers to the keys of a piano keyboard, numbers to the velocity with which the key was hit (giving loudness), and delays between the points of hitting and releasing keys. For example, Middle C, (often about 261 cycles/second), is assigned 60 decimal; the velocities range from 0 to 127. Delays between events can be up to 28 bits in units of MIDI ticks. Since quarter notes are often assigned a duration of 240 ticks, either a note or a rest could be as long as 1118481 quarter notes or 279620 whole notes. Since delays are variable-length quantities (in byte steps), they can range from 1 byte to 4 bytes in size in the MIDI file, but as only 7 bits of value are permitted in each byte, values can be only up to 28 bits long (unsigned). MIDI also specifies controls, such as damper pedals and "pressure" (named for pressure-sensitive keyboards that permit making a note louder or software by changing the force applied to the key), and synthesizer-specific message handling as "SYSEX" or "System Exclusive" messages. As a result of encoding key presses rather than audio signals, MIDI files can be nearly 300 times smaller than a stereo MP3 file of the same piece. A disadvantage is that support for MIDI features and the General MIDI instrument definitions is sometimes poor.

Standard MIDI files are a means of describing a musical performance in time. MIDI files can be created by software that records the MIDI stream received over a MIDI interface as you play a piano or other MIDI controller. MIDI files can also be created on sequencing or scoring software.

1.3 History

`textmidi` was developed in 1999 and improved in 2020 to 2022 in order to add support for more of the MIDI specification. It was used in 2003 to create the MIDI file for the Quintet for piano and strings by Robert Schumann, which was added to the Classical MIDI Archive at that time.

2 Invoking textmidi

2.1 Options

textmidi [**−i**|**−−textmidi**] *textmidi_input_file* **−o**|**−−midi** *standard_midi_output_file*
[**−a**|**−−answer**] [**−d**|**−−detache** *numticks*]
[**−l**|**−−lazynoteoff**] [**−h**|**−−help**]
[**−V**|**−−version**] [**−v**|**−−verbose** [**−n**|**−−runningstatus**
[**−y**|**−−dynamics_configuration** *dynamics_configuration_file*]
standard|*never*|*persistentaftermeta*|*persistentaftersysex*|*persistentaftersysexormeta)*]

`-h, --help`
: Print the options summary.

`-v, --verbose`
: Write some informative messages to the screen. Errors are printed regardless.

`-V, --version`
: Print the version of `textmidi`.

`-i, --textmidi textmidi_input_file`
: The input file: a text representation of a MIDI file in `textmidi` language.

`-o, --midi standard_midi_output_file`
: The output file; a binary standard MIDI file.

`-d, --detache num`
: A small number of MIDI ticks to separate consecutive notes. It always is shaved off the end of preceding note events and made into a rest (but not taken from preceding rests). The default is 0. Originally, the default was 10 and was based on experience with MIDI synthesizers from the 1980's that could behave poorly with high rates of note events with no delay between note-off and note-on events. The time is stolen from the preceding note's duration, not added.

`-l, --lazynoteoff`
: In LAZY mode, for the ends of a note's duration, use a MIDI note-off with the global velocity rather than a note-on with a velocity of zero.

`-a, --answer`
: If the output textmidi file already exists, ask before overwriting it.

`-n, --runningstatus {standard | never | persistentaftermeta | persistentaftersysex | persistentaftersysexormeta }`
: For the purpose of testing with old MIDI files, specify the policy for running status. By default, the MIDI SMF standard is followed: running status is used but cleared at the appearance of meta and SYSEX events. Specifying "never" means that status bytes always are written. Specifying "persistentaftermeta" means that **meta** events do not clear running status. Specifying "persistentaftersysex" means that **sysex** events do not clear running status. Specifying "persistentaftersysexormeta" means that neither **meta** nor **sysex** events clear running status. The purpose of "never" and "persistentafter*" is to emulate the misbehaviour of some MIDI file writing software, so that a round-trip test can be performed in which a MIDI file can be converted to textmidi text, then back

to a MIDI file that is identical to the original file. This aids testing. From the spec: "Meta events and sysex events cancel any running status that was in effect." RP-001_v1-0_Standard_MIDI_Files_Specification_96-1-4.pdf page 7 bottom. **sysex**, **meta** events, and **end-of-track**.

`-y, --dynamics_configuration {dynamics_configuration_file}`

To set the MIDI velocity values for lazy dynamics expressed with "forte", "mf", etc., edit a dynamics configuration file. It is in the same format as boost::program_options requires. You can see various settings for MIDI dynamics on wikipedia at the **Dynamics_(music)#Interpretation_by_notation_programs** page. It is not necessary to specify values for all of the dynamic symbols. An example file:

```
ppppp=5
pppp=10
ppp=25
pp=40
p=50
mp=62
mf=75
forte=90
ff=110
fff=120
ffff=127
fffff=127
```

2.2 Invocation Examples

The following command will read the hand-edited prelude.txt and convert it to the standard MIDI file prelude.mid, with no separation between the end of notes and the notes that follow them. If LAZY mode is used in the textmidi file, end notes using a note-on event with a velocity of zero.

```
textmidi --textmidi prelude.txt --midi prelude.mid --detache 0
```

The following converts prelude.txt into prelude.mid, using the default 20 ticks between notes and a MIDI note-off event with the current velocity to end each note in LAZY mode rather than a note-on.

```
textmidi --textmidi prelude.txt --midi prelude.mid --lazynoteoff
```

3 `textmidi` Language

The language used in `textmidi` text files represents binary events and commands of MIDI standard file; multiple bytes typically represent a MIDI event or command. There are two modes: Detail mode and LAZY mode. LAZY mode can contain only notes, rests, durations, dynamics, and the chan (channel) command. The `textmidi` language is case-insensitive except for the "b" used for a flat sign. The b for a flat sign as in Ab3 must be lower case. ab3 is the same as Ab3, but there is no note name aB3. A semicolon is the comment character and marks the remainder of a line as comment not to be converted into MIDI stream bytes. C4 is middle C. A new octave begins with C, so the B below middle C is B3 or b3. Note that all channel numbers and program numbers are 1-based in the `textmidi` file. They are adjusted to be 0-based in the binary file. This reflects practice as it appears in the MIDI specification. An example of the format follows:

```
FILEHEADER 3 240
STARTTRACK
END_OF_TRACK
{
  NOTE_ON 1 C4 64
  DELAY 960
  NOTE_ON 1 C4 0
  NOTE_ON 1 C4 64
  DELAY 960
  NOTE_OFF 1 C4 0
  LAZY
  C4 1
  END_LAZY
}
STARTTRACK

END_OF_TRACK
```

3.1 FILEHEADER

FILEHEADER takes three arguments:

- An integer number of tracks
- Ticks per quarter (ignored)
- An optional file format: MONOTRACK | MULTITRACK | MULTISEQUENCE. The default is MULTITRACK.

3.2 Tracks

A track contains the musical data in a MIDI sequence. In `textmidi` language, a track is defined with either STARTRACK and END_OF_TRACK or by braces:

```
FILEHEADER 1 384
STARTTRACK
TEMPO 120
TIME_SIGNATURE 4 4 24
PROGRAM 1 1
NOTE_ON C4 63
DELAY 960
```

```
NOTE_OFF C4 63
END_OF_TRACK
```

or

```
FILEHEADER 1 384
{
    TEMPO 120
    TIME_SIGNATURE 4 4 24
    PROGRAM 1 1
    NOTE_ON C4 63
    DELAY 960
    NOTE_OFF C4 63
}
```

Track data can be expressed explicitly in DETAIL mode, the default mode, or in LAZY mode, which makes it possible to type in musical more quickly.

3.2.1 DETAIL track mode

3.2.1.1 Note Events

NOTE_ON channelnum pitchname velocity

NOTE_ON events put a note-on event into the MIDI file.

```
NOTE_ON 1 G4 57
```

The pitch may be given with a letter a−g,

- sharps: "#"
- flats: "b" (must be lower-case b)
- double-sharps: "x"
- double flats: "bb"

an octave −1 to 9 (MIDI pitches range from C−1 to G9).

NOTE_OFF channelnum pitchname velocity

```
NOTE_OFF 1 G4 57
```

3.2.1.2 DELAY

```
DELAY ticksnum
```

```
DELAY 960
```

Note that textmidi is not line-oriented except for some uses of the text events. You may write

```
DELAY 72 NOTE_ON 1 B4 53
```

and follow it with as many more events as you like.

A delay in MIDI ticks inserts that delay into the MIDI file. DELAY times are not events; the accumulated delay is not written into the MIDI stream until the next event. If no DELAY events are inserted in DETAIL mode, then the mandatory delays inserted into the MIDI file will all be zero. That is allowed, but the music will be unexpectedly quick. LAZY mode calculates and inserts the delay values before each event for you. DELAYS may be zero to 268435455 in MIDI tick units.

3.2.1.3 Text meta events

Text meta events (a sort of MIDI pseudo-event that appears only in MIDI files) take string arguments. These events may repeat throughout the track within Detail mode. The string data the follows text event commands must either use the remainder of a line, or be double-quoted. Escaped characters in this list may be embedded in string events: \r (carriage return), \n (line-feed), \a (bell), \" (double-quote), \f (formfeed), \b (backspace), \t (tab), \v (vertical tab).

```
TEXT "Rewrite this measure" TIME_SIGNATURE 3 4 24
TEXT_08 "Rewrite this measure" TIME_SIGNATURE 3 4 24
TEXT_09 "Rewrite this measure" TIME_SIGNATURE 3 4 24
TEXT_0A "Rewrite this measure" TIME_SIGNATURE 3 4 24
TEXT_0B "Rewrite this measure" TIME_SIGNATURE 3 4 24
TEXT_0C "Rewrite this measure" TIME_SIGNATURE 3 4 24
TEXT_0D "Rewrite this measure" TIME_SIGNATURE 3 4 24
TEXT_0E "Rewrite this measure" TIME_SIGNATURE 3 4 24
TEXT_0F "Rewrite this measure" TIME_SIGNATURE 3 4 24
```

or

```
TEXT Rewrite this measure
TIME_SIGNATURE 3 4 24
```

Note that <EOL> refers to end-of-line, that is, no commands follow on the same line. Text events can be written with no quotes if no commands follow. If the text is put inside quotes, then other commands may follow on the same line.

`TEXT [string]<EOL>` or `TEXT "a string" [more commands]`

```
TEXT "See above"
```

`COPYRIGHT [string]<EOL>` or `COPYRIGHT "string" [more commands]`

The copyright notice meta event.

```
COPYRIGHT Copyright © 1823 Ludwig van Beethoven
```

`TRACK [string]<EOL>` or `TRACK "string"`

The track name.

```
TRACK "Trumpet stings"
```

`INSTRUMENT [string]<EOL>` or `INSTRUMENT "string" [more commands]`

The instrument name for the given track. This is only a string and does not effect the General MIDI instrument preset.

```
INSTRUMENT "Flugel Horn or best substitute"
```

`LYRIC [string]<EOL>` or `LYRIC "string"`

A lyric string. The MIDI Manufacturers Assocation publishes "RP17 SMF Luric Events Definition" with guidelines on adding lyrics to MIDI files. The guidelines there include the following:

- Each LYRIC event should have just one syllable.
- Use a space character at the end of a word (not of a syllable).
- Any comma or period should appear after the syllable and before the space.
- A carriage return can indicate the end of a line.
- A line feed often tells karaoke machines to refresh the lyric display.

- Do not add dashes between syllables; scoring software can do that. On the other hand, use dashes in compound words as spelled in a dictionary.

```
LYRIC "No lyric could be cleared, oh Baby!"
```

`MARKER [string]<EOL>` or `MARKER "string"`

```
MARKER "Letter A"
```

`CUE_POINT [string]<EOL>` or `CUE_POINT "string"`

```
CUE_POINT "Letter A"
```

It is not entirely clear what the MIDI spec meant, or how studio musicians use these.

3.2.1.4 Non-text meta events

Non-text meta events.

`TEMPO num` TEMPO is set in beats per minute for a quarter note. The tempo is per quarter note even if the time signature has designated the beat as an eighth note. This restriction to quarter notes comes from the MIDI spec. You can still use any time signature, but you need to compute the tempo for a quarter note in that time signature.

```
TEMPO 72
```

`KEY_SIGNATURE note_name`

KEY_SIGNATURE is given as a note name like the pitch names, but with no octave. Lower-case keys are minor keys and upper-case keys are major keys. The flat sign (a b) must always be lower-case.

C-flat major:

```
Cb
```

C-sharp major:

```
C#
```

C-sharp minor:

```
c#
```

F-minor

```
f
```

`TIME_SIGNATURE {beats_per_measure} {beatduration} {ticksperbeat}`

The value beats_per_measure is the traditional musical value and must be an integer. It can be 1, 2, and up. The value for beatduration is the traditional musical part of a time-signature giving the value-per-beat, such as 4 for a quarter note, or 1 for a whole note. Note that beatduration must be a positive integer. The value for ticksperbeat is MIDI ticks in a beat. It is often 240, but 384 is common as well.

```
TIME_SIGNATURE 3 4 240
```

`XMF_PATCH_TYPE {GM1|GM2|DLS}`

Selects the XMF patch type: General MIDI 1, General MIDI 2, or DLS, which refer to the synthesizer type. XMF_PATCH_TYPE should appear only as the first event of a given track, but textmidi does not enforce it.

```
XMF_PATCH_TYPE GM1
```

```
                XMF_PATCH_TYPE GM2
                XMF_PATCH_TYPE DLS
```

`SMPTE_OFFSET`
`{SMPTE_24FPS|SMPTE_25FPS|SMPTE_30FPSDROPFRAME|SMPTE_30FPSNONDROPFRAME}`
`HH:MM:SS:Frame:framefraction`

```
                SMPTE_OFFSET 07:47:13:07:11
```

`SEQUENCE_NUMBER num`

```
                SEQUENCE_NUMBER 1
```

`MIDI_CHANNEL num`

```
                MIDI_CHANNEL 1
```

`END_OF_TRACK or }.`

MIDI tracks must end with either an END_OF_TRACK or }.

`SEQUENCER_SPECIFIC byte byte byte...`

3.2.1.5 Unknown meta events

Unknown meta events (that is, META events using unassigned meta codes) take byte arguments in the format of SYSEX. These are META events that the MIDI spec has not assigned. These events may repeat throughout the track while within DETAIL mode. Do not include the length: `textmidi` will compute the length and put it in the MIDI file as a variable-length integer. The individual values may be hexadecimal, prefixed with "0x", or decimal, but must not exceed 255 decimal.

```
UNKNOWN_META meta_code_byte data_byte...
```

or

```
UNKNOWN_META 0x11 0xFF
```

3.2.1.6 MIDI Events

MIDI events

`NOTE_ON channel_num pitch velocity_number`

```
                NOTE_ON 1 G4 57
```

`NOTE_OFF channel_num pitch velocity_number`

```
                NOTE_OFF 1 G4 57
```

`POLY_KEY_PRESSURE channel_num pitch velocity_number`

```
                POLY_KEY_PRESSURE 1 G4 100
```

A succession of POLY_KEY_PRESSURE commands, with delays between them, can create swelling and fading effects if the player used supports poly key pressure.

`CONTROL channel_num controller_id value_num`

CONTROL allows the setting of various controls on channels. The channel is in decimal from 1 to 16. The control ID may, optionally, be one of the strings below, or any valid number in 0..127, including those represented by strings. About a half-dozen of the controls have shorter forms available, but the `miditext` program always writes the full form using the CONTROL keyword.

```
CONTROL 13 64 10
```

Some MIDI controller ID's have names:

- BANK_SELECT

```
CONTROL 2 BANK_SELECT 2
```

- MODULATION

```
CONTROL 4 MODULATION 3
```

- BREATH For example,

```
CONTROL 1 BREATH 64
```

  An abbreviated form is available. Leave off the CONTROL:

```
BREATH [chan] [velocity]
BREATH  11 99
```

- UNDEFINED_03
- FOOT_CONTROLLER

```
CONTROL 1 FOOT_CONTROLLER 0
```

- PORTAMENTO_TIME

```
CONTROL 1 PORTAMENTO_TIME 5
```

- DATA_ENTRY_MSB
- CHANNEL_VOLUME

```
CONTROL 1 CHANNEL_VOLUME 74
```

- BALANCE
- UNDEFINED_09
- PAN channel_num LEFT|CENTER|RIGHT|{-64..63} When using the numeric pan values, note that -64 is left-most, 63 is right-most, and 0 is in the center.

```
CONTROL 1 PAN CENTER
CONTROL 1 PAN LEFT
CONTROL 1 PAN RIGHT
CONTROL 1 PAN -10
CONTROL 1 PAN 12
```

  Note that if a CONTROL for pan was written using the number for PAN (=10, =0x0A) instead of the string PAN then Excess64 (=64) will not be added.

- EXPRESSION

```
CONTROL 1 EXPRESSION 17
```

- EFFECT_1

```
CONTROL 1 EFFECT_1 18
```

- EFFECT_2

```
CONTROL 1 EFFECT_2 19
```

- UNDEFINED_14
- UNDEFINED_15
- GENERAL_PURPOSE_1

```
CONTROL 1 GENERAL_PURPOSE_1 20
```

- GENERAL_PURPOSE_2

```
CONTROL 1 GENERAL_PURPOSE_2 126
```

- GENERAL_PURPOSE_3

```
CONTROL 1 GENERAL_PURPOSE_3 125
```

- GENERAL_PURPOSE_4

```
CONTROL 1 GENERAL_PURPOSE_4 124
```

- UNDEFINED_20 to UNDEFINED_31
- LSB_00 to LSB_31
- DAMPER The damper pedal on a piano. It supports a value in 0..127.

```
CONTROL 6 DAMPER 0
CONTROL 6 DAMPER 127
```

  An abbreviated form is supported. Leave off the CONTROL.

```
DAMPER [chan] [value]
DAMPER 12 122
```

- PORTAMENTO_ON_OFF

```
CONTROL 1 PORTAMENTO_ON_OFF 0
CONTROL 1 PORTAMENTO_ON_OFF 127
```

- SOSTENUTO The sostenuto pedal on a piano: only the keys being held at the time are sustained, not notes following the pedal.

```
CONTROLLER 1 SOSTENUTO 127
CONTROLLER 1 SOSTENUTO 0
CONTROLLER 1 SOSTENUTO ON
CONTROLLER 1 SOSTENUTO OFF
```

  There is an abbreviated form. Leave off the CONTROL.

```
SOSTENUTO [chan] [ON/OFF]
SOSTENUTO 16 ON
SOSTENUTO 16 OFF
```

- SOFTPEDAL value Use 0 for off and 127 for on.

```
CONTROL 1 SOFTPEDAL OFF
CONTROL 1 SOFTPEDAL ON
CONTROL 1 SOFTPEDAL 0
CONTROL 1 SOFTPEDAL 127
```

  An abbreviated form is supported. Leave off the CONTROL.

```
SOFTPEDAL [chan in 1..16] [value]
SOFTPEDAL 13 127
SOFTPEDAL 13 1
```

- LEGATO_FOOT

```
CONTROL 1 LEGATO_FOOT
```

- HOLD_2

```
CONTROL 1 HOLD_2
```

- SOUND_VARIATION

```
CONTROL 1 SOUND_VARIATION
```

- TIMBRE_INTENSITY

  ```
  CONTROL 1 TIMBRE_INTENSITY
  ```

- RELEASE_TIME

  ```
  CONTROL 1 RELEASE_TIME 63
  ```

- ATTACK_TIME

  ```
  CONTROL 1 ATTACK_TIME 63
  ```

- BRIGHTNESS

  ```
  CONTROL 1 BRIGHTNESS 63
  ```

- DECAY_TIME

  ```
  CONTROL 1 DECAY_TIME 63
  ```

- VIBRATO_RATE

  ```
  CONTROL 1 VIBRATO_RATE 63
  ```

- VIBRATO_DEPTH

  ```
  CONTROL 1 VIBRATO_DEPTH 63
  ```

- SOUND_CONTROLLER_9

  ```
  CONTROL 1 SOUND_CONTROLLER_9 63
  ```

- SOUND_CONTROLLER_10

  ```
  CONTROL 1 SOUND_CONTROLLER_10 63
  ```

- GENERAL_PURPOSE_5

  ```
  CONTROL 1 GENERAL_PURPOSE_5 63
  ```

- GENERAL_PURPOSE_6

  ```
  CONTROL 1 GENERAL_PURPOSE_6 63
  ```

- GENERAL_PURPOSE_7

  ```
  CONTROL 1 GENERAL_PURPOSE_7 63
  ```

- GENERAL_PURPOSE_8

  ```
  CONTROL 1 GENERAL_PURPOSE_8 63
  ```

- PORTAMENTO This is MIDI portamento control.

  ```
  CONTROL PORTAMENTO 0
  CONTROL PORTAMENTO 127
  ```

  An abbreviated form is supported. Leave off the CONTROL.

  ```
  PORTAMENTO [chan] [value]
  PORTAMENTO 14 120
  ```

- HIRES_VELOCITY_MSB

  ```
  CONTROL 1 HIRES_VELOCITY_MSB 63
  ```

- REVERB_SEND_LEVEL

  ```
  CONTROL 1 REVERB_SEND_LEVEL 63
  ```

- TREMOLO_DEPTH

  ```
  CONTROL 1 TREMOLO_DEPTH 63
  ```

- CHORUS_SEND_LEVEL

```
CONTROL 1 CHORUS_SEND_LEVEL 63
```

- CELESTE_DEPTH

```
CONTROL 1 CELESTE_DEPTH 63
```

- PHASER_DEPTH

```
CONTROL 2 PHASER_DEPTH 17
```

- DATA_INCREMENT

```
CONTROL 1 DATA_INCREMENT 63
```

- DATA_DECREMENT

```
CONTROL 1 DATA_DECREMENT 63
```

- NON_REGISTERED_PARAMETER_LSB

```
CONTROL 1 NON_REGISTERED_PARAMETER_LSB 63
```

- NON_REGISTERED_PARAMETER_MSB

```
CONTROL 1 NON_REGISTERED_PARAMETER_MSB 63
```

- REGISTERED_PARAMETER_LSB

```
CONTROL 1 REGISTERED_PARAMETER_LSB 63
```

- REGISTERED_PARAMETER_MSB

```
CONTROL 1 REGISTERED_PARAMETER_MSB 63
```

- ALL_SOUND_OFF This would probably not be used in a MIDI file, but only by a MIDI player. Nevertheless it is available in `textmidi`. The value is always zero.

```
CONTROL 1 ALL_SOUND_OFF 0
```

  An abbreviated form is available. Omit the CONTROL and the value.

```
ALL_SOUND_OFF [channel]
ALL_SOUND_OFF 5
```

- RESET_ALL_CONTROLLERS Previously `textmidi` called this RESETALL. The value must be zero.

```
CONTROL 5 RESET_ALL_CONTROLLERS 0
```

  An abbreviated form is available. Omit the CONTROL term and the value, which is always zero:

```
RESET_ALL_CONTROLLERS [channel in 1..16]
RESET_ALL_CONTROLLERS 3
```

- LOCAL_CONTROL This sets whether a piece of MIDI hardware's front panel controls are locked out. You can use ON and OFF, or the respective values of 127 and zero.

```
CONTROL 1 LOCAL_CONTROL ON
CONTROL 1 LOCAL_CONTROL OFF
CONTROL 1 LOCAL_CONTROL 0x7f
CONTROL 1 LOCAL_CONTROL 0x00
CONTROL 1 LOCAL_CONTROL 127
CONTROL 1 LOCAL_CONTROL 0
```

An abbreivated form is available:

```
LOCAL_CONTROL 2 ON
```

- ALL_NOTES_OFF Turn off all notes on the channel. The value is always zero. Previously `textmidi` called this ALLNOTES_OFF.

  ```
  CONTROL 1 ALL_NOTES_OFF 0
  CONTROL 1 ALL_NOTES_OFF 0
  ```

  An abbreviated form is available. Leave off the CONTROL:

  ```
  ALL_NOTES_OFF [channel in 1..16]
  ALL_NOTES_OFF 9
  ALL_NOTES_OFF 9
  ALL_NOTES_OFF 9
  ```

- OMNI_OFF (all notes off)

  ```
  The value must be zero.
  CONTROL 11 OMNI_OFF 0
  ```

  An abbreviated form is available; omit CONTROL and the value:

  ```
  OMNI_OFF 11
  ```

- OMNI_ON The value must be zero:

  ```
  CONTROL 11 OMNI_ON 0
  ```

  An abbreviated form is available:

  ```
  OMNI_ON 11
  ```

- MONO_ON The value is the number of channels:

  ```
  CONTROL 11 MONO_ON 4
  ```

  An abbreviated form is available; provide the base channel and the number of channels:

  ```
  MONO_ON 12 5
  ```

- POLY_ON

  ```
  CONTROL 11 POLY_ON 0
  ```

  An abbreviated form is available:

  ```
  POLY_ON 15
  ```

MIDI 3D is implemented via registered parameters. The `textmidi` program can translate some 3D parameter names. However, `miditext` does not output the parameter LSB names; it prints the hexadecimal values instead. Below is an example of a 3D MIDI set-up. It has not been verified on MIDI hardware. Consult the MIDI 3D memorandum for the arithmetic expressions that convert degrees to the integer values required in the MIDI stream.

```
FILEHEADER 1 240
STARTTRACK
; horizontal azimuth angle of 0 degrees.
CONTROL 1 REGISTERED_PARAMETER_MSB 0x3d
CONTROL 1 REGISTERED_PARAMETER_LSB AZIMUTH
CONTROL 1 DATA_ENTRY_MSB 0x40
CONTROL 1 LSB_06 0x00
```

```
; elevation angle of 0 degrees.
CONTROL 1 REGISTERED_PARAMETER_MSB 0x3d
CONTROL 1 REGISTERED_PARAMETER_LSB ELEVATION
CONTROL 1 DATA_ENTRY_MSB 0x40
CONTROL 1 LSB_06 0x00

; gain of 0dB.
CONTROL 1 REGISTERED_PARAMETER_MSB 0x3d
CONTROL 1 REGISTERED_PARAMETER_LSB GAIN
CONTROL 1 DATA_ENTRY_MSB 0x7f
CONTROL 1 LSB_06 0x7f

; distance of 0.001
CONTROL 1 REGISTERED_PARAMETER_MSB 0x3d
CONTROL 1 REGISTERED_PARAMETER_LSB DISTANCE
CONTROL 1 DATA_ENTRY_MSB 0x00
CONTROL 1 LSB_06 0x10

; maximum distance of 1000 units
CONTROL 1 REGISTERED_PARAMETER_MSB 0x3d
CONTROL 1 REGISTERED_PARAMETER_LSB MAXIMUM_DISTANCE
CONTROL 1 DATA_ENTRY_MSB 0x7f
CONTROL 1 LSB_06 0x7f

; gain at maximum distance of 1000 units -60dB
CONTROL 1 REGISTERED_PARAMETER_MSB 0x3d
CONTROL 1 REGISTERED_PARAMETER_LSB GAIN_AT_MAX_DISTANCE
CONTROL 1 DATA_ENTRY_MSB 0x51
CONTROL 1 LSB_06 0x0f

; reference distance ratio of .001
CONTROL 1 REGISTERED_PARAMETER_MSB 0x3d
CONTROL 1 REGISTERED_PARAMETER_LSB REFERENCE_DISTANCE_RATIO
CONTROL 1 DATA_ENTRY_MSB 0x00
CONTROL 1 LSB_06 0x10

; pan spread angle of 30 deg.
CONTROL 1 REGISTERED_PARAMETER_MSB 0x3d
CONTROL 1 REGISTERED_PARAMETER_LSB PAN_SPREAD_ANGLE
CONTROL 1 DATA_ENTRY_MSB 0x4a
CONTROL 1 LSB_06 0x55

; roll angle of 0.0 deg
CONTROL 1 REGISTERED_PARAMETER_MSB 0x3d
CONTROL 1 REGISTERED_PARAMETER_LSB ROLL_ANGLE
CONTROL 1 DATA_ENTRY_MSB 0x40
CONTROL 1 LSB_06 0x00

END_OF_TRACK
```

`PROGRAM channel_num program_num`

PROGRAM selects a General MIDI intrument. The program is 1-based.

```
PROGRAM 14 47
```

`CHANNEL_PRESSURE channel_num pressure_num`

A per-channel pressure. Pressure is on the velocity scale from 0 to 127.

```
CHANNEL_PRESSURE 15 120
```

`PITCH_WHEEL channel_num wheel_num`

```
PITCH_WHEEL 16 16000
```

Bend values are in 14 bits, 0 to 16383.

`MIDI_PORT num`

3.2.1.7 SEQUENCER_SPECIFIC

SEQUENCER_SPECIFIC is a way of inserting proprietary synthesizer commands into a standard MIDI file. It is the command SEQUENCER_SPECIFIC followed by 1-byte values. Do not include the length of the data; `textmidi` will compute the length and insert it before the data bytes. The values may be either 2-digit hexadecimal byte values prefaced with "0x", or decimal numbers from 0 to 255.

```
SEQUENCER_SPECIFIC 0x43 0x73 0x7f 0x32 0x11 0x00 0x1B 0x03
```

3.2.1.8 SYSEX

SYSEX, or System Exclusive, is a way of inserting proprietary synthesizer commands into a standard MIDI file. There are two types of SYSEX commands:

SYSEX byte byte byte...

Note that the bytes can in decimal or hexadecimal. Hexadecimal bytes must start with "0x". Do not include the SYSEX command, F0, the length, or the final F7. The `textmidi` program will add those. Note that the values of the bytes should fit in a byte, and have values from 0 to 255 decimal, or 0x00 to 0xFF hexadecimal. One particular synthesizer permits setting the metronome using a SYSEX command:

```
SYSEX 0x43 0x73 0x7f 0x32 0x11 0x00 0x1B 0x03
```

The `textmidi` program will add F0 and a length of 9 to the front of the message, and an F7 to the end. (The length includes only the functional data and the terminating F7). There is some symbolic support for SYSEX standard messages.

```
SYSEX_SUBID = NON_COMMERCIAL|NON_REALTIME|REAL_TIME
SYSEX_NONRT_SUBID1 = NONRT_SAMPLE_DUMP_HEADER|NONRT_SAMPLE_DATA_PACKET
  |NONRT_SAMPLE_DUMP_REQUEST|NONRT_TIMECODE|NONRT_SAMPLE_DUMP_EXTENSIONS
  |NONRT_GENERAL_INFO|NONRT_FILE_DUMP|NONRT_TUNING_STD|NONRT_GM|NONRT_END_OF_FILE
  |NONRT_WAIT|NONRT_CANCEL|NONRT_NAK|NONRT_ACK
SYSEX_RT_SUBID1 = RT_TIMECODE|RT_SHOW_CONTROL|RT_NOTATION_INFORMATION
  |RT_DEVICE_CONTROL|RT_MTC_CUEING|RT_MACHINE_CONTROL_COMMANDS
  |RT_MACHINE_CONTROL_RESPONSES|RT_TUNING_STD
```

The commands in a textmidi file may be:

```
SYSEX {SYSEX_SUBID} {Device ID} {SYSEX_NONRT_SUBID1} 0xnn 0xnn...
SYSEX {SYSEX_SUBID} {Device ID} {SYSEX_RT_SUBID1} 0xnn 0xnn...
```

The device ID may be a hexadecimal or decimal positive byte value, "ALL_CALL" or a MIDI channel. See "MIDI 1.0 Detailed Specification": M1_v4-2-1_MIDI_1-0_Detailed_Specification_96-1-4.pdf, page 35, "Device ID" 0x7f is "All Call" or, on page 57, "Broadcast".

For example:

```
FILEHEADER 1 384 MONOTRACK
STARTTRACK ; bytes in track: 74
TEMPO 60
```

```
TIME_SIGNATURE 4 4 24
SYSEX NON_REALTIME 0x7f NONRT_GM 0x01
SYSEX NON_REALTIME ALL_CALL NONRT_GM 0x1
SYSEX NON_REALTIME ALL_CALL NONRT_GM 2
DELAY 768
END_OF_TRACK
```

SYSEXRAW byte byte byte...

SYSEXRAW also takes either decimal or hexadecimal byte values. It permits sending a more freely-formatted block of data, and is fully specified by the synthesizer or effects box vendor. Do not include the F7 at the start, or a length unless the synthesizer manufacturer specifies it, or an F7 at the end unless the synthesizer manufacturer requires it. Some manufacturers use SYSEXRAW to continue long messages that start with a SYSEX block.

3.2.2 LAZY track mode

At any time in a track, during DETAIL mode, a LAZY (or BRIEF) command can be inserted in order to enter LAZY mode. You can leave LAZY mode and return to DETAIL mode at any time. There may be as many LAZY or DETAIL mode sections as needed. For example, in some music, it is necessary to reset the time signature in mid-track, especially the rhythm track (often the first track in a multitrack file). Since the TIME_SIGNATURE command is only available in DETAIL MODE, then if the track is in LAZY mode, a short section of DETAIL mode can make it possible to set the time signature and return to lazy mode:

```
LAZY
C4 E4 G4 4
END_LAZY
TIME_SIGNATURE 3 4 24
LAZY
D4 F4 A4 4
...
```

There are some directives available in `textmidi` DETAIL mode.

`ticks` When this directive is encountered, print the accumulated MIDI tick value to the screen. This is a `textmidi` file debugging feature. If the tracks get misaligned by a small number of ticks, then the ticks directive can help find where they go out of sync.

`Symbolic dynamic`
Set the dynamic with symbols {pppp|ppp|pp|p|mp|mf|forte|ff|fff|ffff}. The dynamic must appear between events and delays.

`vel num` Set the velocity (dynamic) for following note events. Num is in (0..127). Relative dynamics permit changing the dynamic without referring to the current value. This is helpful for accents.

```
ff C4 4 vel -10 D4 4 vel +10 E 4
```

`chan channel_num`
Set the MIDI channel.

`END_LAZY, END_BRIEF, DETAIL`

3.2.2.1 Notes

LAZY mode note events. In LAZY mode you simply type in the notes followed by musical durations. To march a C-major scale in quarter notes you would simply write

```
C4 4 D4 4 E4 4 F4 4 G4 4 A4 4 B4 4 C5 4
```

Lower case notes are allowed:

```
c4 4. d4 8 e4 4. f4 8 g4 4. a4 8 b4 4. c5 8
```

To use accidentals, add a lower-case b for a flat, or a # for a sharp.

```
c#4 e4 4. d4 f4 8 e4 g4 4. f4 ab4 8 g4 b4 4. a4 c5 8 b4 d5 4. c5 eb5 8
```

3.2.2.2 Chords

To make chords, merely add the chord notes before specifying the duration:

```
c4 e4 4. d4 f4 8 e4 g4 4. f4 a4 8 g4 b4 4. a4 c5 8 b4 d5 4. c5 e5 8
```

3.2.2.3 Rhythm

Rhythm in LAZY mode is given in duration ratios, that is, fractions of whole notes, just as in traditional music notation. In addition, if the numerator is 1, then the denominator alone may be given instead.

- 1/4 − quarter note
- 4 − quarter note
- 1/4. − dotted quarter note
- 4. − dotted quarter note
- 3 − a third note (i.e., a triplet half note, three to a whole note)
- 5/16 − a note five sixteenths long
- 1 − a whole note
- 4/1 − 4 whole notes.

Note that to get 4 whole notes you must write 4/1 (or 8/2), but not a 4 by itself.

To use dotted quarters, add a period to the duration (double dots are also supported):

```
C4 4. D4 8 E4 4. F4 8 G4 4. A4 8 B4 4. C5 8
C4 4.. D4 16 E4 4.. F4 16 G4 4.. A4 16 B4 4.. C5 16
```

Durations are fractions of a whole notes, but if the numerator is 1, as for 1/4 (a quarter note) then just write the denominator (4). Any positive integers are allowed. Using unusual values, for example for trills, might cause the accumulated MIDI tick value to not line-up with what you consider to be the measure bar. That is why the tick directive was added to aid in tick value debugging.

```
C4 111/445 D4 1/4 E4 1/4 F4 1/4 R 4 A4 3/4 B4 2/3 C5 23/17
```

The `textmidi` utility, in LAZY mode, now gratuitously accepts rhythmic durations expressed as simple continued fractions. Information on the mathematical construct "continued fractions" is available in many places on the world wide web. Note that the simple continued fractions available in `textmidi`

- must be positive;
- overflow is not protected, so an overly-long fraction may crash `textmidi`;
- There must be no spaces anywhere in the simple continued fraction from opening bracket to closing bracket;

- simple continued fractions may NOT be dotted (as in dotted rhythms);
- must not have zero denominators (each integer after the semicolon is a denominator).

```
C4 4
C4 1/4
```

becomes

```
C4 [0;4]
C4 [0;4]
```

The conversion of simple, proper (less-than-1) fractions with a "1" in the numerator is always similar; just put the integer part before the semicolon and the denominator after. However even a simple dotted rhythm requires following an algorithm for conversion.

```
C4 3/4
C4 2.
C4 1/2.
```

The 3/4 and dotted half become

```
3/4 = 1/(4/3) = 1/(1 + 1/3)
```

The integer is 0 as 3/4 is less than 1. Picking off the denominators in the final version, we get 1 and 3. Taking the denominators 1 and 3, the line in a `textmidi` file becomes

```
C4 [0;1,3]
C4 [0;1,3]
C4 [0;1,3]
```

Rhythms greater than one, such as a multi-bar rest, will have a finite integer part:

```
R 5/4
```

The 5/4 becomes

```
5/4 = 1 + 1/4
```

which becomes

```
R [1;4]
```

Also note that simple continued fractions can be written in two ways. If the last denominator is greater than one, then you may subtract 1 from it, then add a 1 as the last denominator. Rational and simple-continued-fraction expressions of rhythm may be mixed in one file or track.

```
R [1;4]
```

becomes

```
R [1;3,1]
```

The other utilities, such as `miditext`, do not yet support simple continued fractions. However, to check your work, you can re-convert the MIDI file produced by `textmidi` into a lazy-mode text file using `miditext` using the −−lazy option; this will then produce conventional musical ratio durations in the textmidi language output that can be compared to your musical score.

3.2.2.4 Ties

To tie a note, add dashes. A dash to the right of the note name means it ties out. A dash on the left means the note is tied in. If there is no tie on the right of a note, the note ends following the following duration. If you forget the tied-in note, the note will be stuck when you play the MIDI file.

```
c#4 e4- 4. d4 f4 8 e4 g4 4. f4 ab4 8 g4 b4 4. a4 c5 8 -e4 b4 d5 4. c5 eb5 8
```

3.2.2.5 Rests

An R inserts a rest.

```
C4 4 R 4 E4 4
```

Any LAZY mode directives must be after a duration and before a notename or rest. The chan directive and the vel directive (and other dynamics) apply to all following notes until another directive changes them.

```
c#4 e4- 4. chan 3 d4 f4 8 e4 g4 4. ff f4 ab4 8 g4 b4 4.
vel -5 a4 c5 8 -e4 b4 d5 4. c5 eb5 8
```

4 Using m4 with `textmidi`

It can be convenient to use the m4 macro processor. A trill that is defined as an m4 macro need not be painstakingly written multiple times by hand. Note that as the `textmidi` comment character is a semicolon ";", you should change the m4 comment character to semicolon using the m4 directive changecom. A trill in m4 could be defined:

```
define(‘trill_68_mid’,‘$1 1/16 $2 1/16 $1 1/16 $2 1/16 $1 1/16 $2 1/16 ’)
```

Then to use this trill in a file called prelude.m4 you type

```
trill_68_mid(C4,D4)
```

Then prelude.m4 is processed by m4 into a textmidi file, which can be converted into a MIDI file:

```
m4 prelude.m4 > prelude.txt
textmidi -midi prelude.mid prelude.txt
```

Another example of using m4 is to define in an m4 file all of the General MIDI instruments to the numbers they are assigned, including that into a textmidi/m4 file, and then running that through m4 to create the textmidi file with the instruments replaced by program numbers.

5 File Formats

The input text file for `textmidi` is a free-form text file, with exceptions. The `textmidi` directives for text to be inserted into the MIDI file must either run to the end of the line or have data strings that are double-quoted.

6 gvim highlighting for textmidi language

A vim highlighting file is provided for the textmidi language. The file is called textmidi.vim. To install it, copy it to ~/.vim/syntax/textmidi.vim. Edit the file ~/.vim/syntax/fileytpe.vim to add recognition of FILEHEADER:

```
if did_filetype()
  finish
endif
if getline(1) =~ 'FILEHEADER [[:digit:]]+ [[:digit:]]+$'
  setf textmidi
endif
```

In ~/.vim/scripts.vim add support for textmidi:

```
if did_filetype()
  finish
endif
if getline(1) =~ '^FILEHEADER.*'
  setfiletype textmidi
endif
```

7 Installation

This program was prepared for builds using GNU autoconf tools. Unpack the archive. Move to the directory created for the program. Run the configure script and run make.

```
./configure
make
```

Make yourself superuser (root), or use sudo to run install targets:

```
make install
make install-info
```

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