U6 Music Technology > MIDI

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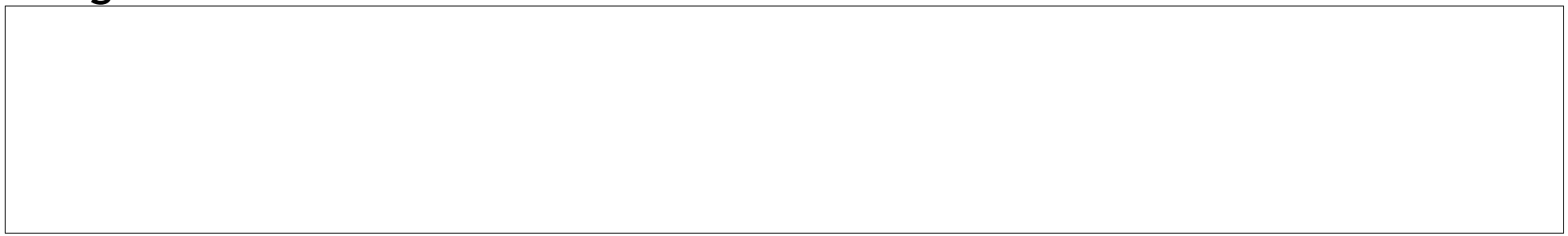
Musical **I**nstrument **D**igital **I**nterface (1982)

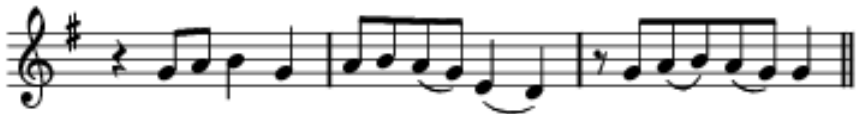
- industry-standard protocol that enables electronic musical instruments, computers and other electronic equipment to **communicate and synchronize** with each other
- MIDI does not transmit an audio signal - it sends event messages about things such as:



What's in a MIDI file?

See http://www.sonicspot.com/guide/midifiles.html

A Practical Example



```
mthd
version 1
unit 384
end mthd

mtrk
trackname "control track"
tact 4 / 4 18 8
beats 60.00000
end mtrk

mtrk(2)
trackname ""
key "1# maj"
1/4; +g5
1/8; -g5; +a5
1/8; -a5; +b5;
1/4; -b5; +g5;
1/4; -g5; +a5;
1/8; -a5; +b5;
1/8; -b5; +a5;
1/8; -a5; +g5;
1/8; -g5; +e5;
1/4; -e5; +d5;
1/4; -d5;
1/8; +g5;
1/8; -g5; +a5;
1/8; -a5; +b5;
1/8; -b5; +a5;
1/8; -a5; +g5;
1/8; -g5; +g5;
1/4; -g5;
end mtrk
```

Note...

alleluia.mid 376 bytes alleluia.mp3 207872 bytes

Why such a big difference?

Your turn...

- Choose a short tune you know well, and translate it into MIDI, as in the example above, using Windows Notpad. Save it with a .mid suffix.
- Open GNMIDI (O:/Acad Depts/Music/PAS/U6 Tech/GNMIDI)
- File > Open > [Choose your .mid file]
- Convert > ASCII text file back to MIDI
- Player > Play
- Did it come out as expected?!

Impact of MIDI

- End of the “wall of synthesizers” phenomenon in prog rock bands – now a whole rack of synthesizers could be operated from a single controller (usually keyboard).
- Facilitated the development of hardware and computer-based sequencers.
- MIDI was quickly added to a number of mainstream computer platforms:
- The standard Atari ST came equipped with MIDI ports and was commonly used in recording studios for this reason.

Timbre

MIDI initially made no provision for specifying timbre, so a MIDI file played on one platform might sound entirely different to that played on a different one.

General MIDI (1991) created a standard set of 128 familiar sound types, but the quality of sound still entirely dependent on the quality of the hardware used.

The 'midi sound' got a bad reputation, but it wasn't MIDI itself at fault!

MIDI messages

See midifiles.html

All MIDI controllers, instruments, software, etc. follow the same MIDI specification, and thus interpret any given MIDI message the same way, and so can communicate with and understand each other.

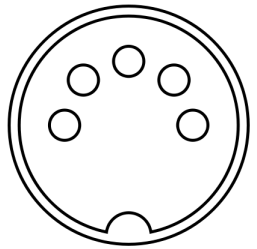
An example sequence:

1.The user presses the middle C key with a specific velocity (which is usually translated into the volume of the note but can also be used by the synthesizer to set characteristics of the timbre as well). The instrument sends one Note-On message.
2.The user changes the pressure applied on the key while holding it down - a technique called Aftertouch (can be repeated, optional). The instrument sends one or more Aftertouch messages.
3.The user releases the middle C key, again with the possibility of velocity of release controlling some parameters. The instrument sends one Note-Off message.

Note-On, Aftertouch, and Note-Off are all channel messages. For the Note-On and Note-Off messages, the MIDI specification defines a number (from 0–127) for every possible note pitch (C, C♯, D etc.), and this number is included in the message.

MIDI Interfaces

MIDI controllers will always have a MIDI-OUT port.
MIDI instruments, modules, etc., will always have a MIDI-IN port.
Some devices may also have a MIDI-THRU port (see below).



The traditional MIDI connection uses a DIN 5/180° connector.

About MIDI-THRU

MIDI devices separate the input and output lines, so if a MIDI message is received by a device in a MIDI network that is not intended for that device, the message must be re-transmitted on the output line. This can introduce a delay, one that is long enough to become musically significant on larger MIDI chains.

The MIDI-THRU port is linked directly to the MIDI-IN socket. Data coming from the MIDI-OUT port has been generated on the device containing that port. Data that comes out of a device's MIDI-THRU port is just a duplicate of the data received at the MIDI-IN port.

In the 2000s, as computer equipment increasingly used USB connectors, companies began making USB-to-MIDI audio interfaces and some MIDI keyboard controllers were equipped with USB jacks.

MIDI Controllers

The most common MIDI controller is the piano-style keyboard.
- number of keys
- key weight
- http://www.youtube.com/watch?v=rTEq2uSEbyY

Pad controllers
- assignable pads, faders and knobs
- some velocity-sensitive
- some performers use more specialized MIDI controllers, such as triggers that are affixed to their clothing or stage items

Pedal keyboards
- http://www.youtube.com/watch?v=neA5RaSj_mY

EWI wind controllers
- air-pressure level sensor
- bite sensor
- 13 touch sensors arrayed along the side of the controller
- touch sensors for octaves and bends
- http://www.youtube.com/watch?v=eXXVWQMgxQ4

MIDI guitar synthesizer controllers
- http://www.youtube.com/watch?v=5dxNosT7eME

Prep Question

How would your life as music technology students be different without MIDI? What impact did the invention of MIDI have on the music industry?

[16]

How would your life as music technology students be different without MIDI? What impact did the invention of MIDI have on the music industry?

Listen also to http://www.bbc.co.uk/programmes/b00xhftd#p00dct9c
(BBC Radio 4, Thursday 20th January 2011: 15.49-20.52, 25.00-27.20)

Sequencing

MIDI not only made it possible for different instruments/controllers/modules to communicate, but also for these devices to communicate with a computer.

A sequencer is a device that enables the
- input
- editing
- storing
- playback

of a musical performance.

Sequencers can be
- built into a keyboard (e.g. Korg M1: 8-track sequencer)
- computer software (e.g. Logic, Cubase: also include sound recording, samples and effects)
- stand-alone units (e.g., Roland MC-500: 4-track – see http://durftal.com/music/edmx/dmxstudio/mc500.htm)

Computers & Music

1985 Atari ST
- Midi sockets as standard
- Software sequencers soon followed
  each track viewable on screen together
  'piano roll' style grid notation – now standard
  http://www.youtube.com/watch?v=rPXAVGizQSY

Mid-90s PCs and Macs become prevalent
- Processors getting faster
- Memory getting cheaper
- Effects become possible
- Greater number of tracks
  = An affordable DAW (digital audio workstation) for the home market)

Late 90s CDRs introduced, mp3
- Now possible to write, sequence, record, mix, master all on one machine

The impact of the Internet on the music industry

✓ ✘

http://www.youtube.com/watch?v=_I82rdaaiUE&feature=related

U6 Music Technology

"The 16-mark Essay Question"
(aka Monday 1 with PAS!)

Covered so far...

Physics of Sound
History of Sound Recording (including Magnetic Tape)
Digital recording (including A/D converters)
Synthesizers
Drum Machines
MIDI

Still to come...

Sampling
Effects, Processing, etc.
Development of electric guitars and amplification