A Brief Introduction to MIDI

The MIDI (Musical Instrument Digital Interface) standard defines a communications protocol between electronic musical devices. Any equipment conforming to the MIDI standard can be operated with any other MIDI device regardless of their manufacturer and type.

There are many aspects to MIDI, but essentially it is concerned with transferring information about which notes are being played from a control device (such as a keyboard, sequencer or computer) to a sound generator (such as a synthesiser, organ, piano or any other musical instrument capable of being operated by electrical signals).

The hardware part of the MIDI standard says that the communications will be in serial format with 1 start bit, 8 data bits, no parity and one stop bit at a rate of 31,250 bits per second. Serial format means that the message is transmitted one bit at a time, which is why the MIDI connector only has a small number of pins. In fact, just 2 pins of the standard 5-pin DIN connector carry the whole MIDI signal.

Using this hardware definition, groups of 8 data bits (bytes) can be sent from one MIDI device to another. A further part of the MIDI standard defines how these bytes relate to what notes are being played.

In a practical system, it's quite likely that you might have several different sound generators, perhaps one for a melody line, one for the accompaniment and one for the bass, all being driven by one controller. In such a setup there would have to be some way for the controller to send the right musical part to the right sound generator without all the signals getting mixed up. MIDI achieves this by allowing up to 16 different channels to be allocated. Each sound generator would be set to a different channel, so the controller can address each one by its channel number.

To turn a note on, the control device sends a group of bytes in turn which, between them, say that a note is to be turned on, which MIDI channel is being addressed, which note is to be played and what the velocity is (how hard the key on the control keyboard was hit).

To turn a note off again, when the controller key is released, another message is sent, similar to the one that turned the note on, but this time saying that the note is to be turned off. As before, the message has to say what the note is and on which channel it is. The note off message also includes a velocity value, but this is usually ignored since the speed of key release doesn't affect the sound of most instruments like pianos and organs.

The definition of which note is being turned on or off is done by a single number within the MIDI message, which can have any value in the range 0 to 127 inclusive. Each number represents one note in a chromatic musical scale, spanning a range of over 10 octaves, which is enough for most purposes. Higher MIDI note numbers represent higher pitched notes and vice versa, the difference in pitch between two adjacent note numbers being a semitone. Middle C corresponds to MIDI note number 60, the C# above this has note number 61, the B below this is number 59 etc. Concert pitch A (440 Hertz) has note number 69.

In addition to note on and off messages, MIDI can also carry several other messages that could affect the sound, such as controller levels (volume, stereo pan, pitch bend, etc) and sound patch selection (organ, piano, violin, etc). Mechanical organs and pianos don't normally need to do anything with this information, but the controller messages are useful in music-linked animation applications as they can be used to set variable quantities such as the positions of servo motors, intensities of light levels, etc.

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