Using MIDI in Music Instruction

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ABSTRACT
The contribution deals with practical use of musical format MIDI in singing lessons and in improving the technique of playing musical instruments. Even the practice of one's part in harmonizing with other musical instruments or the orchestra accompaniment is another use of this format.

KEY WORDS
MIDI, singing instruction, personal computer, General MIDI, sequencer, notator

Computer technology in the form of PCs gave teachers a very powerful tool for music lessons. Teachers, however, have a rather conservative attitude to computers, which hinders in introducing them. Most music teachers' knowledge of MIDI is very limited, sometimes none at all, and as a matter of fact, the use of MIDI – as far as work with children is concerned – is hardly known. Let me inform you in this article not only about basic data of MIDI and programme equipment for processing MIDI, but also about my experience with using MIDI while working with children and young people.

First of all, a few basic pieces of information concerning MIDI:
History of MIDI Format – MIDI Format is the worldwide standard of transferring and storing music information, independent of devices. Its beginnings date back to 1981 music fair in Anheim, where Rolland Company and further big music firms came up with a suggestion to create the music standard for transferring music information. A year later, the founders were joined by some other companies of music industry and in 1983 Rolland Company called the standard MIDI.

Music information comprised in the norm of MIDI is very simple, but still, it contains the complete code, which the MIDI sequencer[1] can play back.

In MIDI protocol there is information about the pitch, length and course of a tone, dynamics of touch, musical instrument, accidentals and clefs. A text can be inserted as well. The information can be stored in files mostly ending with MID. Each music programme, however, uses its own format for storing MIDI. MID-ended files are mainly used because of the size of data (the smallest one) and represent standards for transmitting music on the Internet.

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[1] The device which based on the protocol of MIDI can control various MIDI devices. The role of sequencer is replaced on the computer by software along with sound card.

The expansion of the music protocol was helped by implementing MIDI processor (MPU 401) into the sound cards of PCs and the following software support.

Hardware interface MIDI – In fact, it is in-series non-synchronic interface. Unlike the standard series interface on the computer (COM1, COM2…) the transmission speed is different (31,25kBd) and in addition, the link must be optically divided. The link between external MIDI devices and the sound card is established by means of a special MIDI cable -– so called game-port. It is a two-way link. Therefore it is possible to insert notes from an external keyboard and – vice versa – the keyboard can be controlled from the computer.

Current sound cards can be divided into two categories from the standpoint of MIDI:

➢ **FM synthesis** (frequency-modulated synthesis) – MIDI outputs are not of high quality because they are made via synthesis from a few oscillators. The output can be improved by software synthesis, which has some unpleasant characteristics, though.

➢ **WAVE Table synthesis** (sound is generated on the basis of samples from real musical instruments) – the output quality of MIDI is close to that of real musical instruments. But it is necessary to realize that each producer has their own table of samples and so each sound card presents the same instruments in a different way. Some cards make it possible to record their own samples.

Standard "*sound package*" comprised in the sound card and supported by the operating system WINDOWS is called **General MIDI** (*GM*). Producers are trying to keep compatibility between individual cards. Generally speaking, a composition written and played back by means of **GM** will sound the same on all computers – with slight differences in quality – (there will be no switch from one instrument to another). Unless the norm of **GM** is used, or if somebody's own samples are used, there might be a problem with transferring to other computers (i.e. a change in instruments can change the composition completely).

There are 16 MIDI channels at disposal on sound cards. Each of them can be assigned to a particular musical instrument, but Channel 10 is always assigned to percussion instruments. **GM** norm gives 128 melody musical instruments and 64 percussion ones. Samples of the instrument layout are in tables 1 and 2. But the number of played-back tracks is much higher, which depends on the possibility of polyphony of the sound card.

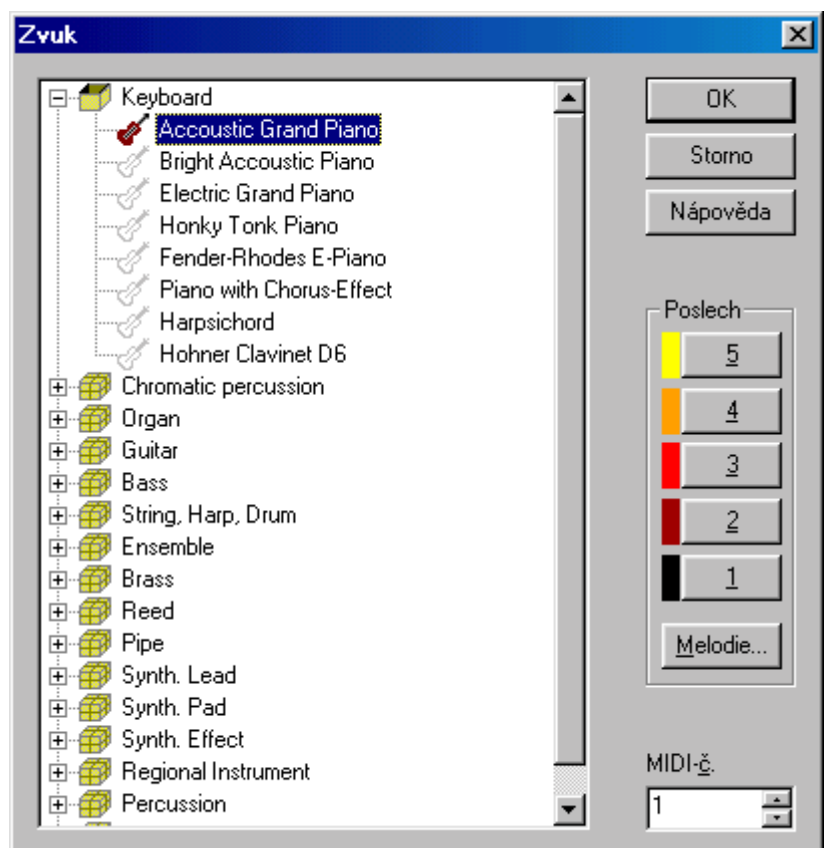| Number of instrument	Instrument
0 – 5	Pianos
16 – 19	Organs
24 – 31	Guitars
32 - 39	Basses
40 – 45	Strings
56 - 79	Brass

Table 1.

Table 2.

While choosing a programme, it is necessary to realise what the most common output will be like. In the case of MIDI File, we will need a programme showing qualities of a sequencer. However, in the case of print outputs, the so called notator must be selected. Most of the programmes have built-in both of the functions with a variety of ratio.

If you are thinking of a purchase of programme, here are a few minireviews on the most widely spread ones.

Sequences

Cakewalk Pro Audio 9 – is a professional 256 track MIDI/audio sequencer. It also makes work with video recordings   in the format AVI, MPG, MOW possible. Export of audio into MP3, G2 and WMA is a certain matter. There is a support for DirectX effects and cooperation with external audio editors such as CoolEdit Pro, SoundForge and WaveLab without having to leave Cakewalk. It is also possible to have notations + guitar tabulators together with a prompt for guitar synthesisers. It has its own macro language, MIDI FX effects, Audio/MIDI mixer and many other possibilities. What is more, it fully covers the needs of a recording studio. Its advantages are clearness and easy operation, which assigns it to the best Audio/MIDI sequencers. The drawback, on the other hand, is notation, which cannot be used for printing at all (however, it is suitable for editing) because it is able to display 32 notes at the most. Buts the disadvantage is equalised with Cakewalk Overture, which is one of the world's best notators.

Cubase VST 24v3.7 – is a professional MIDI/audio sequencer with 96audio tracks and a limitless number of virtual MIDI tracks at disposal as well as an excellent graphic layout of effects. It supports DirectX effects and synchronisation with video. This version, on the other hand, has a slow operation and entirely chaotic arrangement along with unpredictable behaviour. But it is also the question of habit. It is the only sequencer, though, that enables more people to work on one project.

Logic Audio Platinium 4.1.1. – a professional MIDI/audio sequencer with 128 audio tracks. It has unlimited virtual MIDI tracks at disposal. It is similar to *Cubase* as to design and operation, but unlike this, it is logically and clearly treated. It is able to display even the hundred and twenty-eighth notes, synchronising with video, and in addition, there are a lot of MIDI functions and prompts for DirectX effects. Its notation, which is very good, could replace individual notators to some extent. There are a couple of shortcomings, which are difficult to cope with in the very beginning. It is due to the fact that its help system is very brief, which means that there are not more than two or three words concerning the topic.

MIDI Studio 4.0 – a professional MIDI/audio sequencer. Limitless MIDI virtual tracks, very simple programme operation as well as very low register charge make it a very interesting product.

Notators

Cakewalk Overture 2.11 – an excellent programme for note setting by means of which you can create any note entry of professional quality in no time. You can write scores, individual voices, percussion lines, tabulators, jazz expressions, chords, texts etc. It is possible to import MIDI files and insert notes via MIDI device. This editor is ideal for those who need to create a note entry in the professional quality for personal use simply and fast.

Encore 4.0 – another widely spread editor which, however, does not have so many functions as Overture, and what is more, it works a bit more slowly.

Finale 98 – a setting note editor with plenty of special functions used in professional DTP studios and commercial printing works. The programme uses postscript language for export and file print. Its drawback is rather complicated and slow operation which – in comparison with Overture – has hardly any intelligence. Fortunately, it has a very good documentation and help system.

Capella 2000 – a high quality product at a relatively low price. Notes can be inserted by means of keyboard, mouse or MIDI device. It makes MIDI data export and import possible as well as everything that a professional notator should master.

How to use it at work with children

While working with children I have tried MIDI a few times. The first successful attempt was about 4years ago. A professional singer and I founded a mixed choir (most of its members were pupils of elementary or secondary schools), which was established temporarily only because of rehearsing and performing ***Christmas Mass by Jakub Jan Ryba called "Hej mistře".*** The singing capacity was satisfying, but we missed the instrumental background according to our requirements. The only solution was to replace living musicians by a computer. I converted the mass into MIDI files. Apart from instrumental parts, I also recorded all vocal parts.

While rehearsing, each member of the choir was given a floppy disc with MIDI files, or an audiocassette. There were two types of recording on the cassette – either only with accompaniment or amplified voice. Using MIDI made it much simpler. While practising, everybody could mix voices themselves according to their needs.

In spite of big problems with time, there were only 5 rehearsals of the whole choir followed by the first concert, midnight mass and a few more concerts at Christmas time. Even though we were accompanied at the computer everywhere, I must admit that if there had been a chance to work with living musicians, I would have definitely chosen this option.

As another example, let me present an individual singing practice with a nine-year-old girl who was trained to participate in the competitions of songs from the theatre called "Osvobozené divadlo". The songs by no means belong to simple ones, and besides, I was too busy to devote enough time to the competition preparation. Therefore I used the personal computer owned by the family of the little singer and I gave her the necessary accompaniments in the form of MIDI files. I taught her how to switch on and operate the programme on the computer (it took only 15 minutes). She herself mastered the intonation and rhythm at the computer very quickly, so my only task was to focus on the right phrasing and expression of her performance. The way of preparation was so successful that – despite few rehearsals led by me – she managed to win the above mentioned competition not only in her category (up to 15), but she was awarded the highest overall prize as well.

Furthermore, I can see another possibility in practising compositions. A teacher is able to put their clear concepts in MIDI, as for the dynamics of the composition, its accent or change of tempo. What I really find advantageous is that while practising a composition you can change its tempo as you like, and it is also possible to play just the practised track (e.g. either left or right hand as to the piano). While practising difficult parts, there is no problem with cyclic repetition. When there is a suitable MIDI programme on, it is possible to watch notes on the screen and at the same time listen to the sound.

In addition, I can see a great possibility in training children's music ensembles, no matter what genre is in question. Even though children have already mastered their parts very well, they find it most difficult to hear the other instruments, and so the good coordination itself is usually very demanding. Owing to MIDI and the computer, everybody has an opportunity to practise at home, but on top of that, they can also rehearse together with the other instruments in a virtual way.

Use of MIDI can make a teacher's work much faster and more efficient. As far as children are concerned, thanks to computers, they like learning better, as I can judge from my experience and the results have been only positive so far.

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