Music Notation News

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Can You Read Sequencer Music?

by Mark Gaare

Many composers, especially those in the pop music world, have already abandoned the old quill and parchment for electronic sequencers which are far superior tools for transcribing music. Computers and software have advanced the state of transcription even further by adding a video monitor capable of displaying the music in a graphical form.

Software sequencers have come a long way, and in the process, the developers have created a new kind of musical notation known as the "piano roll." Just like traditional music notation, a piano roll is a graph of notes with the vertical axis representing pitch and the horizontal axis representing time.

Like HyperTalk and other high-level computer languages, the piano roll acts as a translator between computers and humans. With a little refinement, these piano rolls could become a new form of music notation.

The Time is Ripe for Change

Three recent innovations have led to a revolution in music communications: synthesizers, samplers, and sequencers. Electronic synthesizers were the first innovation to loosen the stranglehold of notation by enabling automatic transposition. Next came samplers which enabled composers to use orchestral instruments without using notation. The final blow was electronic music sequencers. A sequence is an electronic transcription of music that is completely editable.

In September of 1989, *Macworld* magazine featured an article on MIDI sequencers. The article quoted Bob Ezrin, composer and legendary producer of Pink Floyd, Yes, Lou Reed, Peter Gabriel, and many more. He said, "In the same way that the telephone revolutionized communication by making it real time, MIDI sequencers have bypassed the old Morse code of notation and rendered musical expression virtually instantaneous."

With step editing and complete control over tempo, sequencers have also enabled the creation of music without dexterity. Laurie Spiegel, inventor of the Music Mouse program, was quoted in the August 1988 issue of *Macworld* magazine: "First of all, sheer physical coordination has nothing to do with musicality. Second, the ability to deal with and manipulate symbolic notation is irrelevant to musical ability. All in all, we filter out 90% of the musicians [by those bogus criteria] and we're left with virtuosos who play piano like it's a sport—without soul."

Current Market for Sequencers

Music Trades magazine conducts a yearly census of the domestic music industry and the results are quite revealing . . .

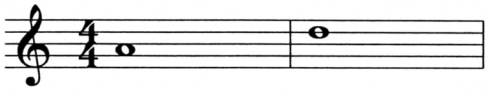
Sales of music software have stagnated, never realizing the large consumer market that was originally predicted. The market for music software remains the province of professional musicians engaged in scoring, arranging, or recording. With new products fewer and farther between, software companies have had to rely on upgrades for their revenue. Compared to new sales, upgrades generate far less revenue and profit for both the retailers and the suppliers.

Dedicated hardware sequencers have been steadily declining since 1988, with only 5,509 units being sold in 1994. However, this decline was unquestionably due to the fact that 71% of all keyboard synthesizers (over 40,000 units) sold in 1993 had on-board sequencers.

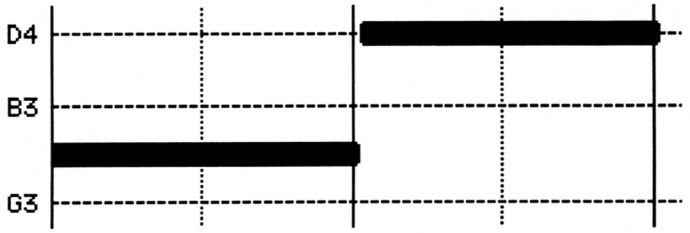
There are basically 3 types of sequencer users. The first is the professional musician mentioned above who can afford to have a dedicated computer sitting directly in front of his keyboard. These people are the primary users of software sequencers. The second type uses on-board sequencers exclusively because they don't have a computer. The third type

The Problems With Automatic Transcription
Figure 1.

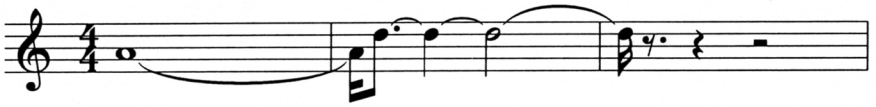
Intended:



Played:



Transcribed:



Strict adherence to the metronome is required.
A hair off the click and the notation will be incorrect, requring heavy editing.

software sequencers have the ability to produce a visual record that may well survive the electronic version. People who are seeking a visual record of their music have several options depending on the amount of time and money they wish to invest. You could transcribe the music the old fashioned way, by hand. The primary advantage being that it doesn't cost anything. Or you can use a software sequencer and spend hours massaging notation files that have been automatically transcribed from your flawless performance. Or you can hire a student music copyist for around $6.00 an hour who is interactive, intuitive, and probably even intelligent. For the casual user, the software solution is the most expensive in terms of both time and money.

The Problems of Automatic Transcription

Notation's ambiguities are its saving grace.
—Roberto Gerhard,
Spanish composer, 1896-1970

A perfect notation is not one
which documents exactly.
If it were, today's technology would finally have
provided the ideal notation—a tape recording
or film of a correct performance.

Notation is lively when it calls for a temporal result
that can only be hinted at by its spatial symbols,
requiring more than an automaton to bring it to life.
—David Behrman

When it comes to notating music, computers will never replace humans. This is because human being are not machines that can be quantized, and because music notation is purposely ambiguous. Music notation is only a guideline for performance and should not be taken literally. Contrary to what your teacher told you, there is no one right way to play a piece of music. There is no formula for determining the duration of a staccato note. No one really knows how many decibels there are in *mezzo-forte*. And how many orchestras have you seen where the tempo is controlled by a metronome and not a conductor? Musical interpretation is one of the most exciting facets of being a musician, director, or conductor. Still think a computer can write the music for you? If so, be prepared for some extensive editing as demonstrated in the following figures.

A New Piano Roll

Software developers have already begun to meld the best of both the old and new worlds. One view of Opcode's Vision and Musicshop programs replaces the up-ended keyboard with a grand staff. The staff lines that form the vertical axis of traditional notation are universally-known, easily readable, and non-instrument specific. Staves are also very compact. This makes them ideal for writing out music by hand. In fact, representing the same range of notes on a piano roll would take twice the vertical space.

Software sequencers add a horizontal bar graph of notes that is a direct representation of time, and can be made readable to both computers and humans. This melding enables us to read the music in a piano roll on-the-fly, the same way we read traditional notation.

Overcoming Traditional Problems

There are several ways to show accidentals in this new piano roll. Opcode's Vision places a note slightly above or below its normal location to indicate a sharp or flat. To do this, extra white space is required between the staff lines that span a major third, such as G to B. A better way may be to show all accidentals in their normal location, but shaded in gray. A legend at the beginning of the piece would indicate whether the accidental gray notes were sharps or flats. With this method, the notes could be larger, and the spacing of the staff lines would remain uniform.

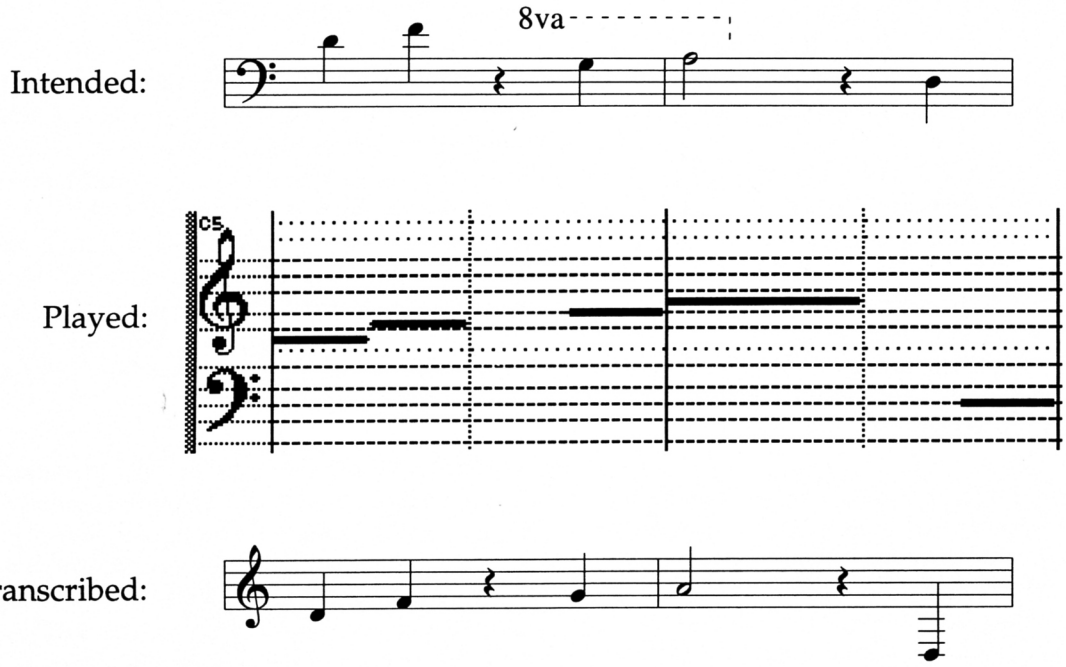
To reduce the difficulties of reading in multiple clefs, the user should be allowed complete control over the display. Treble, bass, and even C clefs could be stacked any way you'd desire. Futhermore, to switch from one clef to another wouldn't require a diatonic transposition for each and every note. Instead, the staff lines could simply be redrawn while the pitches remain in absolute positions on the vertical axis.

Finally, by adding thin vertical lines at every beat, we may just be able to read the same horizontal time axis that the computer does. Once again, the user should be allowed complete control over the spacing of the time lines. The spacing could even change from measure to measure. For whole notes, no beat lines would be necessary. But for more rhythmically complex passages, the frequency could increase to 8 lines per measure or more. Tuplet markings may still be needed if the grouping crosses over a beat line. For reading purposes, it would be desirable to replace multiple measures of rest with a numbered symbol. Similarly, long notes that are intended to be held could be replaced with a fermata symbol. For playback purposes, the computer could be taught to understand these symbols and modify the timing accordingly.

Making it Readable

Although humans and computers can distinguish between at least 127 levels of volume, it is very difficult for us to read a full-scale velocity map while simultaneously

The Problems With Automatic Transcription
Figure 2.



Octaves and clefs are not intuitive. In music notation, the actual pitch is determined by a knowledge of the individual instruments, and a combination of symbols for clefs, registers, and key signatures.

reading the notes. These velocity maps also take up a lot of room on a printed page. Therefore, a more "reader-friendly" dynamics bar could be used with only 7 levels of volume from *pp* to *fff*.

All that is missing now is one very important command: "Print." This could be very simple at first—no Postscript, just a series of bitmapped screen shots would do the trick.

Conclusion

Software sequencers that incorporate these ideas become more than just horizontal piano rolls. The cross between software sequencers and traditional music notation could be termed "Sequencer Notation."

Sequencer Notation is a very powerful language because it allows wired musicians to communicate music graphically and accurately with other musicians, even those from the unplugged classical world. That's because Sequencer Notation is intuitive. It is a direct visual representation of music; no decoding of complex symbols is required to read it. Software developers can implement Sequencer Notation in steps, the most basic of which is remapping the vertical scale to a 5-line staff. For programmers who massage MIDI syntax all day long, this should be a cakewalk. But the best part about Sequencer Notation is that it's almost here, and you already know how to use it.

FIGURES

1. The Problems of Automatic Transcription
   a. Metronome Timing
   b. Octaves & Clefs
   c. Visual Modifiers
2. Vision/Musicshop and Metro Screen Shots
3. Diagram of Sequencer Notation

Music Notation News

is the journal of the Music Notation Modernization Association (MNMA). MNMA is an international, non-profit (tax excempt in the U.S.), organization dedicated to research and education. The chief purpose of the MNMA is to find ways to improve the basic system of music notation for greater simplicity and efficiency in reading, writing, and printing music. *Music Notation News* is printed in United States of America and published quarterly.

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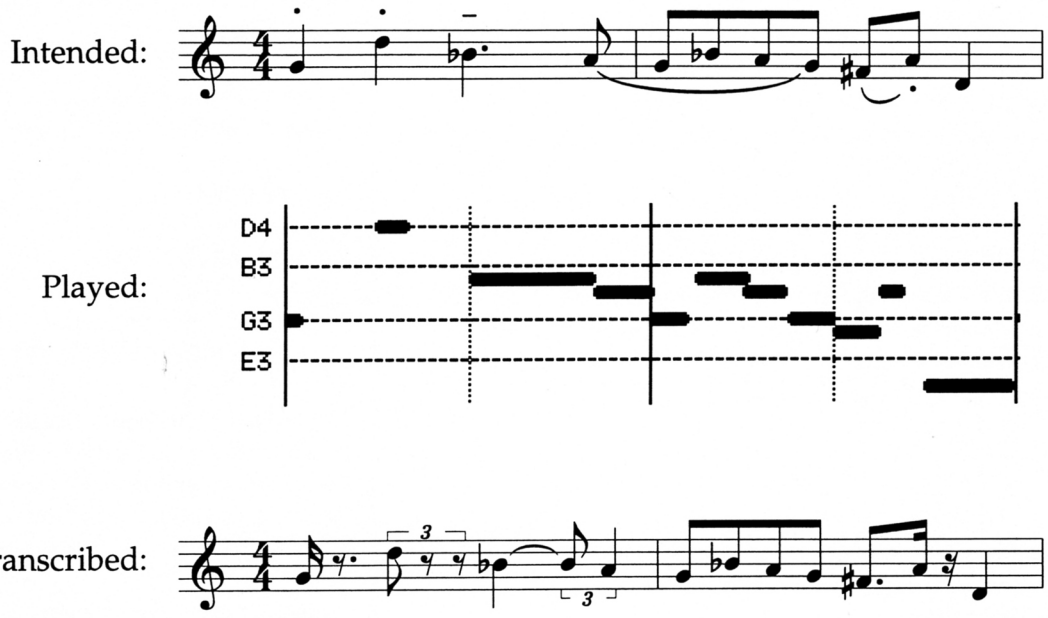
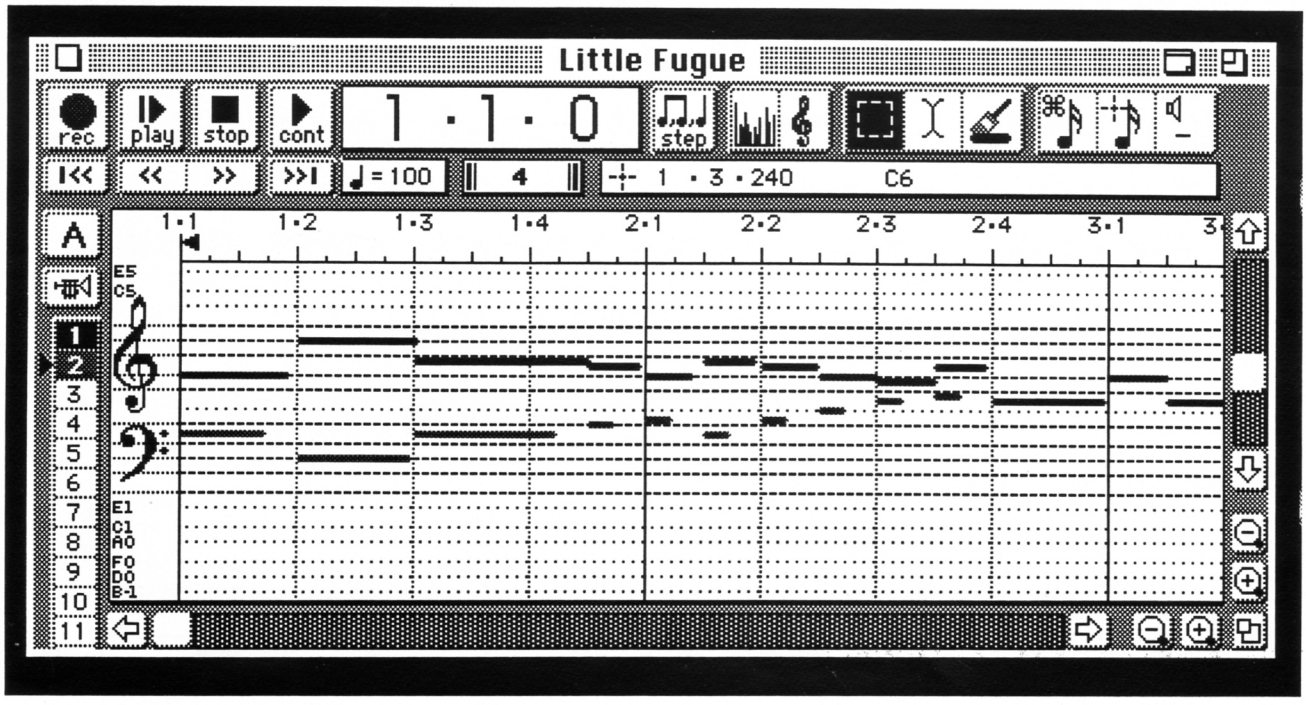
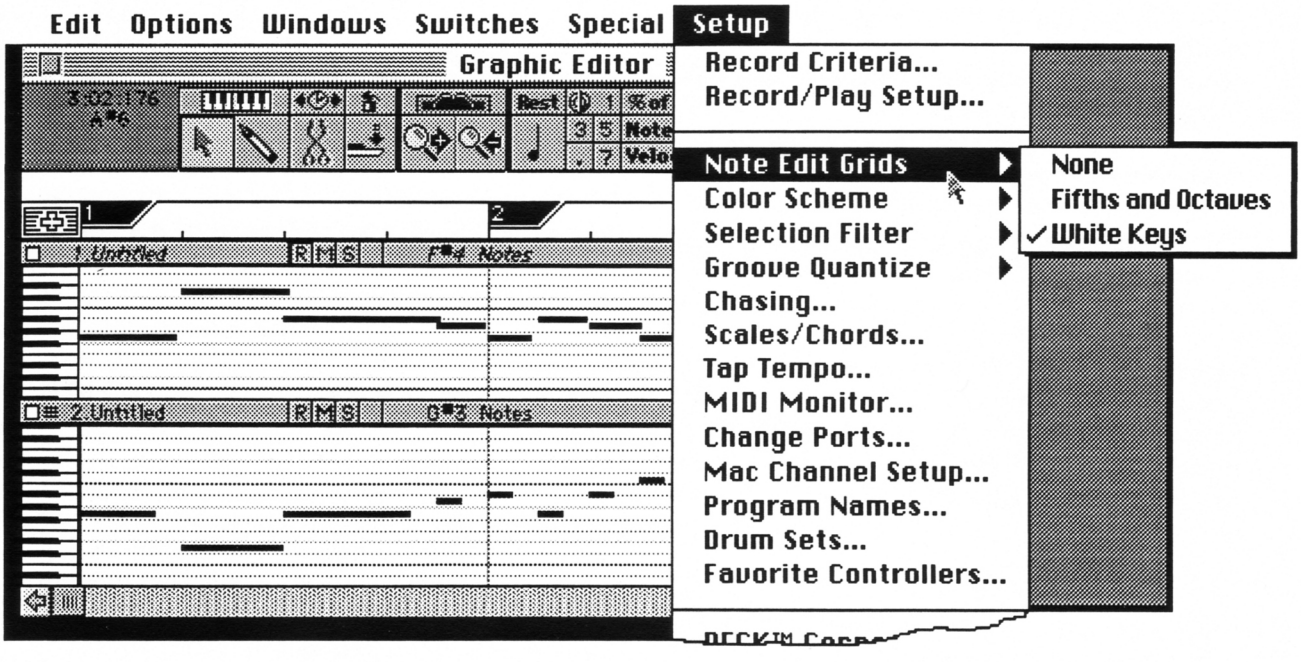
The Problems With Automatic Transcription
Figure 3.



Computers cannot interpret and correctly notate
the visual modifiers for duration, volume, and execution.



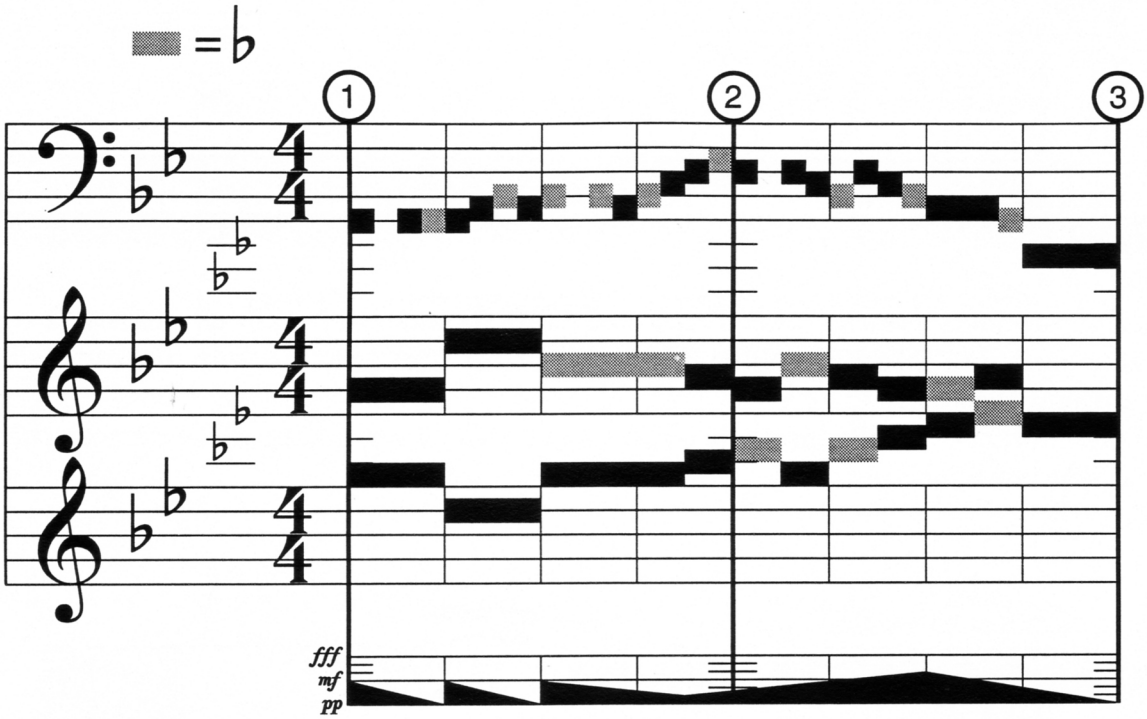
Innovative products like Opcode's Vision and Musicshop have brought us closer to a readable sequencer notation. Here, the up-ended keyboard has been replaced with a grand staff. Also noteworthy is the ability to zoom in both dimensions independently (see magnifying glasses in lower right corner). Finally, multiple tracks can be viewed simultaneously, each with their own color as selected by the user.



The Metro sequencer from OSC sports a very clean and readable display with rectangular notes, solid grid lines shaded in gray, and distinctive measure numbering. Through a pull-down menu, you can also customize the spacing of the horizontal grid lines. Individual tracks are viewed in color within their own windows.

Sequencer Notation

making the piano roll "readable"



The pitches occupy a fixed location on the vertical axis.
However, the clefs can be changed and realigned to suit the user's needs.