Electronic Percussion

The Educational Side of Electronic Drums, Part II

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Part I of "The Educational Side of Electronic Drums" focused on valuable job-related skills that can be gained by learning to work with the various components of an electronic percussion studio. Programming the drum machine, creating sounds on the electronic drums, and using computer-based sequencing software are all new skills that today's players need to learn. It is important to keep abreast of all new developments, particularly since requirements for employment as a musician continue to change.

As electronics and computers become involved in almost every aspect of our daily life, we also owe it to ourselves to learn about any new advances. The entire situation is not much different from when the vibraphone was first introduced. Some players accepted it, some did not. Those who learned how to play this "new" instrument were able to accept jobs that called for vibraphone performance. Those who didn't learn how to play the vibes didn't get called. Electronic percussion instruments are simply the newest in the percussion instrument category.

Part II of this article will deal with how electronic drums can be used to improve a player's technique and control of time, tempo, and rhythmic accuracy. One of the qualities that separates a good player from a great player is control (by control, I mean that the player does what he does because he meant to do it). Dynamics, tempo, phrasing, and a hundred other aspects of a performance are done in a certain way, not by chance, but because the player desired it. I am not going to try to tell you that, by adding electronic drums to your inventory, you are going to become the next Steve Gadd, Keiko Abe, or Cloyd Duff. While electronic drums won't solve all your playing problems (wouldn't that be nice?), they can be used to solve many common faults that arise from lack of control. Some of these problems are the control of dynamics, balance of hands, tone production, and rhythmic timing.

If you could design the "ultimate metronome," what would you desire? Would you like it to make a different sound on each division of the beat and/or measure? Perhaps give the click in less common meters than two, three, four, and six? How about a "reverse metronome" feature so that you simply tap the tempo you desire, and it tells you the speed you are going? While some of the newer models of metronomes have added some of these features, just let your ideas flow, and the drum machine will do all of this and more.

All drum machines have several different sounds built into them. The machine I am using, the E-Mu Systems *SP-12*, contains 24 different sounds that can be altered in pitch to create well over a hundred separate colors. When using the drum machine as an ultimate metronome, there is the choice of different sounds, pitches, dynamics, or any combination of these to signify the various divisions and subdivisions of the measure.

Mixed meters and odd meters are two of the biggest drawbacks of a standard metronome. If you have ever tried to use one for a passage in 7/8, then you are well aware of the "first bar is on the beat, second bar is off the beat" problems that arise. With a drum machine, you can program just about any type of measure that you might need. A measure of 17/16 is just as easy to set up as a measure in 4/4 time.

Measures that have less common subdivisions can also be programmed into the drum machine. A 4/4 bar that is phrased 3 + 3 + 2 can be easily demonstrated by using a different sound for the first beat of each division and another sound color for the weaker parts of the division. As you can see, the choices and possibilities are wide open. Most drum machines allow you to create many different patterns (in some machines, up to a hundred or more) that are then saved in the memory of the machine. When the machine's memory is full, these patterns can be saved on cassette tape or computer disk. It is a good idea to program about every type of measure that you can think of, assign these to different memory locations, and then save the entire memory onto tape or disk. Once they are off-loaded, you can put them back into the memory in a very short time. A handy reference chart could be used so that you know where certain patterns are located. For example: 4/4 as 3 + 3 + 2 is pattern 20, 4/4 as 3 + 2 + 3 is pattern 21, 4/4 as 2 + 3 + 3 is pattern 22, and so on.

Some players have trouble dealing with the musical concepts of ritardando and accelerando. Either one can be an even metrical change over a certain period, a change in tempo that is more subtle at the beginning and more apparent toward the end, or any number of different variations. You can program the *SP-12* to change tempo up to plus or minus 99 beats per minute over a time span of up to 32 beats. Longer time spans and more drastic tempo changes are possible but need to be programmed in two or more steps. Changing the tempo is a very simple matter, and allows you to hear how different types and degrees of tempo change affect the mood and style of the piece being performed. Again, the desired goal is to play what you feel is going to sound the best for the particular passage, not just change the tempo to whatever happens.

Most drum machines permit the user to combine the different patterns and save them into memory as songs. Mixed meters or combinations of different meters are then the very simple process of creating a song by "chaining" the different metric patterns together. These songs can be either programmed to repeat for a specified number of times, or play one time through and then stop. Songs can be custom-designed for a specific etude or excerpt and placed into memory along with the patterns. Song number one might be etude 21 from Cirone's *Portraits in Rhythm*, while song 46 might be the "Dance Sacrale" from the *The Rite of Spring*, and song 62 might be the glockenspiel part to Messiaen's *Exotic Birds*.

Obviously, you are not going to shell out around a thousand dollars for a sophisticated drum machine simply to use it as a very fancy

metronome. In order for the expense to be justified, there must be other uses for it as well. The most apparent one is to program not just the metronome for the particular passage or work, but to program the entire etude's rhythm as well. In addition to programming the rhythm, you can add dynamics, accents, tempo changes, pitch, different instruments, or fermatos. In essence, this will give you a metronome that will play the piece note for note with superb precision.

There are two times when this might be useful. One is to simply listen to a "perfect" performance of the passage. The other (and possibly more beneficial) is to play along with the programmed performance. This would allow you to compare (in real time), every stroke of the passage. We all know that when playing with a metronome, it is possible to make adjustments so that the beats fall with the sound of the click while the subdivisions may still wobble around a bit. With all of the strokes sounding on the "metronome," you will be able to hear any weakness in your sense of time at a much finer level.

I have had much success programming the drum machine to play a passage, then having a student play the same passage on the electronic drumset while it was turned off. This lets the student imagine that his own strokes are producing the sounds that he is hearing. While this may appear rather weird, it seems that the student is less involved with a comparison of two different sounds, and more involved with relating a body movement to the sound that that particular movement should be producing. Perhaps the student has an easier time judging the differences that occur between the stroke and the immediate sound that he has always expected. Percussionists are very used to hearing a sound just as soon as the tactile feedback of the stroke reaches the brain. Whatever the reason might be, this has proved to be an extremely valuable aid for fixing rhythmic wobbles in complex passages.

Sometimes, you may not want the total "perfect" performance. Perhaps, just the accent patterns can be programmed to help you realize that all accents in a passage could be at the same level. Or, it might be helpful to leave the accented notes out of the program and listen to the inner rhythm of the non-accented notes. You can even create your own "music minus one" studies.

Please do not get me wrong, I am not saying that the more "perfect" a performance is, the better it is. We all know that there are times when you might not want the rhythm to be perfect, when the mood and the moment demand that the tempo push or relax, and the dynamics undergo subtle changes. However, if you can control what you are doing when you want tempo and dynamics to be steady, then your alterations of these parameters will be easier and more convincing. What we are talking about is only control of what you are playing, not an unyielding, stiff, or sterile performance.

With the addition of the computer into your system, many more possibilities are created. Okay, this is where the real fun begins! Electronic instruments communicate with computers in a language called M.I.D.I. which is short for Musical Instrument Digital Interface. An explanation of how it works might be useful at this point. When electronic instruments are played, keys or pads, or almost anything for that matter, send certain information to the machine's brain, which in turn produces the desired sound. With MIDI, these same commands can be recorded on a computer disk and then played back into the electronic instrument's brain to achieve the exact same, original sound. The brain really doesn't care whether or not the command came from a drum pad, a keyboard, a computer, a toaster, or any other type of device. It simply receives the command and acts upon it. Because of this, when you record with MIDI, you are not really recording sound, but recording information. The recorded information consists of the numbers "0" and "1" (the only numbers that a computer can understand) and after the numbers are recorded, their sequence and content can be edited and altered with a great deal of accuracy. Dealing with numbers is what computers are really good at doing.

Sequencing programs are so named because they record the information that tells the instruments what to play. This sequence of information (or data) can be changed and molded in many different ways. When a computer plays back this stream of data, it is just as if the performer were doing it himself. A sequencing program is to music what a word processor is to text.

The device that connects the instruments to the computer is a MIDI interface. One of the programs I work with is called *Total Music* by Southworth Music Systems. *Total Music* comes with its own interface which permits two MIDI inputs and four MIDI outputs. With this interface, it is possible to record the MIDI information from two sources at the same time. Not unlike a standard tape recorder, it is then possible to record your performance while you are playing along with the drum machine. You can then have the opportunity to go back and listen to what was just played, and can then compare the two versions side by side without the subjective problems that occur during the actual performance.

While a simple tape recorder might be able to record this "perfect" performance along with the live performance, the computer can do much more with that recording. The two individual instruments can be heard at the same time, or either part can be turned off or on again during the playback. The mix or volume of the two parts can be adjusted so that one is more prominent than the other. But the most exciting aspect of controlling the playback with the computer is that the tempo of the performance can be adjusted without affecting any of the other parameters.

Much can be learned about how something sounds by placing it under a type of slow motion "aural microscope." Some passages which might sound pretty good, but not quite great, may contain rhythmic differences which are hard to hear as they happen but are quite obvious when replayed at a slower tempo. One of the best examples is the roll. If a roll is an aural relation to an optical illusion, then the player is trying to produce the illusion that there is a sustained tone coming from the drum. A roll is the performance of many short attacks so close together that the ear is fooled into hearing the sound as a single tone. Any slight accent or difference in the volume of a stroke will cause the ear to pick it out of the texture and assign it a rhythm. Any slight deviation of time between attacks will also draw the ear away from the desired impression.

With the computer and the electronic drums, you can play a roll and then listen to it at a much slower speed. In addition to hearing the roll, you can see the various lengths between strokes and the various dynamics of each stroke. Example 1 shows the computer's recording of a pretty good sounding roll (but not great) in real time. Once a problem is discovered, the solution might be much easier to achieve.

Another good example is a simple crescendo. If you are trying to make a smooth crescendo, the desired effect would be to have each note slightly louder than the previous note. This change of volume should also be at a fairly consistent rate. If one note is a lot louder than the previous note, an accent might be heard. If the volume stays steady for one or two notes, then the smooth line of the crescendo is lost. Example 2 compares the computer's version of a "perfect" crescendo and a live performance of the same crescendo.

Perhaps the biggest advance and advantage of using electronic percussion with the computer is that of automated notation. It is possible to play something on the drums and have the computer's program print it out in standard musical notation. This is probably the biggest single advance in music since the printing press. When you add notation to the system, the educational value available to you is increased dramatically.

You can actually *see* what you have just played! This is another type of feedback which you can use to analyze your performance. Not only did it feel right and sound right, but it also looked right. Unfortunately the notation is not perfect. The complexity of the program and amount of memory that would be required for absolute perfect notational transcription is beyond the scope of personal computers at this time. But even in this developmental stage of computer-assisted notation, it is incredibly useful. You can perform an etude and then see the printout of the notation. Problem areas can

Example 1

Midi Performer, by Mark of the Unicorn, lists the MIDI data of a nine-stroke closed roll. The data information is as follows: The first column (time) shows the exact time of the attack as bar/beat/tick. The second column (pitch) indicates what pitch is recorded. The third row of numbers is the "on" velocity (volumes from 1-128). The next number is the "off" velocity (drum machines do not send off velocity and use the standard number of 64 for all notes). The last column is the duration of the event, also stated as bars/beats/sticks.

In this particular example, each hand movement produced three bounces. By looking at the "on" data, you can see that each stroke of the bounce is softer than the note before it. The velocity of 78 for the last stroke indicates the accent which ended the roll. With 128 different levels of dynamics available in MIDI, small differences of less than about six numbers are not too obvious to the ear.

This roll was recorded at quarter note equals 250, and at this speed, there are 2000 divisions during each second of time. Again, small differences are not too obvious, but several things can be learned from this example. Notice how the stick takes longer to rebound back to the drum after the initial attack (88 ticks for the first note, versus 52 and 68 ticks for the bounced strokes). Another interesting aspect is the expanded length of time between the last bounce stroke and the accent that ends the roll. This space of 100 ticks is so much longer than the other durations that the ear will notice that difference.

Once these problems are discovered, then specific exercises can be used to help correct them and improve the sound of the roll.

Track-3

	Time	Pitch	On	Off	Duration
Key→	1|1|000	♪C3	↓64	↑64	0|1|000
Data→	1|1|000	♪C4	↓55	↑64	0|0|088
	1|1|088	♪C4	↓49	↑64	0|0|052
	1|1|140	♪C4	↓41	↑64	0|0|068
	1|1|208	♪C4	↓54	↑64	0|0|072
	1|1|284	♪C4	↓47	↑64	0|0|052
	1|1|336	♪C4	↓43	↑64	0|0|048
	1|1|384	♪C4	↓61	↑64	0|0|092
	1|1|476	♪C4	↓53	↑64	0|0|056
	1|2|052	♪C4	↓42	↑64	0|0|036
	1|2|088	♪C4	↓48	↑64	0|0|076
	1|2|164	♪C4	↓46	↑64	0|0|052
	1|2|220	♪C4	↓39	↑64	0|0|100
	1|2|320	♪C4	↓78	↑64	0|0|160

Example 2

In this example, the live performance was a complete measure of sixteenth notes in common time. The computer version has been corrected in two different ways. All attack points have been moved to the closest sixteenth, and a smooth crescendo has been assigned to all of the strokes. This way, one can see problems that arise in terms of both timing and control of dynamic shading.

Live Performance

Insert | View | Goto | Legend

1|1|000	♪C4	↓22	↑64	0|0|113
1|1|113	♪C4	↓21	↑64	0|0|121
1|1|234	♪C4	↓28	↑64	0|0|123
1|1|359	♪C4	↓29	↑64	0|0|117
1|1|476	♪C4	↓33	↑64	0|0|121
1|2|117	♪C4	↓32	↑64	0|0|121
1|2|238	♪C4	↓36	↑64	0|0|117
1|2|357	♪C4	↓36	↑64	0|0|113
1|2|470	♪C4	↓39	↑64	0|0|121
1|3|111	♪C4	↓43	↑64	0|0|121
1|3|234	♪C4	↓41	↑64	0|0|111
1|3|347	♪C4	↓50	↑64	0|0|121
1|3|468	♪C4	↓59	↑64	0|0|113
1|4|103	♪C4	↓60	↑64	0|0|125
1|4|228	♪C4	↓65	↑64	0|0|113
1|4|341	♪C4	↓70	↑64	0|0|123
1|4|466	♪C4	↓79	↑64	0|0|467

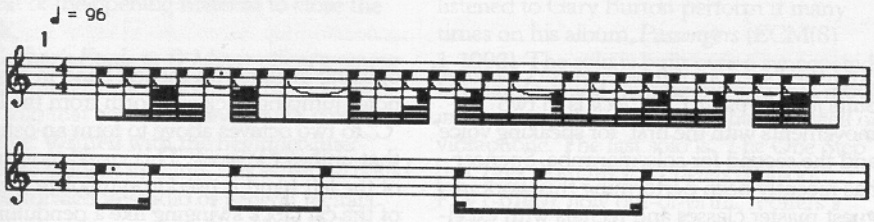
Computer Version

Insert | View | Goto | Legend

1|1|000	♪C4	↓22	↑64	0|0|120
1|1|120	♪C4	↓26	↑64	0|0|120
1|1|240	♪C4	↓29	↑64	0|0|120
1|1|360	♪C4	↓33	↑64	0|0|120
1|2|000	♪C4	↓36	↑64	0|0|120
1|2|120	♪C4	↓40	↑64	0|0|120
1|2|240	♪C4	↓43	↑64	0|0|120
1|2|360	♪C4	↓47	↑64	0|0|120
1|3|000	♪C4	↓50	↑64	0|0|120
1|3|120	♪C4	↓54	↑64	0|0|120
1|3|240	♪C4	↓58	↑64	0|0|120
1|3|360	♪C4	↓61	↑64	0|0|120
1|4|000	♪C4	↓65	↑64	0|0|120
1|4|120	♪C4	↓68	↑64	0|0|120
1|4|240	♪C4	↓72	↑64	0|0|120
1|4|360	♪C4	↓75	↑64	0|0|120
2|1|000	♪C4	↓79	↑64	0|1|000

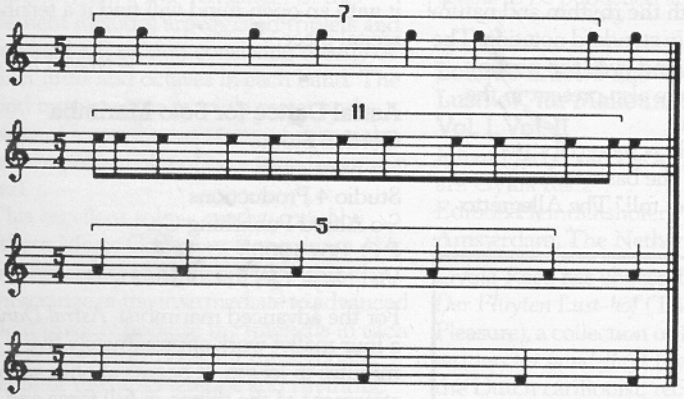
Example 3

Two versions of a "simple" rhythm. The upper staff is what was actually played, the lower staff is the quantized (rounded off to the nearest sixteenth) version of the same rhythm.



Example 4

A complex polyrhythm like this can be programmed in a very short amount of time. This rhythm can be played back through the computer, the drum machine, or the electronic set. It can be played back as slow as 20 bpm or as fast as 400 bpm. Notice that all rhythms are automatically alligned to their proper position by the computer.



then be discovered by comparing the original written page to the performed written page.

So that you don't get the wrong impression, let's look at two limitations. First, the sytem will not add the proper dynamics to the printed page automatically. All dynamics will be reproduced during playback, just not in the notation. Dynamics can be added, but they must be added by the computer keyboard, not the musical instrument. The second limitation is that of resolution. Not a lack of resolution, instead the problem arises from the computer being more accurate than you would like. The two different programs that I use with this system are *Performer* by Mark of the Unicorn and *Total Music*. These two programs use different "tick" rates which are quite fast (480 to the ♩ in *Performer* and 96 in *Total Music*), and this highly accurate resolution can create some mind-boggling headaches. Keep in mind that these resolutions are for each quarter note, not for divisions of a measure. These tick rates do not change along with the tempo. In other words, there are 480 divisions in *Performer* whether the tempo is ♩ = 60 or ♩ = 240.

Unless the recording is quantized (autocorrected) the resulting notation will look like absolute garbage. If you want to see some very tricky rhythms, take a look at the top staff of Example 3! No player on earth has a strong enough control of time to play any sixteenth notes exactly on the proper division numbers with any sense of consistency. However, the computer will try its best to print that crazy rhythm even if you happen to play on tick 368 instead of tick 360. This is where the quantization of attacks is necessary. When you quantize, you are telling the computer to round off all attacks to the nearest specified note value. If the computer is told to quantize to the nearest 32nd note triplet, then the resulting notation will look a little better and still give you a very fine line of resolution. The second staff of Example 3 shows how this would really sound to normal humans rather than to computers. You can see that the notation in the second staff is much easier to read than in the first staff.

Once the art of quantizing is learned, you can learn such concepts as "laying back" on beats two and four, "leaning forward" into a syncopated accent, or even playing a very loose style of Dixieland. It is possible to really see the second and fourth beat delayed by a small amount. While these concepts may often be difficult to explain and fully understand in words, they become easier to understand and grasp when they can be heard and seen.

This process can also be reversed. By using a program like *Professional Composer* by Mark of the Unicorn, the notation of the desired feel can be entered on the computer and then read and played back by *Performer*. This will allow you to first hear passages that might be even too tricky for the drum machine. Very complex polyrhythms, such as Example 4, can be programmed and heard in just a few minutes.

If all of these wonderful educational advances do not convince you to "go electronic," don't forget that you will also have a very powerful computer. Your productivity will increase in many areas. Word processing will help you write that article that you have been thinking about doing. Data base programs will help you control your inventory of music and instruments. And, the notational capabilities of this system can make it easier for you to get your musical ideas down on paper, performed, and maybe even published in much less time.

So what are you waiting for? Electronic percussion has much to offer you. With electronics, there is a whole other world of information to explore and to learn from and, on top of that, it's a great deal of fun too! And really, isn't that what it's all about?

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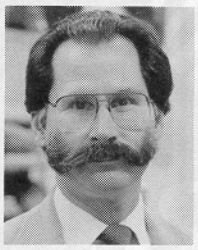

Michael Rosen
editor
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