NEW HORIZONS FOR MICROCOMPUTER MUSIC

Malcolm Wright[1]

Since October of 1974 when the first 8-bit micro processor kit was introduced to the hobbyist, the computer kit market has exploded with a variety of supporting peripheral circuits. Who would have guessed that today a person could have his own personal computer at home to generate a form of animation on the television screen, play games in a software language like BASIC, control home appliances like a burglar alarm, or produce different frequencies to an audio amplifier in the form of music? All this, and yet few of the applications or potentials of the micro computer kit have been developed.

One of the applications for the micro computer which is just starting to be explored by the hobbyist is music. With only 45 bytes of instruction a simple routine was written by Paul Mork which could read a table of binary numbers in memory and generate a square wave frequency related to the value of the numbers. The small program by Paul could play simple melodies like "Daisy" or "Jingle Bells" when executed. Due to the speed of the micro computer, frequencies up to 2000 cycles per second could be produced.

By December 1975 the scope of software music was expanded again. Alpha-numeric music with amplitude control was introduced by *PCC*[2] in a magazine article. The author, Malcolm Wright had written Alpha-numeric music for the 8080 with capabilities not considered before. The music was still a coded table of bytes for each melody, but the bytes were alpha-numeric characters in the ASCII format. Now to play a note like middle C, the user just typed "4C" which specified the octave and the note. If the user wanted a sixteenth note of B flat, one octave higher, he would type "5SB!" into memory. Alpha-numeric music allowed the user to vary the volume, tempo, duration of the notes, generation of rests, repeat measures in music, generate six octaves of notes — sharp or flat, and create envelopes (attack) for special tonal qualities.

Software has its limits and many companies are in the prototype stage of developing computer control hardware devices for music. The modern electronic organ with a band box (rhythm generator) gives an idea of how far we can go in synthesis of instrument sound. Imagine an instrument like the MOOG synthesizer, used in many electronic music recordings, controlled by a computer! Dr. Prentis Knowlton in Pasadena, California has interfaced a PDP8 minicomputer with a pipe organ and with the assistance of many interested friends has encoded musical pieces like Bach's *Concerto in A-Minor* and Rimsky-Korsakov's *Flight of the Bumble Bee* for computer control. The Bumble Bee can be played at tremendous speeds by the computer with no mistakes and with complete repeatability.[3]

If one is going to generate electronic sounds from a special circuit board for a computer, what should be some of its capabilities? The circuit should be able to simulate different tonal qualities by generating different complex waveforms other than just sine or square waves. The circuit board should be able to give different attack and decay times for the notes to realistically simulate the various kinds of musical instruments. The frequency range of the circuit should be the whole audio spectrum from 15 cps to 20,000 cps at the minimum. The user should have control of the volume and the duration of the notes generated.

Another requirement that should be placed on the music synthesizer circuit board is that a minimum of the computer's time should be used to control the card — less than 50%. If the control time is less than 100% computer usage then the computer can be executing other programs at the same time. Imagine computer games with sound effects in the background at the same time!

The future for computer controlled instruments or synthesizer sounds is exciting. There are at least three companies presently developing these kinds of products. Solid State Music in Santa Clara, California is presently prototyping an Altair compatible card which will meet all of the above requirements.

As a last note, imagine the future composer being able to write and edit pieces of music for a whole orchestra and being able to play the music instantly after completion by typing RUN on his computer! ■

[1]Solid State Music, 2102A Walsh Ave., Santa Clara, CA 95050
[2]Peoples Computer Company, Box 310, Menlo Park, CA 94025
[3]An LP record of this system, "Unplayed by Human Hands" is available for $6.98 from Computer Humanities, 2310 El Moreno St., LaCrescenta, CA 91214.