Music500: A New Real-time Digital Synthesis System

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Music500, a new real-time computer music performance system based on the Analogic AP500 array processor, is described. It is designed both for live performance and as a research tool. The development was preceded by a careful rethinking of the function and interconnection of orchestras, scores, I/O, and control protocols.

The orchestra (the signal-processing part of the system) operates on floating-point vectors and scalars by interpretively executing unit generators. These unit generators handle their own initialization and updating, allowing the orchestra to handle much of the work traditionally done by non-real-time preprocesors. Orchestras are built out of active objects, corresponding roughly to instruments, which communicate by message-passing. This allows a high level of control to be implemented right in the orchestra.

The traditional ”score” is embedded in a powerful new structure based on ”control processes.” Many control processes can run simultaneously, either on a host machine or on the AP500's native MC68000 microprocessor. They are connected to each other and to orchestra objects both by synchronization and by message-passing. The synchronization of events is accomplished by an adaptation of Max Matthews's ”waitf” and ”trigger” primitives from his RTSKED system. In Music500 control processes, which are usually in C, these primitives are implemented as subroutines instead of keywords. Message-passing between control processes is a special case of that between orchestra objects.

Music500 works well because it is simple. Its flexibility makes it easy to fit into a wide variety of applications. Its control structure and physical portability make it useful on stage. Above all, since most of its structure is determined by user-level processes, the system is easy to evolve as new ideas in synthesis and synthesis control arise.