Workshop Report:

MICRO-9

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Birds-of-a-feather sessions and a small workshop flavor were the dominant features of Micro-9, the Ninth Annual Microprogramming Workshop, held September 27-29 in New Orleans. Sponsored by ACM SIGMICRO and the IEEE Computer Society, this year’s workshop drew 113.

Following introductory remarks by workshop chairman Bruce D. Shriver, the first round of formal presentations began with the general problems of microprogramming and continued on to specific architectures. The first workshop sessions followed with discussions of host architectures (Bill Lidinsky moderating), graphics support in firmware (Neil Johnson moderating), and operating system support (Joel Herbsman moderating). All three discussion sessions included a high degree of participation from the audience.

The first workshop session, “Host Architectures,” centered around a discussion of current and future machines. The discussion on current machines covered the full spectrum from microprogrammed microcomputers to whole systems for user microprogramming. The discussion of future machines included mainly small size machines for specialized support.

The “special” session’s topic was “Graphics Support via Firmware.” This session covered a wide range of topics, all focused on graphics support via firmware, and was characterized by a high degree of interaction among the panelists (industry representatives). Topics presented and discussed were: hardware features conducive to unconventional microprogrammed graphics support, microprogrammed control of display functions, graphics routine implementation for a microprocessor assembly-language, IBM 2840 emulation, and high speed cache memory minicomputer alternatives to microprogramming.

There were several notable benefits provided by the informal workshop environment: A microprocessor manufacturer was able to gather good input on needed features for graphics support. Several panelists made concrete redesign and enhancement suggestions for another panelist’s machine. Mainframe manufacturers and independent suppliers were able to gather enough information on each other’s technology to fuel their competitive analysis profiles for some time to come.

The working session, “Operating Systems via Firmware,” began with a brief general discussion on classes of systems functions and system architectures applicable for encoding in firmware. Both formal and informal presentations followed. John K. Ahlstrom began the presentations with a discussion on implementation of operating system assists to the Burrough’s B5000 hardware and B1700 firmware architectures. Arthur G. Olbert described the VM/370 assist features of the extended Control Program Support, utilized in the IBM 370, models 138 and 148. His discussion also covered the concepts of hypervisors and Virtual Machine Monitors.

Rahul Cattergy discussed the approach used in the BCC500, a multiprocessor architecture, to allocate systems support and user program support features among the component processors. Joel L. Herbsman, the moderator, presented a brief discussion on the QM/1 architecture, followed by an analysis of the development of the microprogrammed Task Control Program. The final presentation, made by this author, was of a paper previously published in the SIGMICRO Newsletter titled “Operating Systems Enhancement Through Microprogramming.” I reported that our current research indicates that the encoding of some operating systems functions in firmware, for realtime applications, appears to indicate a practical performance gain, but these functions must be chosen carefully.

The second day’s session schedule was like that of the first day. The formal papers from the morning session were used to establish the back-
ground setting for the afternoon workshops, centering around two parallel sessions: "Microprogrammed Microprocessors" (John Birnkner moderating), and "High Level Language Support via Firmware" (Gideon Frieder moderating).

The first session of the day discussed present day architectures of existing and forthcoming microprogrammed microprocessors. A first-hand description of the actual implementation of instruction sets and the problems encountered was given.

In the second session provocative moderation and a lively discussion centered on the various intermediate machines for the support of Fortran-like languages. The lead presentations by Lee Hove1 and Vic Schneider introduced both theoretical and practical considerations and were followed by extensive comment, data, and critical evaluations from both industry and university participants. Several machines were analyzed. The informal setting of this workshop was fully exploited in this session, where formal papers were not possible, due to their proprietary nature. The informal exchange was invaluable.

The last day was devoted mainly to a session on "Coding and Optimization" (Tom Rauscher moderating). As these subjects span a range of interrelated aspects of microprogramming, the presentations and discussions covered a variety of topics.

Greg Lloyd discussed tools, their utility, and their cost in developing microprograms. Y. S. Wu discussed his "W-test" for deciding whether to implement algorithms in hardware, firmware, or software. The influence of structured control operations on emulations was presented by Joe Dorack. Dick Merwin, former chairman of SIGMICRO, described a microcode compiler whose generated code had an efficiency within 20 percent of hand-coded microprograms. Subrata Dasgupta, who followed Merwin, talked about the optimization of loop-free microprograms. Gideon Frieder, who will be chairman of MICRO-10, spoke on the use of micro operations on the QM-1 and the efficiency of different emulators. The final speaker was Tom Rauscher who presented results showing that automatically generated problem-oriented emulators outperform higher level language emulators and ordinary machine language emulators.

The departure from a conference format and true adherence to a workshop format was proven to be the right way of dealing with a subject which has both academic and industrial interests. The high participation of industry representatives was an obvious asset and should be encouraged in the future. This workshop format will be continued and will be "emulated" in the forthcoming MICRO-10. In particular, the various topics covered in the birds-of-a-feather sessions will be recognized as focus areas. These are maintenance of microcode, the value of user microprogramming, and obviously, the still fully unexploited areas in the existing sessions—i.e., communication, code integrity, diagnostics, etc.