Defense Science Board

Task Force on Supercomputer Applications

Meeting Minutes

Date/Place

9:00 a.m. - 6:00 p.m., 13 May 1983
Stanford University, California

Attendees

Task Force Members:
Dr. Joshua Lederberg, Chairman
CDR Ronald B. Ohlander, Executive Secretary
Dr. Dr. William J. Perry
Lt. Gen. Philip D. Shutler, USMC (ret)

DSB Members:
Dr. Ivan Sutherland

DSB Staff:
LCDR Ralph Chatham

Invited Guest Participants:
Dr. Robert E. Kahn
Dr. Elliott C. Levinthal
Gordon Bell

Business

The second meeting of the DSB Task Force on Supercomputer Applications was opened by the Chairman, Dr. Joshua Lederberg. The primary objectives of this meeting were to further refine task force requirements and gain familiarity with military defense systems requirements and artificial intelligence (AI) technology.

Dr. Kahn of DARPA then presented another overview of the Supercomputer program for the benefit of those who had not attended the initial DSB Task Force meeting. During the presentation, the issue of training sufficient numbers of people with the needed skills was raised. It was anticipated that the Supercomputer Program would place an unprecedented demand on skills that are in relatively short supply, i.e., expertise in AI and design of specialized machine architecture and software. The consensus of opinion was that universities would play the key role in generating this pool of talent. Universities would also be critical to transferring existing technology to industry and developing new milestones in technology that would be necessary for the program to succeed. The DARPA program overview also emphasized that the focus was on the development of parallel symbolic computational machines, rather than the traditional numeric processors. This approach differs significantly from the

main thrust of the major computer manufacturers who are pursuing more conventional technology (although account must be taken of efforts like CDC's AFP).

The task force then received a series of three briefings on military applications and AI technology. The briefings were scheduled to inform members of the task force on the application needs of DoD and the state-of-the-art in technology that has the potential of contributing to some of the more pressing application needs. Copies of briefing charts are appended to these minutes.

The first briefing was presented by Hughes Corporation and addressed a research project to apply the latest image understanding technology to a port monitoring task. The Hughes vision system was based on the ACRONYM image understanding system developed by Stanford University under DARPA sponsorship. ACRONYM was a useful starting point but had to be modified substantially to meet the needs of a real photointerpretation task with its attendant poor imagery. The entire interpretation evolution took about 10 hours. In order to obtain real-time performance a speedup of 3 to 4 orders of magnitude in computational power would be required. It was postulated that, although computer vision tasks are exceedingly difficult, image understanding technology is ripe for exploitation. It is not clear, however, whether ACRONYM is subtle enough to be of real value in exploitations without some expansion of its rule base.

The second presentation was on simulation and wargaming: important DoD application areas with demanding computational requirements. Currently, the work in these areas is mainly software limited. As algorithms are developed to address such problems as man-machine interfaces, greater complexity in models, etc., and applications justify large investment in rule knowledge bases, the need for much greater computational power will manifest itself. This is expected to happen in the next couple of years. The estimated additional computational power that would be needed for future applications ranged from 3 to 6 orders of magnitude over a Cray-1, depending on the specific application.

The third presentation was in the area of knowledge-based systems. The briefing gave a resume of the state-of-the-art of this technology and forecast requirements for future, complex systems. Estimates of needed computational resources were in the range of an increase of 3 orders of magnitude.

On the basis of the day's discussions, Dr. Perry proposed 3 potential areas of application: autonomous weapons, signal understanding, and simulation. Autonomous weapons would involve real-time vision and intelligence for planning and mission execution. Signal understanding applications would be oriented around intelligence exploitation and would have less severe real-time requirements. Simulation would include both wargaming and airplane modeling.

The last part of the meeting involved a discussion of future meetings and topics to be addressed. Suggested topics for future briefings included signal understanding, guided weapons, and information search and retrieval.

Certified: _____

Joshua Lederberg,
Chairman