CG in China: The Dragon Stirs

Donald P. Greenberg and John Staudhammer

We had similar, rare opportunities last year. We were invited separately to mainland China to visit a few universities, to interact with faculty and students, and to advise on how to use $200 million worth of new computers, instruments, and graphics equipment that China has installed with the help of a World Bank loan.

Many universities and research institutions received up-to-date hardware as part of this effort to modernize. Modernization is affecting every facet of Chinese life; there is a recognition that the self-imposed isolation of the past has not resulted in a rise in living standards comparable to the West’s. China sees technology as the key to raising industrial and manufacturing capability, and the newest computer gadgetry is expected to lead the way.

We spent over a month in Hangzhou and Beijing, and then met in Hangzhou toward the end of our visits and compared observations in situ. Truly we felt the stirrings of the awakening dragon.

Monolithic system

Much of the recently acquired equipment was ordered by a central authority, an office not charged with making those machines perform. Selections seemed to have been based on lowest hardware cost, not maximal usefulness. Lack of experience in computer operations is evident; the factors of maintenance cost and reliability seem to have been ignored.

This purchasing process is a reflection of the entire monolithic academic system. Furthermore, groups jealously guard their turf, facilities are restricted to departmental use, and interdisciplinary cooperation is rare.

In the push to quickly update existing software, “current” (and hence about-to-be-obsolete) hardware is bought and published algorithms are recoded. Most of their knowledge is based on reading the literature: A discussion of our attendance at the SIGGRAPH conference prompted the question, “why not just read the papers?”

Cracking the shell

Prof. Jian at Hangzhou used an interesting metaphor to describe the challenge this country faces: “China has been like a nut, secure from the outside world. However, now the shell has been cracked, and we within have found that the world has changed greatly. We now see the Third Wave of technology practiced all over the world. We want to join this wave.”

Thus the push for the latest and best the West has to offer. In Hangzhou a DEC VAX 11/785 and an Evans & Sutherland PS 300 have been installed for image processing and computer graphics. Comparable equipment is being shipped to other institutions.

But one major ingredient is missing: enough trained personnel. There is a strong—almost desperate—effort going on to train more people, to modernize all levels of schooling. The pace to build up all computer-related fields, including computer graphics, is frantic. Technical faculty members are sent abroad, usually as visiting scholars to Western universities. From Hangzhou, for example, professors Liang, Shi, Tang, and Ye have been at Utah, East Anglia, Berkeley, Maryland, and Florida, respectively, typically for two years.

Technology transfer is rapid. Last spring’s demonstrations included the use of numerical control tools to design and produce a complex air compressor blade, color simulations with texture mapping, and ray-tracing procedures. The visiting scholars do return with the current state of our art, along with copies of our books, papers, and programs.

However, in the catch-up effort many shortcuts are made. Most academic work is still very narrowly oriented. Too many niceties of intellectual proprietorship are ignored: Books, monographs, and programs are copied at will. This creates reluctance on the part of Western advanced technology groups to expose their truly best and newest.

But even in this way progress is made in China. Maybe in a few years technology and idea exchange will be even more equitable. The education of a technocratic elite will be more eclectic, with more variety and a broader scientific base. Perhaps in years to come individual problem solving, the basics of science, and imaginative thinking will be stressed again.

Challenges

At the same time China is experimenting with radical changes in economic policies. We were surprised to hear often, openly, and from high-ranking officials an admission of the failure of past policies. The change is toward a system
of economics that rewards individual efforts. The introduction of a system of rewards for individual work is likely to spur people to higher achievements.

We saw little evidence of long-term goals, other than to "catch up with the West." Plans tend to become set in concrete and there is no reasonable way of revising them, since that would call into question the original authority. The axiomatic basis of the system does not allow anyone to challenge the gray eminence behind a decision. Endeavors into new technical domains will be hard to achieve.

The academic system is in-bred: The vast majority of faculty were students at the institute where they now teach. Our system of dispersing students is foreign, perhaps because of the general immobility of the population. Also, entrance requirements to advanced study in given departments are generally skewed to favor the crop of local undergraduates.

Interdisciplinary work is not encouraged, a sad omission in computer science and especially in computer graphics, where diversity of preparation and background has been the fountainhead of much progress. The recent spate of visiting scholars, amounting to as much as 20 percent of a given faculty (at Beijing's Tsinghua University), is an attempt to introduce new ideas in teaching.

Most visiting scholars now spend just a year or so abroad, where they have little opportunity to establish their own research. Earning an advanced degree in the West requires many years of study abroad, for which home institutions should, but do not now, make provisions. Currently, host institutions are expected to undertake long-term studies.

**Assets**

The quality of students, their industry, and their desire to excel is high. Their knowledge of current literature, at least in computer graphics, is outstanding. Their work is limited primarily by computer and graphics peripheral resources.

We found the people to be fascinating, helpful, and warm. We returned with admiration for the tenacity, industriousness, and enthusiasm of faculties and students alike. We admire them and the achievements they have made under the circumstances.

We saw a strong build-up of computer facilities, particularly computer graphics and image processing hardware. With the help of trained, dedicated faculty we expect to see large numbers of well-qualified young people become active in all facets of computer graphics and CAD/CAM. We feel fortunate, as Westerners, to have had the opportunity to experience from within the stirring of the dragon.

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