

## **CHARTER RENEWAL APPLICATION** SIAM Activity Group on Geometric Design

This CHARTER RENEWAL APPLICATION applies to the SIAM Activity Group on Geometric Design. The SIAM Activity Group (or SIAG) to which this renewal applies was originally formed under the aegis of SIAM by the SIAM Council and by the SIAM Board of Trustees with its initial operating period beginning July 1, 1989 and ending December 31, 1992. Its charter has been renewed by the Council and Board five times thereafter. This SIAG had 138 members as of December 31, 2005.

According to its Rules of Procedure, the objective(s) of the SIAG are to organize activities, including conferences and publications, to promote the interaction of practitioners and researchers and to keep the SIAM membership up to date on trends in geometric design.

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The SIAG has complemented SIAM's activities and supported its proposed functions. The answers to the questions below indicate how this was accomplished and what the officers propose as the future directions for the SIAG.

1. How is the field covered by the activity group doing? Is it growing, is the focus shifting? What have been the significant advances over the last three years?

The fields covered by our activity group are doing reasonably well. Many of them have matured by now, but there have been also a number of inroads to new areas. There are still many people working in classical research topics, such as curve and surface representation, spline curves and surfaces, classical geometry, etc., but the field has also seen a number of relatively new topics: subdivision, optimal parameterizations, new applications of differential and algebraic geometry and topology, application of PDEs in surface modeling, to mention just a few. Looking at a few recent issues of the CAGD journal (CAGD stands for "Computer Aided Geometric Design") shows that research in most of these and other areas is quite active.

Historically, our geometric modeling community has been relatively homogeneous and stable; the main non-homogeneous components come from various bordering research and application areas: solid modeling is a good example, and so are computational geometry, image processing, animation, mesh generation/processing, visualization, and a host of application areas. The border-line areas are often causing "defections" of some of our members to other groups and conferences (e.g., those associated with SIGGRAPH, ACM). The research focus is probably not shifting dramatically, at least not in areas traditionally covered by our group; that is, people in this group still work on "classical CAGD problems". However, the playing field is in our opinion becoming increasingly inhomogeneous.

The scientific activities at this stage are perhaps characterized by incremental advances as opposed to major new developments. The community is expanding to new application areas and there seems to be less interest in classical engineering-type applications.

As a positive development, in a very near future we expect an explosion in computational performance on standard workstations by multi-kernel CPUs and programmable graphics cards (data-stream processors). The traditional program codes within CAGD are programmed according to a sequential paradigm, and have until now grown as transistors have miniaturized. At present, additional computation performance is achieved by introducing additional processor cores. Dual cores are used in commodity computers as well as extremely powerful programmable graphics cards. Intel expects to have in the next few years a rapid growth in computational capacity of commodity CPUs by introducing multi-core CPUs. This will dramatically change how we process geometry. Older program codes do not scale with multi core and stream processor technology. Consequently, we expect a growing interest in critical algorithms for all computer-intensive applications. First presentations related to CAGD and graphics card programming were given at the Phoenix conference, attracting considerable interest from participants from the industry. By

properly focusing the SIAG activities, we should become an attractive and competent group, with appeal to industry. The Norwegian member of the SIAG Board plans to organize a workshop in the second half of 2006 on this subject in Norway. This can be done in cooperation with SIAM

2. How is the activity group doing? Is it remaining vibrant? Is the size of the SIAG stable or increasing? How is the SIAG keeping up with the changes in the field? How are the broader interests of SIAM reflected in the activities of the SIAG?

Perhaps, it would be an exaggeration to say that the activity group is “vibrant”. However, it is also far from stagnant, which is attested to by the many discussions and exchanges by the participants of the recent Phoenix conference. Many people were excited to be working in the field and suggested a host of improvements/activities that the SIAG or our individual members could instigate. Our members seem to be excited to be associated with this community. Many of them are active participants in the activities even though they are not formally members of the SIAG. Currently, the mailing list for our newsletter subscribers has more than 800 entries.

3. Please list conferences/workshops the activity group has sponsored or co-sponsored over the past three years, and give a brief (one sentence or phrase) indication of the success or problems with each.

The SIAG-GD has traditionally directly sponsored only the biennial conference series “SIAM Conference in Geometric Design and Computing”, the latest of which was held in Phoenix, AZ, Nov. '05. This does not mean that individual members of the SIAG have not been involved with other meetings and conferences. However, the SIAG name has not usually been officially attached to these other meetings.

Attendance at the last two meetings of the activity group:

2005 Phoenix, AZ	164 paid attendees. (183 attended)
2003 Seattle, WA	203 paid attendees. (221 attended)

The SIAG-GD co sponsored the workshop Computational Methods for Algebraic Spline Surfaces II (COMPASS II) September 14th-16th 2005, Centre of Mathematics for Applications at the University, Oslo, Norway, with approximately 30 participants. This was a very successful workshop with proceedings to be published by SPRINGER.

The “SIAM Conference in Geometric Design and Computing” takes place every other year. During the years in between, these SIAM meetings are complemented by a series of French and Norwegian conferences: every fourth year in Norway and every fourth year in France. The Norwegian conference has grown to 150 participants; the French conference has between 300 and 400 participants. We have tried to establish a formal close link to these conferences, either by SIAM co-sponsoring the events or as meetings in Cooperation with SIAM. This has not been possible due to the French/Norwegian conference series always taking place during a weekend at the end of June/beginning of July. As this is always less than two weeks away from the SIAM Annual meeting, such cooperation has been impossible to implement. This does not hurt the European conferences, but it certainly reduces the visibility of the SIAG-GD. In fact, given that these conferences are held in Europe, the SIAG-GD Board is of the opinion that, at least in this special situation, SIAM’s policy concerning sponsorship of other conferences is unreasonable and counterproductive. In our opinion it is highly unlikely that attaching SIAM’s name to these conferences would alter people’s minds about attending or not attending the SIAM Annual Meeting. In fact, this is a good opportunity for us to ask SIAM to lift this policy, at least in our case: the European conferences are well established and it would be unreasonable to expect their organizers to change the dates so as to accommodate SIAM’s policy.

4. Please indicate the number of minisymposia directly organized by the activity group at the last two SIAM annual meetings. When did the SIAG last organize a tract of minisymposia at an annual meeting?

There were none. The SIAG-GD Board realizes that this is not something we are too happy about. It seems that not having had any minisymposia recently is a consequence of the fact that most of our members prefer specialized meetings and are less eager to attend large general meetings. Some members might also be influenced by a negative experience of the 50<sup>th</sup> SIAM anniversary meeting, at which the SIAG-GD minisymposium was not well attended by SIAG non-members. The fact that there have not been many minisymposia organized in recent past could also be attributed to a specialized nature of our area and the fact that the mathematical focus of other SIAG groups is quite disjoint from ours. In particular, our community seems to be less theoretically oriented than a typical SIAM conference participant. However, we will seriously consider organizing a minisymposium at the '07 meeting and we will invite our members to help with the organization.

5. Please indicate other activities sponsored by the activity group, to include newsletters, prizes and Web sites. Have each of these been active and successful?

The SIAG-GD has a website (<http://www.sintef.no/static/am/SIAM-SIAG/>) and also there were several issues of a newsletter, called CAGD NEWS ([http://www.sintef.no/static/am/SIAM-SIAG/CAGD\\_News/index.html](http://www.sintef.no/static/am/SIAM-SIAG/CAGD_News/index.html)). We have room to improve both; however, we think these steps are in the right direction.

6. What activities are planned and proposed for the next period of the charter? Please describe scheduled and suggested future activities in detail.

At this time, the SIAG is in a planning stage of rethinking the organization of the biennial SIAM GD conferences. One reason for the need to do this is that the most recent conferences in the series (Sacramento, Seattle, and Phoenix) had lower attendance than earlier conferences. The situation was discussed at the SIAG-GD business meeting in Phoenix, Nov. 05. It was decided at this meeting that we would consider a new system of organization of these conferences, in which there will be less reliance on SIAM's administrative help. We hope that this will make the conference more affordable to participants and, as a result, we hope to bring back the attendance levels to above 250. The issues concerning the organization of the next '07 conference and various other related topics are discussed at length in the most recent issue of CAGD NEWS ([http://www.sintef.no/static/am/SIAM-SIAG/CAGD\\_News/index.html](http://www.sintef.no/static/am/SIAM-SIAG/CAGD_News/index.html)).

Another important activity, which goes beyond the SIAM conference organization, is that the SIAG plans to take steps to lure back the scientific and engineering community working in industry. The waning interest of the industrial community was seen at the most recent Phoenix conference, where, unlike in previous meetings, there were very few speakers outside academia. A shift in the industries that directly use geometric design has been going on over the past 5-10 years. However, we see some signs that the new industries that use geometric design are beginning to increase their participation in the conference. We think that regaining strength of the non-academic participation in our activities is imperative and is one of the most important tasks that the SIAG needs to tackle.

The Board is also thinking about taking steps to improve our visibility, attract more young people to the community, and encourage organization of conferences in addition to the main SIAM conferences.

We also intend to establish cooperation with European workshops and conferences such as the planned COMPASS III in Spain in 2007. In Europe, there are numerous workshops and conferences that could have cooperation with SIAG-GD. We have to increase the awareness of SIAG-GD members that such cooperation and SIAG-GD co-sponsorship is positive and not too easy to achieve. One example is activities taking place at the center of research excellence, "Centre of Mathematics for Applications", at the University of Oslo, where many workshops are organized during the year.

7. How can SIAM help the activity group achieve its goals?

The main SIAM help we see in (1) supporting us in our efforts to make the SIAM biennial conferences less costly, without sacrificing quality; (2) continuing helping us with the organization of the SIAM conference

(in a lesser extent than in previous years), for example with advertising the conference and other help that we might need; (3) continuing providing financial support to organize the main SIAM conference.

A formal cooperation with the French/Norwegian conference series would also be very helpful for increasing the visibility of the SIAG. However, this requires that SIAM would allow holding “Meetings in Cooperation with SIAM” even if their dates overlap or are close to the dates of the SIAM Annual Meeting.

8. How can the activity group help SIAM in its general role of promoting applied mathematics and computational science?

Individual members of the SIAG already promote applied mathematics and computational science and have done so in the past, even though this has typically not been under the SIAM-SIAG-GD logo. Our members write research papers and books, attend conferences, and through their activities often show how their results can be applied in “real life”. This is good for the promotion of applied mathematics. The SIAG should play an active role in this primarily as a source of information about individual members and their work, and as an interface with the outside world. As formulated in our business meeting in Phoenix, an important role of the SIAG is that it “should serve as a point-of-contact to scientists and engineers needing advice from members of our community”. Thus, our help should consist, among other things, in making sure that our geometric modeling community is better advertised to the outside world.

This SIAG requests that the SIAM Council and Board of Trustees renew its charter for a two-year operating period beginning January 1, 2007.

Signed

Mike Neamtu  
SIAG-GD Chair  
April 27, 2006

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## ***Geometric Design***

The SIAM Activity Group on Geometric Design is concerned with the mathematical and computational issues that arise in generating and processing geometric information for various engineering applications, such as mechanical design, process planning, and manufacturing. The scope of the group's activities encompasses a wide spectrum of scientific, technological, and other skills, ranging from rigorous mathematics to the subjective aesthetics of shape. The SIAG organizes a [biennial conference](#). Visit the SIAG on Geometric Design website. <http://www.sintef.no/static/AM/SIAM-SIAG/>

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Vice Chair: [Stephen Mann](#) 1/1/05 - 12/31/06

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