APPLIED COMPUTATIONAL ELECTROMAGNETICS SOCIETY (ACES)

NEWSLETTER

Vol. 5 No. 3 November 1990

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EDITOR'S COMMENTS

We are asking various ACES founders, ACES Journal Editors, and ACES Committee members to share their perspectives on ACES and on computational electromagnetics. This issue we include "perspectives" articles from Virgil Arens and Ted Roach. Tentatively we shall feature two perspectives articles in each issue of the ACES Newsletter to promote dialog. Thanks to Dave Stein for implementing this idea.

This issue includes a short note on a modification to the plotting routine in NEC-2 which the authors of the note have found most useful, and a modification to the GTD code called NEC-BSC (or BSC). The CAEME column, which Dr. Iskander has been contributing for the last year and I hope continues to do so, includes a summary of CAEME activities in the past few months, a list of the 1990 funded projects and many calls for participation in CAEME projects. Also included is the fact that the CAEME has approved international participation and sponsorship by industry.

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ACES NEWSLETTER COPY INFORMATION

Issue	Copy Deadline
March	January 25
July	May 25
November	September 25

Send copy to PO Box 2044, Smyrna, GA 30081-2044 in the following formats:

1. A hard-copy.
2. Camera ready hard-copy of any figures.
3. If possible send text on a floppy disk. We can read MICROSOFT-WORD and ASCII files on both IBM and Apple disks. On IBM disks we can read WORDPERFECT and WORDSTAR files. If it's not possible to send a disk, the hard-copy should be in Courier font only for scanning purposes.

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The opinions, statements and facts contained in this Newsletter are solely the opinions of the authors and/or sources identified with each article. Articles with no author can be attributed to the editor. The United States recently became part of the Berne Copyright Convention. Under the Berne Convention, the copyright for an article in this newsletter is legally held by the author(s) of the article since no explicit copyright notice appears in the newsletter

NEWSLETTER EDITORS AND WRITERS NEEDED

The ACES Newsletter could use the following:

* Acquisitions Editor - to locate articles for Newsletters
* Advertising Editor - to solicit and coordinate ads
* Writers - to write occasional articles

Any volunteers should contact Paul Elliot, Newsletter Editor.

OFFICER'S REPORTS

PRESIDENT'S REPORT

You will see elsewhere in this Newsletter a photo of the last stages of a fairly lengthy meeting of the Board of Directors at the Dallas Convention Center in May. Ed Miller had shifted over with his glass of coke to make sure he wasn't obscured by the camera angle. You have read a summary of the important proceedings in the last issue of the Newsletter. The completion of formal incorporation also permitted the registration of ACES as a non-profit organization in the State of California. Dick Adler tells me that this has taken place. We can now take advantage of this status in our business transactions and for any future solicitations of support.

There are two additional procedures that you can expect to see: one is the election of three new directors to replace or re-instate those whose terms expire (Pete Cunningham, Jim Logan and Ed Miller), and the distribution of an official yearly report which will be reviewed at the annual meeting. The Nominating Committee under the chairmanship of Pete Cunningham is now preparing the slate and the Elections Committee under the chairmanship of Pete Li will arrange to mail out the ballots. Please show your support for ACES by casting your vote.

During the last six months I have experienced the dynamics of our society from contacts by phone, FAX, mail and in meetings. Societies such as ours are dependent on the sustaining involvement of our members in publications, symposia and committees. In particular, I found it satisfying to receive phone calls for information on some of our modelling experiences from members across North America, based on recommendations made by Dick Adler who continues to serve as a productive clearing house in this regard. This is our society in action! I have also identified for myself certain personal action items which I also urge you to make your own. The first is to ask any of my professional contacts whether they are members of ACES, and if not why not? The second is to urge our library to subscribe to ACES publications and to urge my friends to do the same at their companies. The third is to ask our sponsors whether the software that we have developed could be made available to the community through ACES. In this connection, whenever you become aware of new useful codes, I urge you to approach the authors with the same question. At the very least, do draw the availability of the software to the attention of Chuck Vandamant, chairman of the Software Exchange Committee. Finally, I am organizing our laboratory computational electromagnetics activity in such a way that we can continue to participate in the benchmark, validation and data base initiatives that are so important to all of us.

Increased membership and subscriptions are important to us financially, but also for the long term vitality and success of our technical mission. Join me in this **"Participaction"**.

There are two key dates that we all should remember - the December deadline for the submission of abstracts for our symposium and the 19th of March, when our 7th Annual Review takes place. Frank Walker and his team are doing their best to make this one of our best meetings by far. Let's give him our support.

Stanley J. Kubina
ACES President

COMMITTEE REPORTS

MEETINGS COMMITTEE REPORT

The Meetings Committee, together with the Software Performance Standards Committee, is promoting a series of international workshops on the use of canonical problems to validate electromagnetic codes and models. These workshops are joint projects with TEAM (Testing Electromagnetics Analysis Methods)Workshops. The first workshop was held in Toronto, on October 25, and 26, 1990, following the Fourth Biennial IEEE Conference on Electromagnetic Field Computation (CEFC). The second is scheduled for Sorrento, Italy, following COMPUMAG, 7-11 July 1991.

The joint workshops provide an opportunity for participants of present brief, informal descriptions of their methods, with emphasis on new work and on extending the capabilities of existing computer codes and models. These presentations will allow participants to contribute to the development of universal code performance standards, modeling guidelines, computational electromagnetics data bases, and tools for validation of codes and models.

The current set of canonical problems is listed in the ACES Collection of Canonical Problems: Set 1, and in the TEAM Workshop Set, Round 3. Summaries of the workshops may be published in the ACES Journal or Newsletter. The workshops will be advertised by ACES; persons who are interested in participating in them should contact Harold A. Sabbagh, Vice-President of ACES.

Harold A. Sabbagh
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SOFTWARE PERFORMANCE STANDARDS COMMITTEE

The software performance standards committee is currently pursuing two primary activities. Most of our recent efforts have been devoted to the collection of canonical problems to be used as benchmarks for software validation. The ACES COLLECTION OF CANONICAL PROBLEMS SET 1 was published in Spring 1990, and workshops facilitating the exchange of information and test problems were held during May 1990 (at the joint IEEE/AP, IEEE/MTT, and URSI conference) in Dallas and during October 1990 (at the Fourth Biennial IEEE Conference on Electromagnetic Field Computation) in Toronto. ACES joined with the TEAM (Testing Electromagnetic Analysis Methods) Workshops, an international group, to conduct the canonical problems workshop in Toronto. We anticipate a second COLLECTION OF CANONICAL PROBLEMS based on these workshop presentations. (The Toronto workshop has not taken place at the time of this writing. A detailed report on both the Dallas workshop and the Toronto workshop will be forthcoming).

In addition to collecting canonical problems, the committee is attempting to develop standards to guide the software validation process. At present, there is little or no agreement on protocols for presenting data, comparing accuracy of numerical and measured solutions, or determining the necessary range or limits of the many parameters involved. Standards that clarify these issues will assist in the construction of a canonical problems database.

Andrew Peterson
Harold Sabbagh
Co-Chairmen

CODE USER GROUPS COMMITTEE

Thank you for responding to my request to register your interest in code user groups. Approximately 50 people responded. The first group has now been formed and a second needs only a chairman to volunteer in order to get underway.

During the 6th Annual Review in Monterey this past March, an enthusiastic group formed the moment method code users group. The primary focus of the group will be the NEC codes, but MININEC, GEMACS and ESP also lie in their range of interests. Consequently, if you have an interest in any moment method code, please plan to support this group. Russ Taylor (c/o McDonnell Douglas Helicopter, 5000 E. McDowell, Mesa, AZ 80205, phone (602)891-3000, x 5539) has offered to chair this group. He will need your support.

One of the first orders of business will be the establishment of communications. One possibility is a "stapled sheet" newsletter, which would be reasonably fast and fairly cheap. A more expensive alternative would be the establishment of a bulletin board system. This would be quicker, but would need to be duplicated (as either a BBS or a newsletter) for the non-North American members of the user group. Let Russ know what your preferences are.

The second group, on the verge of forming, is the "HF methods" code users group. Probably the best known code of this group is the Basic Scattering Code from Ohio State University, but others employ similar techniques as well. This group needs someone to volunteer as chairman. Of course, any support you can offer would be welcome. Contact me (c/o Kaman Sciences Corporation, P.O. Box 7463, Colorado Springs, CO 80933-7463, phone (719)599-1406) if you can help. We hope to get information on code updates out to HF Methods User Group soon.

Several respondents indicated an interest in other codes. A half-dozen or so mentioned EMC/EMI codes such as IEMCAP. Others mentioned supporting codes such as Mathematica, or circuits codes. It would be premature to start users groups based on a small response, but your responses will be kept on file. In the meantime, please consider writing an article for the ACES newsletter on your use of such codes. I'm sure it will be of interest to other members, and will publicize your interest in starting a new users group.

Chris Smith

SYMPOSIUM COMMITTEE REPORT

We have received the first few abstracts for next year's conference. We wish to remind all potential authors that abstracts are due by **DECEMBER 1, 1990** for review by the Symposium Committee. It is our goal to process the abstracts in the fourth quarter of this year and publish the conference proceedings in time for distribution at the conference in March. The photo-ready copy of your paper will be due by **FEBRUARY 1, 1991**. We understand that because this is the first year that we have attempted pre-symposium publication it is important that every author be responsive to the changes in publication schedule. Please help us to meet our publication schedule and make this a great year for ACES Conference publications. Please forward your paper abstracts to Frank Walker, ACES Symposium Chairman.

This year we hope to encourage greater international participation by organizing regions outside of the United States. We are currently contacting ACES members and other candidates to identify ACES Symposium Regional Co-chairman for regions such as Great Britain, Western Europe, South Africa, Australia, Japan, and mainland Asia. If you have an interest in establishing ACES Conference representation for an international region please contact Frank Walker.

We are currently investigating the potential of establishing library indexing of ACES publications with our affiliates in the IEEE. We are interested in a shared publications cooperation or some other arrangement by which technical papers published at ACES conferences can be indexed in major library data bases. Our efforts in this area are preliminary. We are seeking a mechanism by which a non- IEEE organization can share in IEEE library affiliations. We hope to have progress to report at the conference.

Dr. John Rockway is the 1991 ACES Conference Co-chairman for Short Courses. "Jay" is organizing the various short course offerings and will schedule them for the convenience of the Conference attendees. The preliminary short course descriptions are listed at the back of this newsletter.

At the 1991 ACES Conference the NSF/IEEE CAEME Center will organize a special session of technical presentations on Computer Applications in Electromagnetic Education/Training. Several booths for demonstration and swapping of software packages will be organized in conjunction with the special session. With this format we hope to provide opportunities for technical reporting on new advances in education/training software. The booths will be dedicated to advertising, demonstrations, and the exchange of ideas. The special session will emphasize topics of interest to education/training, evolving computer technologies, and the latest in visual electromagnetics computation and analysis. New educational software developments and interactive software will be among the topics addressed. For more information regarding the special session and the booths please contact Dr. Magdy Iskander, CAEME Director.

If our conference is to be great we must make it so. Plan on participation and begin preparation now. Please feel free to contact the following members of the 1991 ACES Symposium Committee as appropriate:

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PUBLICATIONS COMMITTEE

In response to recent membership surveys which were publications-motivated or publications-sponsored, we have received suggestions and comments of potential interest to the entire membership. We now share these suggestions and comments, even those which relate only indirectly to publications. (The suggestions and comments are grouped by general category, and some but not all of them have been edited for space or clarity).

In some cases, we have added further commentary of our own. The viewpoints reflected in our own commentary will not necessarily be decisive, but the consideration of all relevant factors is essential.

UNFULFILLED NEEDS IN COMPUTATIONAL ELECTROMAGNETICS:

Evaluation of specific codes

The region between where MoM and GTD run out of steam, for example, VHF incident on large aircraft, where the MoM limit is approximately 30 MHz and the GTD limit is approximately 100 MHz.

The need for reliable updates to software. Users of large codes such as NEC often receive no news of updates (unless they are personally acquainted with the code developers). ACES can be an "official" vehicle for updates.

PC hardware and compilers for use with the NEEDS 2.0 package. A review and updates, i.e., "how to do it without a VAX".

Videotape the courses offered at the ACES conference. As far as I know, no videotapes on computational electromagnetics exist today.

Educational software.

Reduce complex theoretical results and numerical procedures to the hardware engineering level by generating simplified "empirical" numerical procedures based on studies using the exact results. (For example, polynomial equations fit to MoM results).

I believe ACES should promote computational electromagnetics by tutorial and educational upbringing for the non-constant user. In other words, I believe more attention to broadening of the membership would benefit the field of activity, increase the available resources, and generally lead to an improved climate for computational electromagnetics advancement.

Develop tutorial PC software with descriptive graphics stepping through the necessary mathematics and demonstrating physical principles in the solution of some simple MoM problems.

ACES might bring together users of various codes with an interest in co-developing code enhancements. Also, let's not forget the "A" in ACES. Does anyone out there actually build antennas or design EM systems?

Help improve the visibility of high frequency applications and techniques. This may promote the development of hybrid techniques for some applications.

Expand the software library. It should be one of the most important assets of the society in the long run and therefore deserves a healthy proportion of our total efforts. Also, establish implicit standardization of the software library by having "preferred machines". Upgrade the software in the library for adaptation to new hardware developments such as parallel computation.

A bibliography of validated results published in open literature would be nice. [separate comment] I think it would be useful to generate a data base of measured data for canonical problems. This data base can be at our disposal for validating and tuning electromagnetics modeling codes.

> Editor's note: The *ACES Newsletter* plans to publish a running bibliography of measured data of interest, and in the previous issue, we asked our readers for inputs. Now that we have provided the mechanisms, the identification of these validated results now depends on the active participation of the entire membership - not the ACES Editorial Board alone. When validated computational results are identified to us, they will also be referenced in the bibliography. Moreover, we anticipate that validated results for canonical and benchmark problems will be generated in the Joint ACES/TEAM Workshops and other ACES activities.

In many cases, electromagnetics codes are developed for specific applications and problems. Although the techniques may be general, the code is not. Some forum is required to better document these limitations and promote the extension of these codes to the full capabilities of the techniques implemented. As a personal observation, I would be reluctant to provide code to someone who might misuse it due to lack of documentation or understanding.

PUBLICATIONS CONTENT:

I would like to see a "stupid question" column (or: "All you wanted to know about computational electromagnetics but were afraid to ask", or: "Uncle Ed's problem page") which would answer very basic questions which users may have (these could even be submitted anonymously!). It should not be afraid to answer the same question every year or two, as new members keep joining ACES and will not have seen the first answer.

> Editor's note: We have already tried something similar in the form of "Pandora's Box" but did not receive enough submissions to make this column viable. If you can suggest ways to obtain more submissions (and with a reasonable probability of success), we shall try again.

Publish more *ACES Journal* papers on (a) radomes, (b) particle accelerators, (c) hybrid methods, (d) high frequency techniques, (e) time domain techniques, (f) pole/zero extraction, (g) inverse techniques, (h) code evaluation, etc. [suggestions from several respondents]

> Editor's note: Outstanding ideas! Write and submit such papers, or encourage your colleagues to do so. If these papers are in compliance with our standards as determined in our peer-review process, we shall publish them. The *ACES Newsletter* also seeks articles in these areas.

Increase the number of "applications papers" published in the *ACES Journal.*

> Editor's note: *ACES Journal* standards require papers to manifest a relationship to application; however, they also permit considerable latitude in interpreting this requirement. Apparently, the acceptable papers which we are receiving are not sufficiently applications-oriented to serve your needs, and we cannot publish papers which are not submitted to us. If you will write such "applications papers" or solicit them from your colleagues in industry, government or academia, the papers will be considered for publication. Furthermore, within the next few months, the Editors will be re-examining and refining our standards, and we would appreciate any specific suggestions which you can provide.

Provide a forum for reader commentary on *ACES Journal* papers and *ACES Newsletter* articles.

Editors note: The forum exists but is underutilized. Readers are encouraged to comment on applied computational electromagnetics issues as discussed in our papers and articles. However, we shall not publish disparaging remarks or similar commentary about authors or other individuals. Therefore, please be tactful.

Do not impose a page limit.

Editor's note: No immutable page limit presently exists, although the length of each paper is evaluated in relation to its content. Future requirements may necessitate a change to our "no page limit" policy, but this is yet to be determined.

Generate a data base of *ACES Journal* papers, *ACES Newsletter* articles, and ACES Symposiu papers, with keywords supplied by the authors.

Editor's note: You should be pleased to know that the *ACES Journal* has already been included for inclusion in the INSPEC abstracting services. In addition, we plan to start our own data base in the near future, and it will include forthcoming *ACES Journal* and *ACES Newsletter* issues. Our primary challenge is to include papers and articles from past issues, as this task is labor-intensive and will not be accomplished immediately. Questions and comments regarding the ACES Symposium papers should be referred elsewhere, as these papers are not within the jurisdiction of the ACES Editorial Board.

COST-SAVINGS/REVENUE GENERATION MEASURES:

Increase the advertising in our publications and the number of institutional members.

Editor's note: We agree. However, it is neither possible nor appropriate for the ACES Editorial Board to assume sole or major responsibility for institutional membership recruitment. (In conjunction with the "Publications Spinoffs" -- the Code User Group Committee and Benchmark Problem Solution Workshops -- we are already carrying almost all of "the burden", at least between symposia). Hopefully, another ACES committee will assume this responsibility. In addition,our Advertising Editor resigned a few months ago, and we need a new one. (Volunteers?)

Reduce the postal costs, especially for overseas mailings.

Editor's note: We are working on this but have not yet found an acceptable solution. (Suggestions?)

Establish voluntary page charges.

Editor's note: This is possible, but some authors feel pressured to pay the page charges even when they are voluntary. The page charges can then become a disincentive, thereby mandating new counterbalancing incentives so that we do not reverse our recent progress in attracting quality papers.

Make the *ACES Newsletter* less elegant and less expensive.

Editor's note: This is one of several cost-savings measures which will be considered should the need arise. Member preferences, as expressed in responses to our present survey, will provide the basis for our decisions.

Replace some or all of our hard-copy publications with disk file distribution or with electronic bulletin boards.

Editor's note: These measures offer possibilities, but their cost-savings potential has not yet been determined. Furthermore, implementation of these measures will be possible only after certain issues are resolved. For example, can we be certain that all of our members in various continents will have access to the necessary equipment? Furthermore, while some authors will welcome the opportunity to submit their papers on floppy discs (instead of in hard copy form), will they have the same incentives to publish electronically as they have for publishing in bound volumes?

Become a part of the IEEE

Editor's note: Notwithstanding the IEEE plans to become more international, this suggestion sounds nationalistic and may not be in the interests of our non-US members. Why not the Institution of Electrical Engineers (IEE) in the United Kingdom or the Institute of Electrical Engineers of Japan? Let's work with all of these professional societies as much as possible, but not with one to the exclusion of the others.

OTHER:

Organize an ACES conference or ACES workshops in Europe.

Editor's note: Excellent idea! Let's not forget other parts of the world where we have members, for example, Japan, Australia, and South Africa. Although some of our Editors in other nations have begun preliminary inquiries regarding such activities, the primary responsibility for selecting locations for conferences, workshops, and similar ACES activities rests with the Meetings Committee (and in the case of Europe, the ACES Europe Committee). These committees will be pleased to work with you to make these activities happen.

Reverse the policy which separates membership dues from the ACES Symposium registration fee.

Editor's note: Dues policies are established by the ACES Board of Directors. Various Directors have already read your questionnaire responses and will be pleased to receive any further suggestions or questions which you may have.

Require ACES Symposium paper presenters to publish their papers in the Symposium Proceedings. In the case of the 1990 proceedings, more than 20 papers were missing.

Editor's note: The ACES Editorial Board has no jurisdiction over the proceedings of ACES Symposia. In spite of this, we have become a focal point for suggestions regarding the Symposium Proceedings, and one of these suggestions, if implemented. will impact the *ACES Journal*. We now share these suggestions with you.

We first point out that this problem is not unique to ACES. Some symposia have adopted a "no paper, no podium" policy to eliminate the problem, and this has been suggested for ACES.

We have also received an alternative proposal to require and publish only the abstracts *and viewgraphs* and to encourage authors to submit manuscripts to the *ACES Journal*. This is a possibility and is similar to the procedures of certain other professional societies. (We also note that a few of our symposium authors prefer refereed publications to symposium proceedings and have chosen to submit their symposium manuscripts to the *ACES Journal*). However, if a large number of

symposium presenters were to do this (and assuming that most of these papers were to meet our standards of publication, at least after revision), then the ACES Journal would find it necessary to impose page limits.

Finally, we can maintain our present policy of requiring but not enforcing the submission of symposium manuscripts. This policy provides authors with the option not to prepare a manuscript for ACES. At the same time, it entails the risk that in successive years, more authors will choose to excercise this option.

David E. Stein
Editor-in-Chief

OTHER COMMITTEE REPORTS

Next issue we hope to include reports from the following committees:

Software Exchange
Constitution and Bylaws
Awards
Historical
European Committee
Long Range Planning (Technical Activities)

FIRST BOARD OF DIRECTORS MEETING OF ACES, INC.
DALLAS CONVENTION CENTER
THURSDAY, MAY 10, 1990

Left to right: Frank Walker, Rudiger Anders, Scott Ray, Ed Miller, Hal Sabbagh, Wayne Harader, Richard Adler, Jim Logan, and Stan Kubina

PERSPECTIVES ON ACES AND COMPUTATIONAL ELECTROMAGNETICS

[This issues contains perspectives from Virgil Arens and Ted Roach]

REPORTING STANDARDS

Today, many if not most, engineering managers insist on taking the output of our computer codes with a grain of salt. Our patterns/input impedances may look good, but there is no background foundation of facts to create a warm fuzzy feeling for the engineering manager that the underlying codes are correct and he need only be concerned with how the codes are applied.

How many presentations has the reader seen where the viewer is required to look at two curves on a chart, one measured, and one calculated and draw his own conclusion, after being advised by the speaker that "that looks pretty good", or even "excellent." Rarely, if ever, will there be error bars on either curve. If the agreement is "poor" the chart will not be shown at all, or at worst, the speaker will explain what was wrong with the measurement, rarely will the speaker address possible problems in his model or the code.

What is needed is published articles jointly written by the measurement group and the computational group where they work as a team to reduce the differences. Bob Tanner pointed out years ago that when such a process is used, both the measurement techniques and the computational techniques are greatly improved.

Ideally one would like to have a simple number to classify the accuracy of a given computer simulation code. This is not possible for several reasons.

Any real useful antenna does not come with a label giving its true specifications. Even if it did, different users are interested in different aspects of the antenna. The antenna engineer who mustdrive the antenna is principally concerned with input impedance. The system engineer's major interest is the main lobe absolute gain.

The EMC person may have the absolute gain outside the main lobe as his principal interest. Still others may have as their interest absolute gain as a function of polarization. Confidence in the output of the code would be increased if one reports the median difference, the range of the difference and the RMS deviation between simulation and measurement.

The members of ACES, have no control over measurements and thus no control over the difference between the simulation and the measurements. However, if we set up some sort of standards to report our comparisons, just maybe, we can make our results more useful to the engineer who needs to know the true parameters of some proposed antenna. I would like to have other members opinion on these ideas. Please call me at (800) 882-4428 (outside the U.S. (301) 258-0970).

BIO

Virgil R. Arens has served as President of Arens Applied Electromagnetics for over twenty years and as a consultant on Wullenweber antennas for the past fifteen years. His recent achievements include the electromagnetics design of two very large wire antennas, one of which is now being built. In addition, he was the lead engineer/programmer to develop one of the first log-periodic antenna computer codes, based first on the Hallen's integral equations and later on Pocklington's equation. Other achievements include the development of the BIGANT computer code and of a course on Modern Antenna Analysis, presented semiannually at George Washington University between 1976 and 1988. Primary research interests are in the area of obtaining agreement between measurements and computations for antennas in the 3 to 3000 MHz range. He is a founder of ACES and has served on the ACES Journal Editorial Board since its establishment.

A NOTE ON MATCHING OPTIMIZATION AND SPEED COMPARISON

Back in 1986, we reworked the MININEC2 program to step through a frequency band and save the impedance data to a disk file (ACES Software Lib. disk #2). After entering the geometry and frequency start, stop and step data, the program could be left to run all night. The frequency sweep of impedance data could then be retrieved next morning. This program is useful for the design of broadband antennas or especially to find resonances in narrowband antennas.

In the case of the broadband antenna, once you have the impedance data, you usually need to match it over some desired frequency band. Five years ago we would have done this with the aid of admittance and impedance Smith charts and much hand waving. More recently we would have used our network analysis program, varying one matching element at a time, then running a plot to see what happened and continuing on to the next element. This approach can be automated in our network analysis program but works only at a single frequency at a time.

About a year ago, we obtained the optimization program of TAME [1]. At $50.00 this is a very useful, low cost version of CIAO, for design optimization. It provides a single method of optimization, the Fletcher-Powell, and allows up to 75 circuit elements, of which 15 can be variable. CIAO has 4 optimizers, allows larger files and has other features for $495.00. For antenna matching purposes, 15 variables allowed by TAME is more than adequate.

We seem to be doing more amplifier design these days. While attending the Dallas MTT conference this year we obtained Stephen Mass's optimization program (C/NL) [2] that includes non linear and noise optimizations for amplifiers. This program has 3 different optimizers and allows up to 100 circuit elements of which 45 can be variables. Either of these programs is useful for aiding the design of amplifiers, filters or matching networks for antennas.

Using either of these programs to match an antenna over a desired bandwidth, we first convert our table of antenna impedances to a table of s-parameters. Next, we define our first guess of a possible matching network in a SPICE-like file. The elements that will be varied are identified and include capacitors, inductors, transmission lines and even coupled lines, etc. The file includes lines stating the frequency band and desired weighting functions. Several minutes or hours later, depending on how many iterations you ask it to perform, the optimized matching network is obtained. At this point the file can be edited to change geometry, to include resistance for finite Q of tuning elements or for another run. We should now be able to approach as close as practical to the theoretical FANO [3] limit on matching to a reactive load. All of these programs run nicely on a PC or AT with a MATH COPROCESSOR installed.

I wish to comment on the article by Messrs. Yergeau and Allred in the Sept. 1989 Newsletter [1]. They compared the speed of their Fortran version of MININEC3, compiled for math coprocessor with a PC BASIC version. In their article, FORTRAN was indicated to be about six (6) times faster than BASIC for the given test antenna. No mention was made of the version of PC BASIC, whether it was compiled or whether a math coprocessor was used. Hey, as a confirmed BASIC user, I find this comparison grossly unfair. At a discount price of $69.00 or so for either QUICK BASIC or TURBO BASIC, anyone can afford to compile BASIC programs for use with a math coprocessor. These programs are then no slouch when compared with anything else out there. I timed a few on my equipment.

Comparison of computing speed, 50 segment antenna of Ref 1.

MININEC version	Compiler language	Micro/ clock(mHz)	Solution time(sec)	Impedance
MININEC3	PC BASIC	8088/8	1191	?
MININEC3	MSFORTRAN4.1	8088/8	197	?
MININEC3	QB87v4.0	80286/10	140	134 -j 364.4
MININEC3	QB87v4.0	80386/25	129	134 -j 364.4
MININEC2	MSFORTRAN3.3	80286/10	298	116.8 -j 336.1
MININEC2	QB87v3.0	80286/10	299	134 -j 364.4
MININEC2	MSFORTRAN3.3	80386/25	214	116.8 -j 336.06
MININEC2	QB87v3.0	80386/25	268	134.0 -j 364.4

I don't have the identical equipment and compiler software as Ref. 4, however, from the Table, there seems to be the greatest improvement in speed by using MININEC3 rather than MININEC2. For the record, my version of MININEC2 MS FORTRAN3.3 is from RF Design Magazine Library. The first 2 lines of the Table are from ref. 4. My 80386 machine is using a 12 mHz 287 coprocessor. Note also that my MININEC3 QB87v4.0 can use up to 50 wires and 225 segments.

REFERENCES

1. Sussman-Fort, Stephen E., *"TAME, Top Algorithms for Microwave Engineering"*, Spefco Software, 18 Bennett Lane, Stoney Brook, NY

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Ted Roach, President
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Leesburg, VA 22075

BIO

Mr. Roach has more than 30 years of engineering practice, primarily at the senior level. His background predominately includes research, development and design in the areas of communications and control. He has considerable experience in the area of small size, low power design, specializing in the miniaturization of advanced RF subsystems using state-of-the-art techniques and components. Mr. Roach is knowledgeable about all the phases of a project, including proposal writing, contract negotiation, engineering design and test, and final production and delivery.

Mr. Roach was an ACES Founder and served as first Chairman of the Software Exchange Committee. Since 1979 Mr. Roach has been President of Microcube Corp. in Leesburg, VA. Prior to that he worked at HDS and Telcom Corporations, and DECO Electronics. He recieved a BSEE in 1962 and the MSEE in 1966 both from George Washington University.

DISPLAY OF CURRENT MAGNITUDE AND PHASE ON WIRE-GRID MODELS

The Numerical Electromagnetics Code NEC-2 package for the VAX includes a plotting program for the geometry and the currents on three dimensional wire structures. This program, called NECPLOT enables one to display the real and imaginary parts of the current on the structure by means of arrows that are of proportional size to the quantity being plotted. Although this information is useful in some respects, it does not give physical insight into the actual current distribution on the structure. In the way NECPLOT was originally configured, the arrows changed direction merely when there is a sign change in the quantity I_{real} or I_{imag} that is being plotted. What would be useful in practical situations is the presentation of current magnitude and phase.

We therefore modified NECPLOT so that it can plot the magnitude of the current specifically. The size of the arrows is made proportional to the log of the normalized current, as in the original program. Logically, too, the arrows should change direction when the phase of the current changes from positive to negative and vice versa, so NECPLOT was also modified to do that. This type of display will not only show current magnitude, but will also give a very good indication of how the current is flowing on the structure. For wire-grid models, this is probably just as useful as sophisticated current contour plots that are sometimes not available in the public domain.

The following changes were made to the code:

1. A new command 'AM' was introduced to display current magnitude. Two IF statements were added to subroutine DAPLOT2:

```
IF (AIN.EQ.'AM') GO TO 130
IF (AIN.EQ.'AM') IAROW=3
```

2. Two arrays CMAG and CPH were added in subroutine REDOUT for current magnitude and phase. COMMON and READ statements are changed accordingly.

3. Maximum of current magnitude CMAGMAX is found in the same subroutine by adding the two statements:

```
CALL MINMAX (CMAG,N,AMIN,AMAX)
CMAGMAX=AMAX1 (ABS(AMIN), AMAX)
```

4. Added the following statement in subroutine PLOTVU for displaying the current magnitude:

```
IF (IAROW.EQ.3) CALL AROWS (CMAG,CRIMAX,CPH)
```

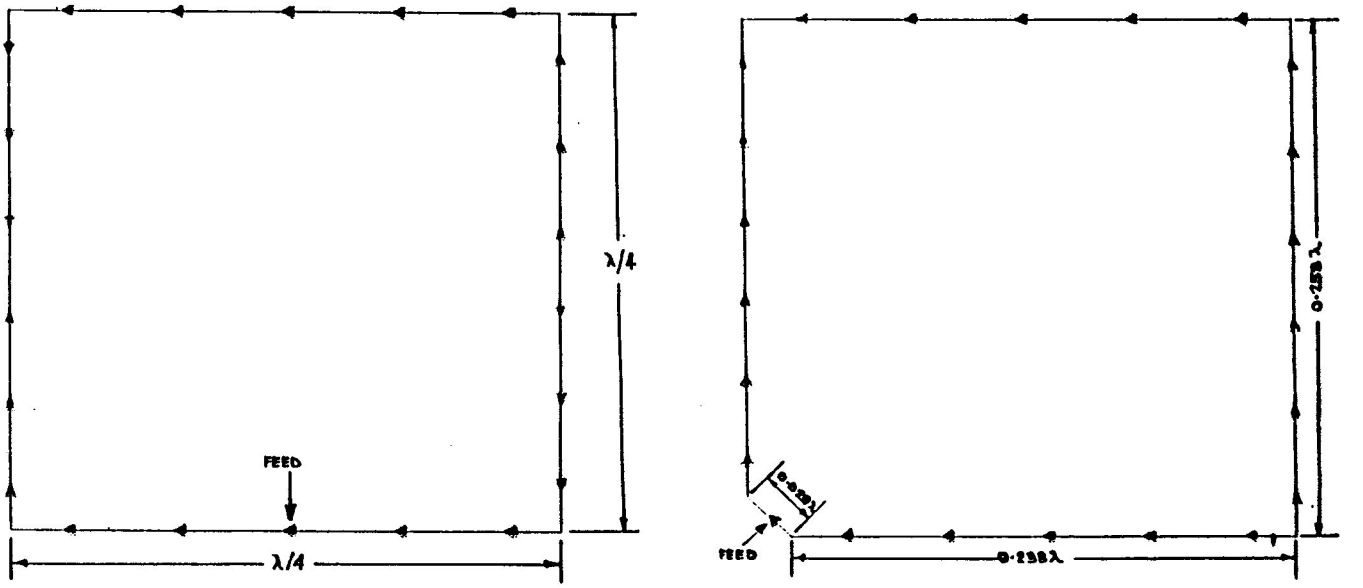
5. In subroutine AROWS the following statements were added so that the arrows showing current magnitude follow the sign of the current phase:

```
COMMON/CURR/CPH(2000)
APH=B(IP)
AS1=SIGN(1.,APH)
IF(IAROW.EQ.3)THEN
XT=AS1*SCALA*XT/EL
YT=AS1*SCALA*YT/EL
ELSE
XT=AS*SCALA*XT/EL
YT=AS*SCALA*YT/EL
END IF
```

Note that B is the current phase array.

In the figure below we show the use of this new current plot for two cases of a thin-wire ($a=10^{-5}$m) square loop. In the first case the loop with quarter-wavelength sides is fed at the center of the lower horizontal side whereas in case two the feed is at a corner. The effects of this on current magnitude and phase are clearly evident.

Riyadh Najm and Brian Austin
The University of Liverpool, U.K.



MODIFICATION OF NECBSC TO ALLEVIATE MACHINE DEPENDENCY FOR SOME USERS

NEC-BSC is an electromagnetic scattering code developed by the Ohio State University. It uses Geometrical Optics and GTD to solve high-frequency electromagnetic scattering problems. Ohio University and other users have noticed machine dependencies in version 2.1. While version 2.27 corrected some errors and helped some users, it is recommended that the following change be made to further reduce machine dependencies.

The following is a segment of subroutine EXECUT, the subroutine called by the XQ: card.

```
      SUBROUTINE EXECUT (I,J,K, ... ,EDRC, HDSC, CDSC)

C!!! LOOP THRU MAJOR GTD GROUPS
C!!!          K=1   DIRECT FIELD
C!!!          K=2   PLATE FIELDS
C!!!          K=3   CYLINDER FIELDS
C!!!          K=4   PLATE-CYLINDER INTERACTION FIELDS

      .
      .
      DO 1150  K=KB, KE, KS
      JB=1
      JE=JMX (K)
      .
      .
```

Since KS is a positive integer and KE is greater than KB, the fields that typically have a larger numerical value are computed first. The smaller field components are then added. The author suggests that this order should be reversed because the answers generated may be machine dependent. The line affected is prefixed with an asterisk.

```
C!!! LOOP THRU MAJOR GTD GROUPS
C!!!          K=1   DIRECT FIELD
C!!!          K=2   PLATE FIELDS
C!!!          K=3   CYLINDER FIELDS
C!!!          K=4    PLATE CYLINDER INTERACTION FIELDS
      .
      .
*     DO 1150  K=KE, KB, -KS
      JB=1
      JE=JMX (K)
      .
      .
```

The many small interaction terms are computed first, then the larger field is added to this number. The reason for doing this is suggested by the following example:

```
      Case A                          Case B

      X = 0.                          X = 1.
      DO 10  I = 0,  10000            DO 10  I = 0, 10000
      X = X + 1E-9                    X = X + 1E-9
10    CONTINUE                  10    CONTINUE
                                      X = X - 1
```

In Case A, the answer will be 1E-5. In Case B, the answer will depend on the word size of the machine.

There are many diffraction and multiple-scattering terms to be calculated. Each one is numerically less than the direct field, typically much less. From a numerical point of view, the small terms contribute very little individually. Their combined effect may be substantial. It is recommended that the lesser field terms (K > 1) be computed first by working through the loop in reverse order. This has minimal impact on the program's structure and no impact on run time. It is expected that the results will be more accurate using this structure.

If other modifications have been performed, care must be taken so that the loop is reversible. The loop should calculate only those field terms that the user specifies, and no others.

Ohio University has run the code hundreds of times with this modification and observed no problems.

Frank Marcum
Ohio University
Athens, OH 45701

APPLIED ELECTROMAGNETICS ENGINEERING
presents

I-NAC-3
AN INTERACTIVE ANTENNA SOFTWARE PACKAGE

I-NAC-3 (Interactive Numerical Antenna Code, 3-term basis functions) is a professional general purpose antenna CAE system for frequency domain and time domain analysis (and synthesis) of arbitrary complex 2D and 3D objects modeled by linear segmented wire frame structures.

A multitude of antenna applications in the frequency-domain ranging from audio to microwave frequencies (10 KHz - 10 GHz) is completely addressed by the package.

Major areas of application:

Broadcast antennas (VLF to VHF range)
Broadband antennas
Waveguide antennas
Ship-board antennas (incl. superstructure)
Satellite antennas (incl. platform)
Direction finding antennas
Particle-beam sensors
Near-field analysis
Radiation hazard analysis
System radiating interaction
Electromagnetic compatibility (EMC)
Electromagnetic interference (EMI)
Electromagnetic pulse problems (EMP)
Electromagnetic education (EME)

General highlights:

HP 9000/300/800 (HP-UX), VAX, mainframes
User-friendly interactive operation
Extensive error checking during data entry
Integrated standard 3D generators
User-definable geometry generators
Unrestricted symmetry handling
Time-optimized and memory-minimized code
Numerically stabilized algorithms
Multi-tasking, multiuser operation
Multiple background operation mode
Networking and remote host operation
HP plotters and Laserprinter support
High resolution bitmapped color graphics

Time-domain analysis is available via transformation of frequency domain data to the corresponding time-domain representation based on the very effective discrete Fast Hartley Transform (FHT).

Mathematical Model

The underlying mathematical model is based on Pocklington's Electric Field Integral Equation (EFIE) which is solved by the method of moments combined with the point matching technique utilizing 3-term hyberbolic basic functions of complex arguments. This offers handling of arbitrary material constants of the antenna conductors as well as isotropic propagation media. Air-ground interface problem is currently

addressed by the RC approach, but will soon be extended to the Sommerfeld technique. I-NAC-3's numerical approach uniquely satisfies the physical boundary conditions without incorporating artificial or unrealistic constraints other than structure segmentation.

Program Description

The highly portable I-NAC-3 system is functionally separated into 3 fully self-contained modules: the pre-processor NAC-PRE, the system engine NAC-ENG, and the post-processor NAC-PST. While these basic modules are appropriate for batch mode operation, interactive operation of the package in a workstation environment is provided by means of an additional interaction module NAC-IAC.

Pre-processor

NAC-PRE offers increased productivity through simplified data input preparation. The input procedure has been particularly tailored for data input of very large and complex antenna systems, offering:

Macro driven and easy to read data input
Free forms data input
Extensive input data checking
Built in library of 3D geometry mesh generators
Merging of separate input data files
User interactive modification
Integrated 'vi' editor
Powerful graphics capabilities for data display
Standardized I/O format for external data interchange

A variety of tools are provided by the pre-processor to help the user set up the input geometry data and display and check the topographic model in the most convenient and economical way. The graphics capabilities allow for rapid plotting of the antenna geometry data on the graphics screen, plotter or LaserJet printer.

Program Kernel

The kernel or engine module NAC-ENG is capable of running separately in a multi-tasking environment. This feature enables the user to run NAC-ENG in multiple quasi-concurrent background processes for increased throughput or via LAN on remote host systems when time consuming jobs with heavy demand on large storage capacity are required. The numerical algorithms have been streamlined for minimum storage requirements and fast execution as well as minimum error noise propagation and are therefore specially suited for the seven digit single precision environment of UNIX-like operating systems.

Post-processor

NAC-PST offers a steadily increasing number of output options, user selectable from a variety of softkey menus. The output can be chosen interactively in either numerical (printed) form for accuracy purposes or in graphical form for quick and comprehensive overviews. The far-field and near-field modules being part of the post-processor also facilitate the multiple background operation mode, hence freeing interactive operation from time consuming number crunching blockage.

Far-field diagrams for all field components
- Magnitude and phase patterns
- Plots in polar or rectangular form
- Linear, lin-log or logarithmic scale
- Gain over frequency

Near-field distribution for all field components
- 1, 2, or 3 dimensional plots
- Plots in vector and contour form

Current and charge distribution
- 1-dimensional, all or selected segments
- Colorcoded 3D perspective form (future)

Impedance and loading
- SMITH chart (for multiple sources)
- VSWR plots
- Peak load voltages and currents

Interactive rerun capability
- New geometry
- New incident field excitation
- New frequency (including sweeping)

Time step plots (time domain option)
- Current and charge distribution
- Near-field distribution

Automatic disk file store and recall capability of
- Input data
- Geometry data
- Current coefficients
- Impedances
- Far-field data
- Near-field data
- Backup and archive features
- ASCII formatting for file interchange

As with the pre-processor, NAC-PST's extensive color graphics capabilities support the graphics scree HPGL plotter and LaserJet printer (color dot matrix printers will be supported soon. Printer outp options include a user configurable 80 column or 132 column format.

Specifications:

(Based on 8 Mb RAM available in a 7-digit (32 bit) single precision UNIX workstation environment)

Maximum number of nodes	4000
Maximum number of segments	4000
Maximum number of excitations and loads	500
Maximum number of frequencies	500
Maximum order of system matrix (in core)	1000

Additional RAM will increase the maximum numbers accordingly.

The maximum order of the off-core system matrix depends on the hard disk storage capabilities. The maximum allowable dimensions are user configurable and dimensions may be traded against each other in order to most economically utilize the maximum available RAM.

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CAEME COLUMN

It is fair to state that the NSF/IEEE CAEME Center is enjoying a great start during its first year of operation, and that it is on its way to establishing a successful project that will have a lasting impact on electromagnetics education. It is true that it took us a few months to realize the depth of the CAEME project, but we have climbed a long way on a steep slope, gained experience and new knowledge, and we are confident that the project is on the right track towards a successful center.

The CAEME Center took major steps towards accomplishing its first year's commitments to NSF. We published a catalog for available software for EM education, thus far held two workshops and one special session in AP-S symposia, and provided grants to 12 projects to develop software for CAEME distribution. We also established strong efforts to strengthen the financial base of CAEME and hopefully achieve its self-supporting status after the three years of NSF funding. Thus far, we have three participating societies including AP-S, MTT-S and ACES, and two sponsoring companies, Hewlett Packard and Motorola. We prepared a very handsome brochure that describes the center's objectives and organizational structure to help attract industrial and society participation in the Center.

Let me briefly share with you some of the events sponsored by CAEME in the last few months.

1. 1990 Workshop in Dallas

On May 11, 1990, CAEME organized its second workshop on "Computer Applications in Electromagnetics Education" in conjunction with the AP-S symposium in Dallas. In our first workshop, held in San Jose, June 25, 1989, we covered a wide variety of topics to help publicize the activities and identify available software. In the Dallas workshop, however, we focused on issues critically important to CAEME development. From the agenda listed below, you may see that truly distinguished members of our society participated in this workshop and CAEME and I wholeheartedly thank them for their generous efforts and support. In all, 47 people participated in the workshop and representatives from several European countries including England, France, Spain, Finland, and Belgium, were also present.

Agenda of 1990 Workshop

Welcome — A. T. Adams (Syracuse)

CAEME Progress Report — M. F. Iskander (Utah)

Curriculum Development and Future Needs

Professor Chalmers M. Butler (Clemson)
Professor Leo Felsen (Polytechnic University of New York)

Standards in Software Development and Documentation

Professor Roger F. Harrington (Syracuse)
Dr. Thomas Reeder (EEsof)

Computer-Based Microwave Laboratory

Professor Tim Healy (Santa Clara)

Evolving Technologies and Their Impact on EM Education

Dr. Ross Stone (MDTI)
Professor Don Wilton (Houston)

Additional Presentations/Demonstrations

Dr. Zvonko Fazarinc (HP)
Professor N. N. Rao (Illinois)
Professor Y. Rahmat-Samii (UCLA)
Professor R. Compton (Cornell)
Professor R. C. Cole (UC Davis)
Professor M. Zahn (MIT)
Professor A. A. Read (Iowa State)

After the brief introduction of the activities of the CAEME Center, Professor P. Clarricoats inquired about international participation and Professor R. E. Collin thought it would be of great asset to CAEME to encourage such participation. I am very happy to report that the Policy Board, in its June 20 meeting in Salt Lake City, approved international participation subject to the general NSF and IEEE guidelines regarding this matter.

Another important event in the Dallas Workshop was the distribution of free copies of five software packages for educational institutions attending the workshop. Distributed packages include Touchstone from EEsof, AppCAD from Hewlett Packard, software for "Elements of Engineering Electromagnetics," by Professor Rao of the University of Illinois, and several copies of new Puff. Dr. Zvonko Fazarinc, of Hewlett Packard, agreed to send copies of RMG (Real Time Graphics) to educators who have the HP computers required to run this software.

2. Special Session in the 1990 AP-S Symposium

In addition to the workshop, CAEME organized a special session on "Innovations in Engineering Education" in the 1990 AP-S symposium in Dallas. Excellent presentations were made including NSF programs in *Engineering Education, Computers use in Teaching Concepts, Experimental Demonstrations for Teaching Electromagnetics, Computational Electromagnetics for Classrooms, ATHENA Project at MTT, Visual Electromagnetics using Mathematica and Hypercards* to name a few. The complete program is included in the AP-S 1990 digest and I would like to encourage you to contact the authors or let me know if you need additional information. I was gratified with the attendance in this special session which during some presentations exceeded 120 people. Obviously, the special session served a different purpose from that of the workshop. The special session provided a focus on new developments while the workshop was a forum to swap software and discuss issues crucial to CAEME development and faculty participation. We plan on continuing this approach of sponsoring both workshops and special sessions as long as we continue to attract the high level of interest that we witnessed in the last two AP-S symposia.

3. **CAEME faculty meeting in conjunction with the 1990 AP-S Symposium:**

During the Dallas symposium, a CAEME faculty meeting was held on Thursday, May 10, from 6:00 to 9:00 P.M. The meeting was scheduled between the special session on Thursday afternoon and the workshop on Friday to capitalize on the presence of CAEME faculty who are not members of AP-S and attended the symposium specially to participate in the CAEME educational activities. The purpose of the faculty meeting was to organize working groups and help build the infrastructure towards an active and self-supporting CAEME after the NSF funding. Fifteen people attended the meeting including Professor Robert E. Collin, Professor Roger F. Harrington, Professor Chalmers M. Butler, Professor Leo B. Felsen, Professor Tim Healy, Professor Markus Zahn, Professor Jim Kirtley, Dr. Ross Stone, Professor Y. Rahmat- Sami, Dr. Zvonko Fazarinc, Professor Al A. Read, Dr. Tom Reeder, Professor Rodney W. Cole, Professor N. N. Rao, and I. The group discussed curriculum needs, standards, and efforts towards a self-supporting CAEME. As a result, four subcommittees were formed to further discuss these issues and make recommendations to the Center. These committees are:

Curriculum Development and Future needs (Professor A. T. Adams, Chair)

Computers in Microwave Laboratories (Professor Tim Healy, Chair)

Financial Subcommittee (to help create a self-supporting CAEME, Dr. Ross Stone, Chair).

Standards in Software and Documentation (Dr. E. K. Miller, Chair)

We are hopeful that each subgroup will prepare a position paper including objectives, specific aims and method of procedure including a budget request. To this end, your participation by joining these groups and/or by sending your thoughts and ideas to the group chair, would be greatly appreciated. Please let me know if I can be of assistance.

4. **1990 Grants for Software Development**

The CAEME Center allocated the major part of its NSF grant to support software development projects at universities across the country. The developed software will be distributed free of charge to universities, participating companies and professional societies. It is also expected that the developers of the software will contribute chapters in one of the CAEME books. These books will include copies of the developed software on diskettes.

The request for proposals was sent out to all EE departments in the US universities (using the NEEDHA list), and was also published in the May 1990 issue of the IEEE Spectrum, AP-S magazine, and ACES newsletter. The deadline for submitting proposals was May 30, 1990. As a result of these adds, CAEME received 30 proposals from 29 universities. These proposals were sent out in groups for review by truly distinguished members of our society including Professor R. E. Collin, Professor A. T. Adams, Professor C. M. Butler, Professor W. Stutzman, Dr. Z. Fazarinc, Professor Tim Healy, Professor T. Sarkar, Professor O. Andrade, Professor A. Elsherbeni, and Professor R. W. Cole. I also read all the proposals and provided some suggestions. Together with the proposals we provided evaluation forms which included guidelines for evaluation similar to those routinely used by NSF. These guidelines include the broad and significant impact of the proposed work on electromagnetics education, matching funds/release time commitments, commitment of the PI to write a chapter in one of CAEME's books, and adherence to software and hardware set standards which include the use of FORTRAN or C for software development and IBM PC and its clones for hardware.

The review process resulted in recommending 17 projects for funding. CAEME had NSF funds to support six projects. The Policy Board decided to use some of the funds raised from participation by societies and sponsorship by companies as well as ask the PI's to submit a lean budget to help support as many as possible of the 17 recommended proposals. Thus far we have been able to finalize arrangements with the PIs of the following 12 proposals:

List of EM Software Development Projects Funded by CAEME in 1990

1. Mac EM	Karl E. Lonngren	University of Iowa
2. Lienard-Wiechert Field Generator and Hypercard Tutorial for Visual Electromagnetics	Rodney E. Cole	University of California, Davis
3. Preparation of Computer-Aided Instructional Materials for Teaching Undergraduate Electromagnetics: Integral Equations and Numerical Solution Methods	Chalmers M. Butler and Don R. Wilton	Clemson University University of Houston
4. An Interactive Software Package for Teaching a Course on Computational Electromagnetics	Magdy F. Iskander and Octavio Andrade	University of Utah
5. An Interactive Menu-Driven Software Package to Solve Static, Sinusoidal Steady-State and Transient 2D Electromagnetics Problems	Jovan E. Lebaric	Rose-Hulman
6. Simulator for Signal Propagation on General Multi-conductor Transmission Lines	Lawrence Carin	Polytechnic University
7. Electromagnetic Waves: A Software Package	Warren L. Stutzman	Virginia Polytechnic Institute
8. Nuline: A Time- and Frequency-Domain Transmission Line Analysis Program	Frederick M. Tesche	Tesche Associates
9. Computer-Aided Instruction for Theory and Design of Linear Antenna Arrays	S. J. Blank and S. L. Wang	New York Institute of Technology
10. Analysis of TE and TM Modes in Arbitrarily Shaped Waveguide Structures Using Finite-Difference and Conjugate-Gradient Methods	Tapan K. Sarkar	Syracuse University
11. 3D: A Software Package Providing Three-Dimensional Antenna and EM Field Displays on Personal Computers	John C. McKeeman	Virginia Polytechnic Institute
12. Analysis and visualization of EM fields inside cylindrical waveguides	A. Z. Elsherbeni	University of Mississippi

We are still trying to fund 3 or 4 more proposals.

Before we leave this section, I want to express my gratitude to the reviewers for doing an outstanding job including reviewing groups with as many as 12 proposals in a week. Also the willingness of the PI's to work within a tight and lean CAEME budget (hopefully only in this first year) was greatly and wholeheartedly appreciated.

5. Society Participation and Corporate Sponsorship

According to CAEME's commitment to NSF, the center will be active and self supporting after the three years of NSF funding. For this reason, CAEME initiated a strong fund-raising activity to help attract participation by professional societies and sponsorship by companies. Presently, society members are AP-S, MTT-S, and ACES; industry sponsors are Hewlett Packard and Motorola. Mr. Gary Wojcik of Motorola at Austin, attended the June 20 meeting of the CAEME Policy Board and subsequently arranged for Motorola to pay the $5,000 membership fee and an additional $5,000 to help CAEME fund the list of 17 projects recommended for support. We are grateful for Gary's efforts and wholeheartedly thank him and Motorola for their support of electromagnetics education.

To help us communicate CAEME objectives and organizational structure, we developed a brochure that includes quotes from key players in the center. We will be delighted to send copies of this brochure to potential sponsors, just let me know where to send them.

6. Future Activities

a. 1990 CAEME Book

The most important remaining activity for 1990 is to publish the first CAEME book that includes copies of software on diskettes, and to organize the 1991 workshops and special sessions. Regarding the book, an outline of the table of contents has been prepared and will be submitted to Professor R. E. Collin, Chairman of the group of Technical Advisors, for evaluation and suggestions. The book will include some of the developed software as a result of CAEME funding, as well as other packages whose developers have kindly agreed to share it with CAEME.

A detailed list of the prepared table of contents will be published in the next CAEME Column in this magazine. In the meanwhile, if you have any suggestions, please let us know, we will be delighted to hear from you.

b. 1991 Workshops and Special Sessions

I am particularly delighted to announce that CAEME has been invited to organize workshops and/or special sessions in four 1991 symposia. Besides the continued support by AP-S and ACES, MTT-S, and PIERS have invited CAEME to participate in their symposia. It is expected that CAEME will sponsor workshops and special sessions in both AP-S and PIERS and workshops or special sessions in each of the ACES and the MTT-S 1991 symposia. The level of interest in EM education is extremely high, and we will be delighted to include as many contributions as practically possible. I would like to particularly encourage presentations from our colleagues from overseas, and extend invitations to those of you who have ideas on curriculum development and future needs. Please send brief summaries of contributions for possible inclusion in these special events as soon as possible. Based on some past experiences, let me indicate at once that CAEME is in no position to provide travel support. Most of CAEME's funds were allocated to support software developments. Maybe in the future and as we continue to build the financial base the situation may change. In the meanwhile, let us pull together and help in arranging successful 1991 workshops and special sessions so CAEME will continue its successful tradition and strong commitment to education. You ideas and suggestions are most welcome.

As in the last workshop, I will try my hardest to arrange for as many software packages as practically possible to be distributed free to the attendees of these special events. Now that CAEME has obtained final approval from RADC to distribute GEMACS and GAUGE to qualified universities, maybe some free copies of these powerful packages will be made available on a drawing basis. Also, many of CAEME's development projects would have been completed by then, and you may obtain pre-publication copies at these symposia. Please give me a call or send me a note of your proposed talk, and I will be delighted to discuss it with you to help us put together the best possible program that will hopefully be of broad interest and have a lasting impact on EM education.

Concluding Remarks

The NSF/IEEE CAEME Center has been in operation for less than a year. I am very proud of the Center's accomplishments in this short period of time. Its extensive list of Policies and Operating Procedures has been set and significant progress has been made in all tasks proposed to NSF. This includes publication of the catalog, sponsorship of workshops and special sessions, providing seed funds for software development projects, fundraising, and taking major steps towards the publication of the first CAEME book. To help build the infrastructure, working groups in the areas of curriculum needs, standards, computers in laboratories, and towards a self- supporting CAEME, have been organized. To this end, your involvement by expressing opinions, providing suggestions, and working as a member of these organized groups is crucial to CAEME's success and would be wholeheartedly appreciated. We have a unique and grand opportunity to boost EM education by successfully organizing the 1991 workshops and special sessions. Once again, your participation is crucial so please let me know of your interest. I am looking forward with pleasure to your response and continued cooperation.

Magdy F. Iskander
University of Utah

[For a biography and photo of Dr. Iskander, see pg. 32 of the March 1990 ACES Newsletter. - Editor]

ADVERTISEMENTS

THE APPLIED COMPUTATIONAL ELECTROMAGNETICS SOCIETY

is currently accepting

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Paid advertisements that may be of interest to the ACES membership are:

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	1/4 page	$ 50.	3.5" x 4.7"

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To place an ad, contact Paul Elliot, Newsletter Editor, ARCO, 1250 24th St. NW, Suite 850, Washington, D.C. 20037 USA. (202)223-8808. The editor reserves the right to reject ads.

EIGHTH COMPUMAG CONFERENCE
on the
COMPUTATION OF ELECTROMAGNETIC FIELDS

Sorrento, Italy, July 7-11, 1991

The Eighth COMPUMAG Conference on the Computation of Electromagnetic Fields will be held in Sorrento, Italy from July 7 to July 11, 1991. Previous COMPUMAG Conferences were held in Oxford, U.K. (1976), Grenoble, France (1978), Chicago, USA (1981), Genoa, Italy (1983), Fort Collins, USA (1985), Graz, Austria (1987) and Tokyo, Japan (1989).

The aim of the conference is to discuss recent developments and practical applications in the numerical computation of electromagnetic fields for physicists and engineers engaged in the design of electromagnetic devices. Reflecting the new trends and rapid progress in the field, the presentation of papers on inverse problems, coupled problems and parallel computing in applied electromagnetics is encouraged. Prominent speakers will be invited to present overviews and focus attention on future trends in areas of interest to the conference.

Short versions of papers are due by November 15, 1990. Full versions of papers are due at the conference. A digest of short versions of the papers accepted for the conference will be made available to all participants at the start of the conference. The Conference Proceedings will be published in IEEE Transactions on Magnetics. All submitted manuscripts, invited as well as contributed, will be evaluated by peer reviewers to determine their suitability for publication.

An on-line computer display and exhibition of both commercial and university/research organizations is planned during the conference.

Persons or organizations who desire further information on the conference should contact:

COMPUMAG - Secretariat, Dipartimento di Ingegneria Elettrica
Universita di Napoli "Federico II", Via Claudio, 21
I-80125 Napoli, Italy, Fax: +39 81 616897

ANNOUNCING

A SPECIAL ACES PUBLICATION

The ACES Collection of Canonical Problems — Set 1

Guest Editor: Harold A. Sabbagh

The problems range in frequency from 10 GHz to 900 Hz, and they include penetrable as well as perfectly conducting bodies. They include diverse applications — radar cross section to nondestructive evaluation and even inverse scattering. Both transient excitation and sinusoidal steady-state excitation problems are included.

Solutions to these problems — and also to TEAM Workshop problems — will be presented and discussed at a series of international workshops. The workshops will be sponsored jointly by TEAM and ACES.

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1991 2nd Call For Papers 1991

The 7th Annual Review of Progress in Applied Computational Electromagnetics

March 19-21, 1991

Naval Post Graduate School, Monterey, California

DEADLINE FOR ABSTRACT SUBMITTAL - DECEMBER 1, 1990

The purpose of this annual review is to bring analysts together to share information about the practical application of EM analysis using computational methods. Contributions by both users and developers of electromagnetic modeling tools are solicited pertaining to experience gained in practical applications. Papers about the solution of practical EM problems encountered in design or problem solving are of particular interest. This symposium also provides a forum for discussion of code enhancements and the development of new techniques and codes. Suggested topics include:

APPLICATIONS	NUMERICAL METHODS	CODE DEVELOPMENT
Antenna Analysis	Differential form methods	Field Codes
EMC/EMI	Integral form methods	NEC
EMP, shielding, radiation effects	Method of Moments	GEMACS
Impulse and transient analysis	Finite Element methods	System Compatibility Codes
Propagation and Scattering	Finite Difference methods	IEMCAP
m- and mm-wave components	GTD and FTD methods	SEMCAP
EM machines and devices	Spectral Domain techniques	AAPG
Power Transmission	Low & high frequency issues	COEDS
Accelerator design	Time Domain techniques	Time Domain Codes
Biological applications	Hybrid techniques	Code Validation
Data interpretation	Perturbation multi-pole methods	CAD & auto-mesh generation
Code studies of basic Physics	New mathematical algorithms	Graphical I/O Techniques

Plan early for paper preparation and submittal. Prospective authors are required to submit four copies of an abstract describing their work for review by the program committee. Abstracts should be as complete as possible but must be limited to a single page, including figures. The initial screening for candidate papers is based solely on these abstracts. The abstract must clearly indicate the paper's value in order to be considered for publication. Therefore, it is essential that your initial submission be carefully prepared. A suggested format for both the abstract and technical paper is outlined below

1. Abstract and Paper format:
   a. Problems or Questions Addressed.
   b. Objective of your effort with regard to Problem.
   c. Approach you employed to achieve Objective.
   d. Progress, Work Performed.
   e. Results and/or Conclusions Reached.
2. For each author:
   a. Name
   b. Work - mail address, phone no, and FAX no.
   c. Home - mail address and phone no.
   d. Brief professional biography.

The deadline for submission of abstracts to the Symposium Chairman is **December 1, 1990.** Authors of accepted presentations will be required to submit a camera-ready summary paper by **February 1, 1991** for publication in the conference proceedings.

1991 ACES Symposium Chairman
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Share your knowledge and expertise with your colleagues at the Applied Computational Electromagnetics Society's 7th Annual Review of Progress

The Annual ACES Conference is an ideal opportunity to participate in a large gathering of EM analysis enthusiasts. Whether your interest is to learn or share what you know, this conference is sponsored for you. In addition to technical publication the conference organizes live demonstrations, and short courses. All aspects of electromagnetic computational analysis are represented.

DEMONSTRATIONS	SHORT COURSES	VENDOR BOOTHS
Computer demonstrations	Numerical techniques	Product distribution
Software demonstrations	Computational methods	Small company capabilities
Poster papers	Surveys of EM analysis	Instruction
Keynote speakers	Code sage instruction	New commercial codes

If you wish to participate in these proceedings as an author, a vendor, or simply wish to demonstrate a new development, contact Frank Walker, the Symposium Chairman. Short Course presentations should be directed to Jay Rockway. The prepaid Conference Registration fee is $180.00 ($195.00 after March 10). Preliminary Short course topics and lecturers are listed on the next page. The average fee for short course attendance is anticipated to be $75.00 per person for a half day session and $100.00 for full day lectures.

The Applied Computational Electromagnetics Society

2nd Call For Papers

1991 1991 1991

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At the 1991 ACES Conference the NSF/IEEE CAEME (Computer Applications in Electromagnetics Education) Center will organize a special session of technical presentations on Computer Applications. Swapping of software packages will be organized in conjuction with the special session. In addition, booths will be dedicated to advertising, demonstrations, and the exchange of ideas. The special session will emphasize topids of interest to education/training, evolving computer technologies, and the latest in visual electromagnetics computation and analysis.

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PRELIMINARY

SHORT COURSE

ANNOUNCEMENT

FOR

THE 7TH ANNUAL REVIEW OF PROGRESS IN APPLIED COMPUTATIONAL ELECTROMAGNETICS

1. "Volume Integral Equations and Conjugate Gradient Methods in Electromagnetic Non-Destructive Evaluation". 1 day course by Dr. Harold Sabbagh

2. "Electromagnetic Analysis of Micro-strip". 1 day course by Dr. James Rautin

3. "The Essence of Electromagnetic Radiation". 1 day course by Dr. Robert Bevensee

   - Antenna theorems
   - Lower-bound bistatic RCS computations
   - Aperature excitation; Ziolkowski EM "bullet"
   - Maximization of directed radiation with an optimized antenna

4. "An overview of Several Topics in Electromagnetic Modeling". 1 day course by Dr. Edmund Miller and Gerald Burke

   - Interface modeling
   - Techniques for improving the efficiency of computations
   - Thin-wire time-domain modeling

5. "UTD and its Practical Applications". 1/2 day course by Dr. Ron Marhefka

6. "Introduction to GEMACS". 1/2 day course by Buddy Coffey

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are invited to attend to learn more about the causes of disruption of services, predicting the disturbances, and possible mitigation of severe effects.

(The symposium is unclassified and open to all interested organizations - military and civilian)