THE INSTITUTE OF MANAGEMENT SCIENCES

NEWSLETTER OF THE
TIMS College on Simulation and Gaming

DAVID KELTON and JOHN CARSON, CO-EDITORS

VOL. 8 NO. 3 FALL 1984

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NEW COLLEGE OFFICERS

Past Chairman Bill Biles reported on September 5, 1984 to Ms. Mary R. DeMelim, Executive Director of TIMS, that he received 28 ballots in the College Officer election, with the following results:

Chairman:

Bruce Schmeiser
School of Industrial Engineering
Purdue University
West Lafayette, Indiana 47907
(317) 494-5422

Vice-Chairman (and Chairman-Elect):

Lee Schruben
School of Operations Research and Industrial Engineering
Upson Hall
Cornell University
Ithaca, New York 14853
(607) 256-4856

Secretary-Treasurer:

James R. Wilson
Department of Mechanical Engineering
University of Texas
Austin, Texas 78712
(512) 471-3076
(As of January 1985, address will be: School of Industrial Engineering, Purdue University, West Lafayette, Indiana 47907, (317) 494-5405)

These elected officers will serve a term of two years (until June 30, 1986 or until an election is held to replace them).

Alan Pritsker (Pritsker & Associates, P.O. Box 2413, West Lafayette, Indiana 47906, (317) 463-5557), who is chairman of the Board of Directors of the Winter Simulation Conference, remains our representative to the WSC.

David Kelton (Department of Industrial and Operations Engineering, The University of Michigan, Ann Arbor, Michigan 48109, (313) 763-1412), the outgoing Newsletter Co-editor, has been named to the College Council. In addition, David has agreed to serve as the Awards Chairman for the coming year.

CHAIRMAN'S MESSAGE

For many years the College on Simulation and Gaming has been one of the most active Colleges of TIMS. We currently

– – sponsor sessions at both national meetings of TIMS/ORSA

– – sponsor the Winter Simulation Conference (with ACM, IEEE, IIE, NBS, ORSA, and SCS)

– – award a prize for the best paper on Simulation in **Management Science** each year

– – publish two or three **Newsletters** each year

As noted elsewhere, we are currently considering expanding the paper prize to all journals and are considering a new award for service.

CHAIRMAN'S MESSAGE CONTINUED

My goals for the next two years are relatively simple: To maintain our current activities with improved quality, and to clean up the procedures of the College.

The maintenance of the current activities is straightforward. Lee Schruben, as Vice-Chairman is responsible for organizing our sessions at the TIMS/ORSA Joint National meetings. Alan Pritsker represents our interests in the Winter Simulation Conference. David Kelton will handle the best paper award. Lou Moore and Barry Nelson will edit the **Newsletter**.

Cleaning up the procedures of the College, unfortunately, is also a job for relatively few people. If you have an interest in such a task, please let me know.

Finally, I want to take this opportunity to thank those whose efforts have brought the College to its current robust state. The last three Chairmen, Bob Sargent, Averill Law, and Bill Biles, are directly responsible for much of the activity and change. In addition, they served as the most recent nominating committee. Alan Pritsker has spent numerous hours as our representative to the WSC, for the last year as its Chairman. Lee Schruben has kept our records and finances in order for the last two years as Secretary-Treasurer. I am pleased that we now consistently publish the Minutes of each meeting in the **Newsletter**. As is obvious to almost all the members of the College, the quality of the **Newsletter** has consistently improved through the years, including the last two, under the co-editorship of David Kelton and John Carson.

Of course, the continued robustness of the College depends upon new people being active in the organization. I encourage you to attend the business meetings, to contribute your opinions and news to the **Newsletter**, and to contact me or any of the other officers with your comments and suggestions.

— — Bruce Schmeiser

NEW NEWSLETTER EDITORS

Beginning with the Spring 1985 edition, and for a period of two years, the **Newsletter** Editor will be

Louis Moore
School of Business Administration
University of North Carolina
Chapel Hill, North Carolina 27514
(919) 962-3196

and the Assistant Editor will be

Barry Nelson
Department of Industrial and Systems Engineering
1971 Neil Avenue
The Ohio State University
Columbus, Ohio 43210-1271
(614) 422-6239

Please send along news items, abstracts of papers, short course announcements, information on conferences and seminars, and any other items of potential interest to College members for inclusion in the Spring 1985 edition; the deadline is March 1, 1985.

CALL FOR NOMINATIONS FOR BEST PAPER AWARD

The TIMS College on Simulation and Gaming is accepting nominations for its annual award for the best paper dealing with computer simulation published in **Management Science**, Volume 30, 1984. The award consists of a plaque and $500, which will be presented at the Fall 1985 joint ORSA/TIMS national meeting in Atlanta. Written nominations should be sent to the awards chairman by March 1, 1985. The address is:

David Kelton
Department of Industrial and Operations Engineering
The University of Michigan
Ann Arbor, Michigan 48109

As noted in the Spring 1984 edition of the **Newsletter**, fewer than three nominations were received for the award covering 1983 (Vol. 29), so that those papers nominated for Vol. 29 will remain eligible for the current competition.

SESSIONS AT DALLAS ORSA/TIMS MEETING

The College is sponsoring the following sessions at the Conference, being held from Monday November 26 to Wednesday November 28 at the Loews Anatole Hotel:

MA17, Simulation Methodology
MB17, Microcomputer – Based Simulation Modeling
MC17, Statistical Aspects of Simulation

The following sessions may also be of interest to members of the College:

MB5, Simulation
MD1, Tutorial: Variance Reduction in Simulation
TA1, Tutorial: Computer Simulation Modeling
TB5, Simulation
TB17, Simulation
TC1, Tutorial: Simulation Support Systems
WB17, Simulation

SESSIONS AT DALLAS ORSA/TIMS MEETING CONTINUED

Also, please plan to attend the College Business Meeting from 6:00 to 7:00 on Tuesday Evening (November 27) in the Chambers room. The main agenda items are

(1) Vote on the proposed Service Award (see the Spring 1984 **Newsletter**).

(2) Vote on expansion of the Best Paper award to include journals in addition to **Management Science.**

If necessary, these items will be carried over to the College Business Meeting at the Winter Simulation Conference (see below).

The College's mixer will be held in Mike Taafe and Bruce Schmeiser's room in the Anatole at 9 PM on Tuesday November 27. The mixer is open to all.

1984 WINTER SIMULATION CONFERENCE

The Conference will be held at the Sheraton-Dallas Hotel & Towers from Wednesday November 28 to Friday November 30. Register before November 19 to obtain a $10 discount. Contact: Leland Blank, Industrial Engineering Dept., Texas A&M University, College Station, Texas 77843.

There will be a College Business Meeting, time and room to be announced. The agenda items may include those from ORSA/TIMS business meeting, as described above.

NEW BOOKS

Systems Publishing Corp. has published Alan Pritsker's **Introduction to Simulation and SLAM II**, Second Edition, which combines a general treatment of simulation with an introduction to the SLAM II simulation language. Contact: System Publishing Corp., P.O. Box 2161, West Lafayette, IN 47906, telephone (317) 463-5559.

Academic Press has published Bernard Zeigler's **Multifacetted Modeling and Discrete Event Simulation**, exploring the formalism of discrete event systems and applying it to design of computer bases for modelling methodology. Contact: Academic Press, 111 5th Avenue, New York, NY.

CONFERENCES

Statistical and Computational Problems in Probability Modeling, January 7-9, 1985, Williamsburg, Virginia. Contact: Professor Carl M. Harris, Dept. of Systems Engineering, University of Virginia, Charlottesville, VA 22901.

Modeling and Simulation on Microcomputers, Computer Simulation in Emergency Planning, and AI, Graphics, and Simulation, January 24-26, San Diego, CA. Contact: Society for Computer Simulation, P.O. Box 2228, La Jolla, CA 92039.

Annual Simulation Symposium, March 13-15, Tampa, FL. Contact: Professor John C. Comfort, Dept. of Mathematical Sciences, Florida University, Miami, FL 33199.

Working Conference on Knowledge-Based Modelling and Simulation Methodologies, July 1-5, 1985, Wageningen Agricultural University, Wageningen, Netherlands. Contact: Professor M. S. Elzas, Computer Science Dept., Wageningen Agricultural University, Hollandsweg 1, 6706 KN Wageningen, Netherlands.

System Simulation and Scientific Computation, August 5-9, 1985, Oslo, Norway. Contact: Dr. Rolf Henriksen, The Norwegian Institute of Technology, Division of Engineering Cybernetic, N-7034, Trondheim-NTH, Norway.

ABSTRACTS OF PAPERS

AN EXHAUSTIVE ANALYSIS OF MULTIPLICATIVE CONGRUENTIAL GENERATORS WITH MODULUS 231-1, George S. Fishman and Louis R. Moore III, Tech. Report UNC/ORSA/TR84/5, Curriculum in Operations Research and Systems Analysis, University of North Carolina, Chapel Hill, NC 27514.

This paper presents the results of an exhaustive search to find optimal full period multipliers for the multiplicative congruential random number generator with prime modulus 2^{31}-1. Here a multiplier is said to be optimal if the distance between adjacent parallel hyperplanes on which k-tuples lie does not exceed the minimal achievable distance by more than 25 percent for k=2, . . .,6. This criterion is considerably more stringent than prevailing standards of acceptability and leads to a total of only 414 multipliers among the more than 534 million candidate multipliers.

Section 1 reviews the basic properties of linear congruential generators and Section 2 describes worst case performance measures. These include the maximal distance between adjacent parallel hyperplanes, the minimal number of parallel hyperplanes, the minimal distance between k-tuples, the lattice ratio and the discrepancy. Section 3 presents the five best multipliers and compares their performance with those of three commonly employed multipliers for all measures but the lattice test. Comparisons using packing measures in the space of k-tuples and in the dual space are also made. Section 4 presents the results of applying a battery of statistical tests to the best five to detect local departures from randomness. None were found. The Appendix contains a list of all optimal multipliers.

STATISTICAL ANALYSIS UNDER SCHRUBEN AND MARGOLIN CORRELATION INDUCTION STRATEGY, Ardavan Nozari (School of Industrial Engineering, University of Oklahoma), Steve F. Arnold (Department of Statistics, Pennsylvania State University), and C. Dennis Pegden (Department of Industrial & Management Systems Engineering, Pennsylvania State University).

Schruben and Margolin (1978) have recommended a correlation induction strategy for a special class of multipopulation simulation experiments. In this paper we present methods for statistical analysis under that strategy.

ANTITHETIC VARIATES FOR MONTE CARLO ESTIMATION OF PROBABILITIES, Tom A. B. Snijders, University of Groningen, **Statistica Neerlandica**, Vol. 38, 1984, pp. 1-19.

This paper explores some possibilities for variance reduction by the use of antithetic variates when estimating probabilities.

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MULTIFACETED MODELING METHODOLOGY: GRAPPLING WITH THE IRREDUCIBLE COMPLEXITY OF SYSTEMS, Bernard P. Zeigler, Department of Computer Science, Wayne State University, **Behavioral Science**, Vol. 29, 1984, pp. 169-178.

The multifaceted modeling discussed in this article is an approach to simulation modeling that realizes that reality is complex, and that, although this complexity is not reducible, partial models can be constructed to aid decision making. This methodology recognizes the need to integrate partial knowledge and solutions obtained under the constraints imposed by disciplinary or problem-oriented perspectives. Various concepts that facilitate this integration are reviewed.

SYSTEM-THEORETIC REPRESENTATION OF SIMULATION MODELS, Bernard P. Zeigler, Department of Computer Science, Wayne State University, **IIE Transactions**, Vol. 16, 1984, pp. 19-34.

Abstract. The representation of simulation models, especially those expressed in discrete event languages, by means of system-theoretic formalism is reviewed. The important concepts of decomposition, static and dynamic structure, and state varible selection are explained and their implications for the design of simulation software explored. The system-theoretic approach is compared with other approaches to model representation derived from general software development methodology. Both simulation software design and systems theory may benefit by the challenges each raises for the other.