



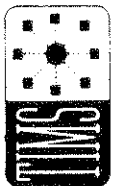
THE INSTITUTE OF
MANAGEMENT SCIENCES

NEWSLETTER OF THE
TIMS College
on
Simulation and Gaming

BARRY L. NELSON, EDITOR and DAVID GOLDSMAN, ASSISTANT EDITOR VOL. 11, NO. 2 FALL 1987

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COLLEGE ON SIMULATION AND GAMING
THE INSTITUTE OF MANAGEMENT SCIENCES
290 WESTMINSTER STREET
PROVIDENCE, RI 02903

FIRST CLASS

TIMS COLLEGE ON SIMULATION AND GAMING OFFICERS

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 Cornell University
 Ithaca, NY 14853
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BALLOT FOR PROPOSED BYLAWS

Please detach this ballot and mail to Lee Schruben, School of Operations Research, Cornell University, Ithaca, NY 14853, by November 1, 1987. The address label on the back of the ballot certifies your vote. The proposed Bylaws are reprinted later in the *Newsletter*.

_____ Favor adopting the proposed Bylaws.

_____ Oppose adopting the proposed Bylaws.

CHAIRMAN'S MESSAGE THE IMAGE AND IDENTITY OF SIMULATION

We have all heard from time to time comments that reflect a negative image of simulation held by some scientists and engineers outside our field. Simulation carries with it the image of unsophisticated brute force problem solving with ad-hoc "what-if?" experimentation. Simulation is frequently referred to as the "method of last resort"; the implication is that if the analysts were a bit brighter and/or better educated they would be able to develop analytical models rather than use simulation. The fact that analytically tractable models often oversimplify a problem and hence are not valid usually goes unmentioned.

Those not familiar with simulation tend to have the impression (reinforced by some advertisements for simulation packages) that it is little more than computer programming. If this were so, then becoming a simulation practitioner would merely require that one attend a short course in a simulation language. Thinking of simulation as simply computer programming is like thinking of statistics as only plotting data. Competent simulation users know that programming is only one part of an actual simulation study. Design and analysis of systems using simulation requires professional training beyond knowing a simulation programming language; it is this aspect of simulation that gives it its art and its intellectual identity.

Universities typically have at most one faculty member willing to teach simulation. Indeed, it is not unusual to have simulation included in a curriculum only as a small section of a survey course. The instructor of such a course may have little qualification and less interest in simulation. Finding more than one faculty member in the same department with a research focus in simulation is rare. We are not recognized as a specific discipline by any major funding agency and I know of no "Department of Simulation" at any university.

Slowly the image of simulation is changing. Professional journals in many disciplines now have special departments with an emphasis on simulation. Many corporations are forming groups with expertise in simulation. However, the negative images are still there.

Let me offer the following thought: any negative image of simulation held outside our field is largely our own doing. We all have a stake in the image of simulation and share in its creation. We should all be willing to accept and offer constructive criticism of our models, methods, and research. Tolerance of sloppy applications and irrelevant research hurts everyone involved with simulation. University professors and simulation practitioners should refuse to teach "language-level" simulation courses or short courses that gloss over fundamental issues and concepts. We should freely reject poorly communicated or weakly motivated research papers.

We should openly criticize engineering and scientific textbooks that present simulation as a "last resort." Simulation is widely recognized as often the only practical way of analyzing realistic non-Markovian models. Less appreciated is the fact that even when traditional numerical analysis methods are applicable, there are many reasonable situations where simulation is the most efficient approach. Increases in cheap computational power has made simulation the "technique of choice" for many problems in computational probability.

Distancing ourselves from commercialism and insisting on high professional standards will do much to improve our image. Simulation might then start to be recognized as an integral part of science and engineering with as much to offer, as, say, the field of statistics. To echo a comment in a recent textbook on simulation, the time is here to view simulation as a field in its own right.

Lee Schruben
Chairman

EVENT CALENDAR

October 25-28, 1987. ORSA/TIMS Joint National Meeting, Adam's Mark Hotel, St. Louis, Missouri. Contact Vicki L. Sauter, General Chairperson, School of Business Administration, University of Missouri, St. Louis, MO 63121, (314) 553-6281.

The College will sponsor three sessions in St. Louis: TD08 Variance Reduction Techniques (David Goldsman, Chairman); TE08 Simulation Methodology -- Modeling (Jorge Haddock, Chairman); WA08 Simulation Methodology (Keebom Kang, Chairman). Due to a scheduling change, the College business meeting in St. Louis will be held on Tuesday at 6:30 P.M. This is later than the usual meeting time.

December 14-16, 1987. 1987 Winter Simulation Conference, Buckhead Ritz Carlton Hotel, Atlanta, Georgia. Contact Hank Grant, General Chairman, FACTROL, Inc., 1305 Cumberland Avenue, P.O. Box 2569, West Lafayette, IN 47906, (317) 463-5559.

TREASURER'S REPORT

For the period 2/27/87 through 8/28/87 the College account had the following transactions, all at First Minnesota, Edina:

Balance Forward: \$13,205.89

Revenues:

Interest earned	393.51
Profit share for WSC '86	4,831.24
Sale of WSC '86 Proceedings	185.00
Total Revenues	5,409.75

Disbursements:

Spring '87 Newsletter	426.18
Reception at New Orleans TIMS/ORSA	202.30
Purchase of WSC '86 Proceedings	400.00
Travel for College Reps. to 6/87 WSC Board Meeting	167.46
Total Disbursements	1,231.94

Net (revenues - disbursements) (as of 2/26/87) 17,383.70

All funds are in a "Supernow" money market checking account at First Minnesota, since the rates on certificates are currently very low. In addition to these funds, the College has on account at TIMS Headquarters the sum of \$7.73, bringing the net worth of the College to \$17,391.43.

Respectively submitted,
W. David Kelton, Treasurer
August 28, 1987

MINUTES OF COLLEGE MEETING AT NEW ORLEANS TIMS/ORSA CONFERENCE

Held: May 5, 1987

Present: William Biles, Gordon Clark, Dave Goldsman, Mark Johnson, Keebom Kang, Barry Nelson, Reuven Rubinstein, Paul Sanchez, Robert Sargent, Bruce Schmeiser, Lee Schruben, Rajan Suri, Jeff Tew, Robert Wait, Jim Wilson

College Chairman Lee Schruben called the meeting to order.

1. In the absence of the Secretary/Treasurer, Chairman Schruben reported that the College has approximately \$15,000 in the treasury.
2. Vice-Chairman Jim Wilson reported that the College will sponsor three sessions at the ORSA/TIMS Meeting in St. Louis, and nine sessions at the TIMS/ORSA Meeting in Washington, D.C.
3. Jim Wilson also reported that there are six copies of the *Proceedings of the 1986 Winter Simulation Conference* available for students at a cost of \$35 each. If they are not sold to students, then they will be sold to others.
4. *Newsletter* Editor Barry Nelson announced that the *Newsletter* will publish a directory of electronic-mail addresses for interested College members.
5. Lee Schruben announced that, as of January 1, 1988, Steve Roberts will replace Alan Pritsker as the College representative to the Winter Simulation Conference Board.
6. New committee members: Steve Roberts replaces Bill Schmidt on the Outstanding Simulation Publication Award committee. Bruce Schmeiser replaces David Withers on the Outstanding Service Award Committee.
7. Ratification of the Bylaws was discussed. Bob Sargent moved that the Bylaws be published in the next *Newsletter* along with a mail-in ballot. The motion passed.
8. Gordon Clark reported that the Outstanding Simulation Publication Award Committee had selected "Confidence Interval Estimation Using Standardized Time Series," *Operations Research* 31, 1090-1108 (1983), by Lee Schruben. Clark read the following announcement: "The TIMS College on Simulation and Gaming presents its publication award to Lee W. Schruben for his conceiving of the standardized time series method of analyzing data. The basic work was published in the 1983 November-December issue of *Operation Research*. The basic paper has caused other researchers to investigate this new method of analysis and it has provided practitioners a new method for analyzing their data."
9. The meeting was adjourned, and a reception for Lee Schruben followed.

Respectively submitted,
Barry L. Nelson
(for W. David Kelton)

NEW BOOKS

Brian D. Ripley (1987), *Stochastic Simulation*, Wiley, N.Y.

Luc Devroye (1986), *Non-Uniform Random Variate Generation*, Springer-Verlag, N.Y.

ABSTRACTS OF PAPERS

W. Tina Song and Bruce W. Schmeiser (1987), "Dispersion Matrices and Optimal Linear Combinations of Variance Estimators of the Sample Mean," Research Memorandum No. 87-1, School of Industrial Engineering, Purdue University.

A classical problem of stochastic simulation is how to estimate the variance of point estimators, the prototype problem being the sample mean from a steady-state autocorrelated process. A variety of estimators for the variance of the sample mean have been proposed, all designed to provide robustness to violations of assumptions, small variance, and reasonable computing requirements. Evaluations and comparison of such estimators depend on the ability to calculate their variances.

A numerical method is developed here to calculate the dispersion matrix of a set of estimators expressible as quadratic forms of the data. The method separates the analysis of the estimator type from the analysis of the data type. The analysis for overlapping batch-means estimators is developed, as is the analysis for steady-state first-order autoregressive data. A closed-form expression for iid data and overlapping batch-means estimators is obtained. Numerical results are discussed for optimal linear combinations of overlapping batch-means estimators when used with iid data.

Bennett L. Fox (1987), "Numerical Methods for Transient Markov Chains," Technical Report, University of Montreal.

The setting is finite-horizon, continuous-time Markov chains. We consider four standard classes of problems and compare deterministic numerical procedures and simulation in each case via their computational complexities. Truncating infinite series or iterative schemes allows nonvacuous complexity estimates for all approaches while introducing only slight bias. For each class, we team up uniformization with simulation and with known deterministic schemes. We also combine the original (non-uniformized) generator with matrix exponentials. No method dominates globally. We discuss numerical stability and briefly consider state aggregation and links to dynamic programming.

Bennett L. Fox (1987), "Gradient Computation for Transient Markov Chains," Technical Report, School of Operations Research and Industrial Engineering, Cornell University.

In the setting of finite-horizon, continuous-time Markov chains we show how to compute gradients by solving a system of differential equations. We briefly compare the computational complexities of this approach and one based on uniformization.

Bennett L. Fox and Peter W. Glynn (1987), "Replication Schemes for Limiting Expectations," Technical Report, University of Montreal.

We show that certain natural estimators occurring in simulation settings have convergence rates less than the canonical rate usually associated with simulation. For some important examples we find alternative estimators that converge at the canonical rate. The implications of these asymptotic comparisons for choosing good strategies when the computer-time budget is modest are discussed.

Michael Z. Zazanis and Rajan Suri (1986), "Comparison of Perturbation Analysis with Conventional Sensitivity Estimators for Stochastic Systems," Technical Report No. 86-123, Department of Industrial Engineering, University of Wisconsin-Madison.

Perturbation Analysis (P/A) of discrete event dynamical systems is a recently introduced method for estimating the sensitivity of the performance of such systems to adjustable parameters. In this paper we examine the Mean Squared Error (MSE) of these estimates and compare it to that of estimates obtained by conventional methods. We assume that the P/A estimate is unbiased (a question dealt with in other papers), and consider two different experimental methods that are commonly used: i) independent replications and ii) regenerative techniques. The analytic results obtained establish the asymptotic superiority of P/A over conventional methods for both of these experimental approaches for systems where P/A is unbiased.

Rajan Suri and Ying Tat Leung (1987), "Single Run Optimization of Discrete Event Simulations: An Empirical Study Using the M/M/1 Queue," Technical Report No. 87-3, Department of Industrial Engineering, University of Wisconsin-Madison.

Simulation modeling has been widely used to analyze complex stochastic systems such as to compute some performance measures of a modern manufacturing facility. Often, we are interested in optimizing these performance measures of the system with respect to some controllable parameters. Traditional methods to find an optimum of a simulation model usually require making a number of simulation runs, which can be computationally intensive. This study proposes a stochastic optimization method to optimize a simulation model in a single simulation run, with the potential of large savings in computational effort. Two algorithms based on this method are developed and evaluated empirically using an M/M/1 queue problem. Experimental results show that the algorithms, especially one of them, are promising and that this approach merits further investigation.

Keebom Kang and David Goldsman (1987), "The Correlation Between Mean and Variance Estimators", Technical Report No. J-85-15, School of Industrial and Systems Engineering, Georgia Institute of Technology.

Consider the problem of estimating confidence intervals for the mean of a stationary stochastic process. Denote the corresponding point estimators for the process mean and variance by \bar{X}_n and \hat{V} , respectively. In this paper, we derive expressions for the correlation between \bar{X}_n and \hat{V} for various variance estimators and stochastic processes. (Among the variance estimators under study are those arising from the methods of nonoverlapping batched means, overlapping batched means, and standardized time series.) Also, we empirically examine the relationships between $\text{Corr}(\bar{X}_n, \hat{V})$ and confidence interval estimator performance; we see that $\text{Corr}(\bar{X}_n, \hat{V})$ affects the symmetry of confidence interval coverage, but not necessarily the actual coverage.

David Goldsman and Lee Schruben (1986), "New Confidence Interval Estimators Using Standardized Time Series," Technical Report No. J-84-15, School of Industrial and Systems Engineering, Georgia Institute of Technology.

We develop new asymptotically valid confidence interval estimators (c.i.e.'s) for the underlying mean of a stationary simulation process. The new estimators are *weighted* generalizations of Schruben's standardized time series area c.i.e. We show that the weighted c.i.e.'s have the same asymptotic length as the area c.i.e.; but in the small sample environment, the new c.i.e.'s exhibit performance characteristics which are different from those of the area c.i.e.

David Goldsman and Marc Meketon (1986), "A Comparison of Several Variance Estimators," Technical Report No. J-85-12, School of Industrial and Systems Engineering, Georgia Institute of Technology.

One of the most important problems in simulation output analysis concerns confidence interval estimation for the mean of a stationary stochastic process. A number of confidence interval methodologies have been developed over the last twenty years; loosely speaking, these methodologies differ only in how they estimate the variance of the point estimator for the mean. In this paper, we study several such variance estimators. Special emphasis is placed on comparing those arising from the theories of *standardized time series* [Schruben (1983)] and *overlapping batched means* [Meketon and Schmeiser (1984)]. Comparison criteria include estimator bias, variance, and mean squared error.

David Goldsman, Marc Meketon and Lee Schruben (1986), "Properties of Standardized Time Series Weighted Area Variance Estimators," Technical Report No. J-86-6, School of Industrial and Systems Engineering, Georgia Institute of Technology.

Consider the sample mean \bar{X}_T from a continuous-time stationary stochastic process $\{X(u): 0 \leq u \leq T\}$, and suppose that we wish to estimate the process variance $\sigma^2 = \lim_{T \rightarrow \infty} T \text{Var}(\bar{X}_T)$. This article expands the results of a previous technical note [Goldsman and Schruben (1986)] by using the theory of *standardized time series* to investigate *weighted* generalizations of Schruben's ("equally-weighted") area variance estimator. We find a simple expression for the bias of the weighted area variance estimator, and we give weights which yield variance estimators with lower asymptotic bias than certain other popular estimators. We use the weighted area variance estimators to derive asymptotically valid confidence interval estimators (c.i.e.'s) for the mean of a stationary stochastic process. Although the weighted area c.i.e.'s are shown to have the same asymptotic expected length and variance of the length as the equally-weighted area c.i.e., it is also shown that, in a number of respects, the new c.i.e.'s are superior.

PROPOSAL FOR THE BYLAWS OF THE COLLEGE ON SIMULATION

Reproduced below are the proposed new Bylaws for the College; they appeared in draft form in Vol. 9, No. 2 (1985) of the *Newsletter*. A vote by the members is now required. Your ballot is on the first page of this issue of the *Newsletter*.

BYLAWS OF THE SPECIAL INTEREST GROUP ON SIMULATION OF THE INSTITUTE OF MANAGEMENT SCIENCES

ARTICLE I — NAME

1. This organization shall be called the College on SIMULATION.

ARTICLE II — PURPOSE

1. The College is organized and will be operated exclusively for educational and scientific purposes:
 - a. To encourage the development and dissemination of knowledge in the area of simulation.
 - b. To promote communication and interaction among individuals and organizations who share an interest in simulation.

ARTICLE III — MEMBERSHIP AND DUES

1. Any person interested in simulation may associate with this College. Any member of TIMS may become a member of the College by completing a membership application and submitting it with the proper dues. All such members of the College shall have equal rights, duties and privileges.

An individual who is not a member of TIMS may become a member of the College if he/she belongs to a related society that offers reciprocal membership in its topical subdivisions to members of TIMS. Such members shall have the same rights, duties and privileges as those of regular members except for the right to hold elective office in the College.

An individual who is neither a member of TIMS nor a member of a society offering reciprocal topical subdivision membership opportunities may become a subscriber to the College. The fee for subscribers shall be equal to the dues rate for non-members and subscribers may not vote or run for office in College elections.

ARTICLE IV — OFFICERS AND THEIR DUTIES

1. The officers of the College shall consist of a President, a Vice President, a Secretary and a Treasurer. The Executive Committee shall consist of the officers, the immediate Past President and the Chairs of the standing committees.
2. The President shall be the chief administrative officer of the College, shall preside at all business meetings of the College and its Executive Committee, shall manage the affairs of the College between meetings, and shall appoint all committees and committee chairpersons of the College.
3. The Vice President shall assume the duties of the President in the event of the President's absence. The Vice President also shall plan all program meetings and arrange for all business and program meetings of the College.
4. The Secretary shall keep minutes of all College and Executive Committee business meetings, send all notices to the membership and Executive Committee, conduct College elections, and perform other duties usual to the office of Secretary. The Secretary shall maintain needed contact with and supply needed reports to TIMS.
5. The Treasurer shall work with the appropriate Business Offices to ensure that dues are collected and mailing lists are maintained, maintain financial and membership records, supervise disbursements of funds, arrange for any bank accounts needed to handle College funds with approval of the Executive Committee for the banks selected, and perform other duties usual to the office of Treasurer. The Treasurer shall maintain needed contact with and supply needed reports to TIMS.
6. Each officer must be a member of TIMS and the College.
7. The term of office shall begin June 1 of even numbered years.
8. Vacancies in any office may be filled at the discretion of the Executive Committee until the next scheduled election.

ARTICLE V — ELECTIONS

1. The Nominating Committee shall select at least two nominees for each office and submit the list of nominees to the Secretary for publication in the fall Newsletter. Any group of 10 or more members may then nominate a candidate for any office by submitting a signed petition to the Secretary-Treasurer no later than February 1. The spring Newsletter will include the ballots, showing all nominees listed in alphabetical order with no distinction between petition and Nominating Committee candidates and providing space for write-in candidates. The ballots shall specify the deadline for their return, which shall be the same as the date of the spring business meeting. Ballot counting shall be the responsibility of the Nominating Committee.
 In the event of a tie vote for any position, the members of the Executive Committee shall choose between the tied candidates by written ballot. Results of the election shall be communicated in the fall Newsletter.
2. A plurality of qualified votes cast shall be necessary for election.
3. The Vice President shall succeed to the office of President in the following term. If it is known before the Nominating Committee submits its list of nominees that the Vice President will be unable to succeed to the office of President, then nominations shall be solicited for the office of President.

ARTICLE VI — MEETINGS AND PROGRAMS

1. Business meetings of the College shall be held at least twice each year in conjunction with the fall and spring meetings of TIMS and the Winter Simulation Conference. A quorum for business meetings shall be 15 members or five percent of the total membership, whichever is less.
2. The Executive Committee shall meet at least twice a year, at the call of the President. The quorum for the Executive Committee meetings shall consist of half its membership.
3. Each Newsletter shall include the minutes of the preceding business meeting(s) (if any) and the agenda for the next business meeting.
4. Roberts' Rules (Revised) shall be followed in all meetings, except as they conflict with these Bylaws.

ARTICLE VII — COMMITTEES

1. The Standing Committees and their duties shall be as follows:
 - (a) Award/Publication — handles all matters with respect to the Outstanding Simulation Publication Award.
 - (b) Award/Service — handles all matters with respect to the Outstanding Service Award.
 - (c) Publications — oversees the Newsletter and handles publicizing of activities to college members and the general public.
 - (d) Nominating — nominates candidates for office and counts ballots.
2. The President may create ad hoc committees and appoint their members and chairpersons. The tenure of an ad hoc committee shall expire with the term of the President who appointed it.

ARTICLE VIII — AMENDMENTS TO THE BYLAWS

1. Amendments to these Bylaws must be approved by:
 - (a) the College membership.
 - (b) the appropriate oversight committee within TMS.

An amendment shall be effective when and only when both of these required approvals have been obtained.

2. Approval of an amendment by the membership must be obtained in the following manner:
 - (a) A proposed amendment may be submitted for action by vote of the Executive Committee or by written petition of 15 members or five percent of the total membership, whichever is less.
 - (b) The amendment shall be read and discussed at a College business meeting. Notice of the meeting and the wording of the proposed amendment shall be distributed to the members at least 30 days before the meeting.
 - (c) With the first Newsletter following the meeting at which the amendment was discussed, the Secretary shall distribute mail ballots on the amendment. These ballots shall include the date by which ballots must be returned, which shall be at least six weeks after the date the ballots are distributed. A two-thirds majority constituting at least 10% of all qualified members shall be required for approval.

EDITOR'S CORNER

Below is the first installment of the directory of electronic-mail addresses for the College. The directory will be updated and published periodically. If you would like to have your address included, please send it to one of the *Newsletter* editors.

Name	Affiliation	e-mail address
Tom Clark	Florida State Univ.	telark@fsu.bitnet
David Goldsman	Georgia Tech.	dgoldsma@gtri01.bitnet
Jorge Haddock	RPI	ffye@rpitsmts.bitnet
Voratas Kachitvichyanukul	University of Iowa	aegvorwy@uiamvs.bitnet
David Kelton	University of Minnesota	dkelton@umnacvx.bitnet
Barry L. Nelson	Ohio State University	nelsonb@osupyr.uucp ts3816@ohstvma.bitnet
Bruce Schmeiser	Purdue University	schmeise@gb.ecn.purdue.edu
Lee Schruben	Cornell University	fx9j@cornella.bitnet
James R. Wilson	Purdue University	wilsonj@gb.ecn.purdue.edu

REPORT ON THE FOURTH CONFERENCE ON CURRENT ISSUES IN SIMULATION: VARIANCE REDUCTION

On May 18-19, 1987, the Fourth Conference on Current Issues in Simulation was held at the Robeson Center on the campus of Rutgers University - Newark. The conference was organized by Nabil R. Adam and George S. Fishman. The focus of the conference was variance reduction. Reprinted below are the names of the speakers and the titles of their talks.

"Importance Sampling for Stochastic Simulation," Peter W. Glynn and Donald W. Iglehart.

"The Problem of Dimensionality in Stratified Sampling," R.C.H. Cheng.

"Estimation of Multiresponse Simulation Metamodels using Control Variates," A.M. de O. Porta Nova and James R. Wilson.

"Simulated Annealing Methods with General Acceptance Probabilities," Avi Federgruen.

"Simulating the GI/G/K Queue When the Traffic is Low," Do Le Minh.

"Variance Reduction for Sensitivity Estimates Obtained from Regenerative Simulation," Phuong-Vien Nguyen and Martin I. Reiman.

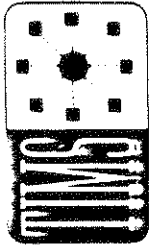
"The 'What-if' Problem in Simulation Analysis," Reuven Rubinstein.

"Planning Queueing Simulations," Ward Whitt.

"Adjusting System Reliability for Errors in Component Reliabilities," George S. Fishman.

"Simulating Discounted Costs," Bennett L. Fox and Peter W. Glynn.

"Reducing the Variance of Simulation Output Measures Using Estimates of Null Effects," Lee Schruben and David Goldsman.



THE INSTITUTE OF MANAGEMENT SCIENCES

FACULTY IN RESIDENCE PROGRAM

OFFERS BENEFITS TO INDUSTRY, GOVERNMENT AND UNIVERSITIES

The TIMS Faculty-in-Residence Program was created to help organizations in industry and government arrange short-term (six months to a year) full time assignments for university professors to work on special projects for host organizations at the hosts' headquarters.

TIMS acts as a "matchmaker", listing applicants from universities and prospective employers from government and industry. The TIMS office puts interested employers in touch with listed faculty whose skills and availability match host project needs. There is no charge for this service. Prospective hosts and faculty applicants communicate directly with each other to agree on assignments, compensation, and other necessary details.

To participate in the program, one need only fill out the application and mail it to TIMS. There is no obligation. All applications will be processed promptly, and applicants will be notified of potential "matchups" that are identified.

The Program Offers Attractive Benefits:

- Host organizations obtain fresh, high level expertise at in-house pay scales rather than high consulting rates.
- Resident faculty gain experience with corporate life that can be brought back to universities and students.
- Special projects get dedicated attention from academics with skills and credentials in the appropriate field.
- Special project needs are met without permanent headcount increases.
- Host staffs have opportunities to work closely with experts who teach the professional state of the art.
- Host organizations and universities can develop closer relationships, positively impacting future projects and recruiting/placement efforts.
- Both sides can collaborate to positively influence teaching programs, for the betterment of the professional and the world.

For more information on the Faculty-in-Residence Program,
contact Mary R. DeMelim, Executive Director

TIMS, 290 Westminster Street, Providence, RI 02903
or call (401)274-2525.

FACULTY IN RESIDENCE PROGRAM

14

EMPLOYER FORM

NAME OF ORGANIZATION _____

DEPARTMENT/DIVISION _____

CITY _____ STATE _____ ZIP _____

TYPE OF INDUSTRY: _____

EXPERTISE AREA REQUIRED:

- | | | |
|---|---|---|
| <input type="checkbox"/> Applied Probability and Statistics | <input type="checkbox"/> Computer Science/MIS/AI/Decision Support | |
| <input type="checkbox"/> Math Programming/Control Theory Optimization | | |
| <input type="checkbox"/> Decision Analysis/Reliability | <input type="checkbox"/> Materials Management/Logistics | |
| <input type="checkbox"/> Simulation | <input type="checkbox"/> Operations | <input type="checkbox"/> Transportation |
| <input type="checkbox"/> Management | <input type="checkbox"/> Public Policy | <input type="checkbox"/> Health |
| <input type="checkbox"/> Energy | <input type="checkbox"/> Military | <input type="checkbox"/> Marketing |

CONTACT NAME _____
Last First Middle

ADDRESS _____

CITY _____ STATE _____ ZIP _____

TELEPHONE _____

I AUTHORIZE FULL DISCLOSURE OF ABOVE INFORMATION-SIGNATURE _____ DATE _____

MAIL TO: TIMS, 290 Westminster Street, Providence, RI 02903.

FACULTY IN RESIDENCE PROGRAM

FACULTY APPLICANT FORM

NAME _____
Last First Middle

ADDRESS _____

CITY _____ STATE _____ ZIP _____

OFFICE PHONE _____ HOME PHONE _____

PRESENT POSITION _____

DEGREES _____

HONORS _____

EXPERIENCE OUTSIDE ACADEMIA, CONSULTING OR FULL TIME: _____

FIELDS OF EXPERTISE:

- | | | |
|---|---|---|
| <input type="checkbox"/> Applied Probability and Statistics | <input type="checkbox"/> Computer Science/MIS/AI/Decision Support | |
| <input type="checkbox"/> Math Programming/Control Theory Optimization | | |
| <input type="checkbox"/> Decision Analysis/Reliability | <input type="checkbox"/> Materials Management/Logistics | |
| <input type="checkbox"/> Simulation | <input type="checkbox"/> Operations | <input type="checkbox"/> Transportation |
| <input type="checkbox"/> Management | <input type="checkbox"/> Public Policy | <input type="checkbox"/> Health |
| <input type="checkbox"/> Energy | <input type="checkbox"/> Military | <input type="checkbox"/> Marketing |

CITIZENSHIP _____ U.S. RESIDENCY STATUS _____

AVAILABILITY: Starting When _____ For How Long _____

GEOGRAPHIC LIMITATIONS _____

OTHER LIMITATIONS _____

I AUTHORIZE FULL DISCLOSURE OF ABOVE INFORMATION-SIGNATURE _____ DATE _____

MAIL TO: TIMS, 290 Westminster Street, Providence, RI 02903.