Letters to the Editor

Disagreement About the Optimization of Splitting Parameters for Monte Carlo Calculations

The Los Alamos Radiation Transport Group disagrees vigorously with the following comments:

1. "In recent years, several approaches have been suggested to solve the problem of an optimum splitting parameter. So far, however, none has resulted in a practical workable solution."[1]

2. "Currently no practical method exists for the optimization of the splitting parameters (or for the optimization of any variance reduction external parameters), and in practice each user is utilizing his best judgment based on experience and on some doubtful 'rules of thumb.' "[2]

The Los Alamos computer code MCNP (Version 3A) has just such a "practical workable solution" as a *standard* feature, and the feature has been available in some form since 1980. The MCNP optimization technique is called the "forward-adjoint generator" or "generator" for short. The generator can supply either splitting parameters or weight-window parameters and has proven to be as good or better than a *good* user at supplying these variance reduction parameters. Certainly the generator is not a panacea for importance sampling problems. (Reference 3 lists the limitations.) However, we think that the state of the art is significantly different than Refs. 1 and 2 suggest and have communicated this.[4,5]

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REFERENCES

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2. A. DUBI, A. GOLDFELD, and K. BURN, *Nucl. Sci. Eng.*, **93**, 204 (1986).

3. T. E. BOOTH and J. S. HENDRICKS, *Nucl. Technol./Fusion*, **5**, 90 (1984).

4. W. L. THOMPSON and T. E. BOOTH, Letter to ARIE DUBI (Oct. 15, 1981).

5. R. A. FORSTER and T. E. BOOTH, Letter to ARIE DUBI (Apr. 5, 1985).

Response to "Disagreement About the Optimization of Splitting Parameters for Monte Carlo Calculations"

The letter[1] written[a] by the Los Alamos Radiation Transport Group (LARTG) has two aspects.

There is a very stressed personal aspect. *Nuclear Science and Engineering* (*NSE*) is a top ranked technical journal, and the editor bears the responsibility of not allowing it to be turned into a stage for gossip. In that spirit I will say no more about that aspect.

The technical part of the letter is rude in its language and amusing in its content. It was difficult for me to figure out what is it all about. If I correctly understand it, LARTG claims that they told me *personally* that they have "a practical workable solution for splitting optimization" (henceforth "solution") and I ignored that information. The following famous story seems to fit at this point.

A man was interrogated by the Internal Revenue Service about a beach house that he bought for $1 000 000. When asked about the source of the money, he said, "One day I strolled along the beach. Suddenly I saw a small green dwarf about 10 cm high. The dwarf told me that if I would dig at a certain point I would find the ancient treasures of the Incas. I dug where he told me and I found the treasure." When asked for proof, the man said, "Well, I bought the house!!"

The point is that it is not enough that LARTG tells me *personally* that they have a solution. I have also to believe it! And I don't!

The main point, however, is that it doesn't really matter what I think or what LARTG thinks. Out there in the big world there are many users of Monte Carlo and MCNP, and hopefully there will be more since MCNP is a superb code. They, the users, will eventually decide which method is the solution (if any).

LARTG distributes their version. They have the funds to develop their method, to spread newsletters about it, to send memos. Why bother that much about my opinion?

In the course of the development of our direct statistical approach splitting optimization method, we published five detailed papers in *NSE* [and two extensive theoretical papers in *Transport Theory and Statistical Physics* (*TTSP*)], trying our best to give a detailed description of the method in its development and its results. In these papers we gave full credit to the MCNP code and referred to the work done by LARTG members.

[a]By the way, was the letter written by the whole group? Who signed it?

Their letter cites a review of works done on splitting and importance. None of our works is mentioned. If our work is so insignificant, why bother about my opinion? Isn't it as insignificant as everything else? Is the right to ignore the work of others reserved to institutes with infinite budgets and two Crays?

Los Alamos did great work in Monte Carlo throughout the years. I wish them the best with their method, and I am sure that if the international community finds that their method is the solution it will not be kept a secret!

My professional opinion is that their method is not the solution—and that it will never be! The weight window and importance generator are beautiful concepts, their connection to optimum splitting is extremely heuristic. No proof or even anything close to a solid basis was ever suggested to explain why the method should lead to optimization of splitting. I think that no such explanation can be given much in the same way as no explanation can be given to solve a polynomial of the tenth degree with a first-order equation. I most humbly suggest that anyone who bothers to understand the explicit expressions derived in my *TTSP* papers will clearly see why I believe that a handwave approach (although backed up with superb programming capability, a lot of prestige, and self-admiration) cannot work.

As to the roaring invitation to test their method, I will be glad to do a comparative study of the two methods, provided a proper proposal for collaboration is agreed upon by personal contacts. Otherwise I have to quote from their letters to me: "We unfortunately have a limited amount of time and can't afford to use it for work that doesn't have the largest payoff."

I do hope that LARTG will concentrate in proving me wrong by developing and spreading their methods, rather than by a shouting competition.

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REFERENCES

1. T. E. BOOTH, *Nucl. Sci. Eng.*, **96**, 260 (1987).