

Dr. Jeremy Roberts
Professor - ME 701
Ward Hall 137D
Kansas State University
Manhattan, KS 66506

Dear Dr. Roberts:

Please find enclosed my manuscript, "Review and Enhancement of Monte Carlo Foam Simulation Using Object Oriented Programming, and Message-Passing Interface", which I would like to submit to you as part of the course requirements of ME 701.

This paper investigates the use of Monte Carlo simulation to predict the intrinsic thermal-neutron detection efficiency of porous media. Previous studies have shown the validity of such methods, but additional review of the simulation methods has suggested significant improvements are possible. The present work assessed the physical accuracy of the simulation environment, and re-designed the software using object-oriented practices to enhance flexibility and expand usability of the simulation. Additionally, message-passing interface (MPI) was utilized to reduce the execution time of the simulation.

Two significant physical flaws were discovered and corrected during this review, yielding a more reliable prediction of intrinsic thermal-neutron detection efficiency. The re-design using object-oriented practices enabled the development of numerous "preset foams" to be used, but also allows for the user to describe specific characteristics for optimization purposes. Finally, the use of MPI reduced the execution time for a characteristic problem (20cm thick, 100% Lithium-Fluoride impregnated foam using 10^5 histories) from 78 seconds to 17 seconds (using only 4 nodes).

The following revisions have been addressed (as described) at the recommendation of the reviewers:

1. Additional description of previous work
 - a. Added more detailed description of previous work under "Previous Version"
 - b. Included results of previous work
 - c. Cited the previous work
2. Revise objective section
 - a. Modified the section titles to more specifically describe the contents of each section
 - b. Removed references to acronyms before they were defined
 - c. Chose not to include a nomenclature section, instead opting to define nomenclature in-line at the first appearance
3. Revise figure 2 caption
 - a. Added a more descriptive caption
4. Simplify flow diagrams
 - a. Resolved with revision #9
5. Propose verification techniques
 - a. Added content at the end of the report describing experimental verification
6. Explain the sample problem used for testing
 - a. Added content in the "speed improvements" section explaining the sample problem in greater detail
 - b. Included justification for the sample problem parameters
7. Fragmented sentence under "accuracy improvements" (first sentence)
 - a. Removed the entire sentence because it did not add to the report
8. Inconsistent tense in "execution speed improvements" section
 - a. Reworded the sentence to use consistent tense
9. Appendix improvements
 - a. Added descriptions to both of the profiles in the appendix
 - b. Moved each profile to its own page
 - c. Increased the size of the profiles to make them easier to read

I thank you for your consideration and look forward to your decision.

Sincerely,



Michael Reichenberger