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Monte Carlo simulation of Neutron Transport in Nuclear Reactors

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Abstract content
   (Max 300 words)

The neutron transport equation is used widely to model the dynamics of neutrons in nuclear reactors. However, it is not feasible to use it for a complex, non-uniform structure like a reactor core as there are no analytical solutions and the complexity is demanding for numerical methods and therefore it becomes computationally expensive. To reduce the complexity, one needs to make drastic approximations such as the diffusion theory class approximations. In practice the neutron transport equation is used to solve for small parts of the reactor core, which then form the homogenized simplified components from which the full reactor core can be constructed and treated by the diffusion equation. The disadvantage of the diffusion theory is the loss of the microscopic detail of neutron interactions. In this presentation the development of a Monte Carlo model using Geant4, to simulate neutron transport in a nuclear reactor will be discussed. This study will be benchmarked against the conventional codes and also compare the results with measurements. The results expected are an improved treatment of the detail of the reactor and ability to overcome the shortcomings of the other simulations. Geant4 is a modern open source object oriented code that has proven success at a very high level of complexity for the geometry construction, materials specification and tracking algorithms.

Apply to be
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Yes

Level for award
 (Hons, MSc,
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MSc

Main supervisor (name and email)
and his / her institution

Azwinndi Muronga
amuronga@uj.ac.za
University of Johannesburg

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Yes

Primary author: Ms MUDAU, Rotondwa (UJ)

Co-authors: MURONGA, Azwinndini (UJ); CONNELL, Simon (UJ)

Presenter: Ms MUDAU, Rotondwa (UJ)

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