212 Update

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20 Dec

1 Leakage Treatment

For random ray, the current crossing surface i is tallied as:

$$J_g^i = \sum_{k \in i} 2\pi \psi_{k,r,g} \cdot (\Omega \cdot \hat{n}^i)$$

For 1D slab, it is :

$$J_g^i = \sum 2\pi \psi_{k,r,g} \cdot u$$

The net leakage on surface i is calculated as:

$$L^i = \frac{\sum_g J_g^i}{N^i/2}$$

where N^i is the total number of crossings on surface i.

To update the multiplication factor, we use:

$$k_{eff} = \frac{\sum_{r=1}^{R} \sum_{g=1}^{G} \nu \Sigma_{r,g}^{F} \phi_{r,g} V_r}{L + \sum_{r=1}^{R} \sum_{g=1}^{G} \Sigma_{r,g}^{A} \phi_{r,g} V_r}$$

where $V_r = H_z * \text{pitch}^2$

2 Comparison on 1D slab

	k-eff
Diffusion	1.10568
Source Iteration $k^1 = k^0 * (newfissionrate)/(oldfissionrate)$	1.06048
Leakage Iteration $k^1 = (newfissionrate)/(leakage + oldfissionrate)$	1.08461

Table 1: k-eff

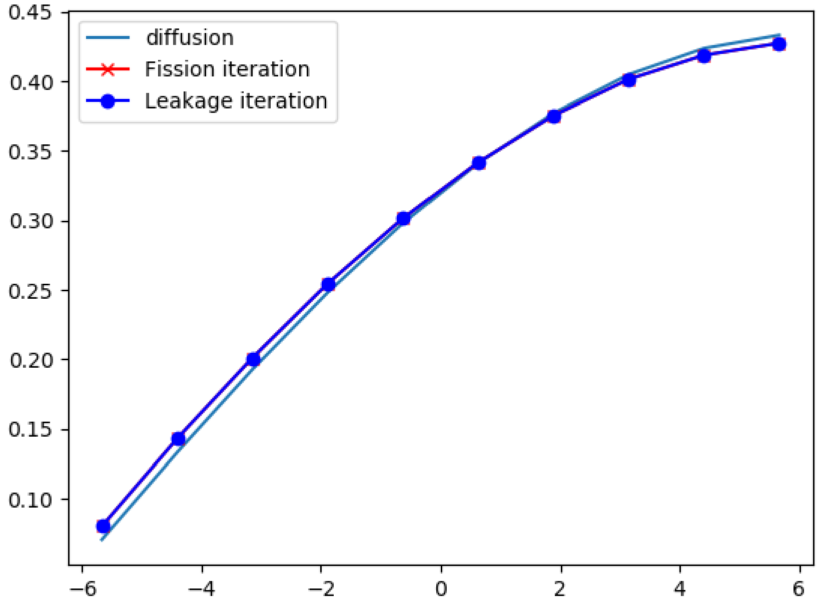

Figure 1: flux shape comparison

3 Discussion

I am not exactly sure why the unit match, but the values of k and scalar flux actually make sense now. There are still some errors, but I believe it is from stochastic noise. Using fission source iteration or using leakage to update k provide a very close flux shape. It cannot even be distinguished on the plot.

Since it is not true random, values of N^i don't match the theoretical value perfectly. For 100 rays with max length of 400cm in a 10 by 1 box, the counts on longer edge is about 58000, and the counts on shorter edge is about 6100. When I increased the length of rays and number of rays, the ratio was getting closer to 10:1, but it took way too long to run.