Outline Report Project 1 – Reactor Physics

Intro

* Discuss objective: Determine oil location based on neutron interaction with ground and oil by modeling neutron transport through a material(s)
* Describe method: Monte carlo, two group, variable density.
* Outline 2 problems we aim to solve. (1) probability of neutron reaching 25 cm, (2) if you can use detector to find oil at a depth of 20cm
* Explain results briefly
* Any areas that could be improved

Method

* Boundary for two neutron energy groups
  + Justify
* Particle tracking method
  + Non-uniform density, used Woodcock tracking variation. Similar to serpent method
* Show probability distribution function of the location of neutron interactions as a function of depth, for both cases.
* Describe how group 🡪 group transfers took place
  + Lethargy calculation
* Selection of Cross sections
  + Either averaged out from ENDF data
  + Grabbed their thermally averaged, fission spectrum values they provided

Describe Part I (No Oil)

* Problem: determine probability that source neutron will reach a depth of 25cm
* Explain basic program flow.
* Where key values came from
* Show results for several particle levels.

Describe Part 2 (with oil)

* Problem: Oil deposit at 20-25cm
  + Find number of neutrons detected by a detector at surface
  + Find number of neutrons detected at surface without oil
* Show results for a few diff numbers of source neutrons
* Give brief calculation flow (algorithim overview maybe?)
* Conclude by addressing what the operation of an oil log is like

REFERENCES

1. <http://www.pnnl.gov/main/publications/external/technical_reports/PNNL-15870Rev1.pdf>
2. Modeling of Nonuniform Density Distributions in the Serpent 2 Monte Carlo Code Jaakko Leppänen\*
3. Duderstadt, pg 243