Check-in

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1 Updates on previous goals

- Rewrite the `BARTDriver`
- Plan for Alex's summer project
- Provide instructions/helps for Marissa

2 Progress up to now

2.1 Rewriting and `BARTDriver<dim>`

The entire rewriting process (except for the `MaterialProperties`) is finished on June 13th. The main efforts were:

- Adapting the migrating classes to the resource struct `FundamentalData<dim>`
- Adding the missing documentations in the rewriting
- Rewriting `BARTDriver<dim>`

In the end, the `BARTDriver` is performing functionalities included in five member functions:

- `MakeGrid`: call `MeshGenerator<dim>::MakeGrid` to generate a mesh
- `InitMatVec`: initialize deal.II and PETSc data structures (SparseMatrix and distributed vectors) contained in `FundamentalData<dim>`
- `DoIterations`: call `Iterations<dim>::DoIterations` which internally call `EigenBase<dim>::DoIterations` or `MGBase<dim>::DoIterations` depending on the input parameters.
- `OutputResults`: output moments to .pvtu files with newly added feature that we can also have keff in the file.
- `DriveBART`: call the four equations above to do the whole calculations.

2.2 Alex's summer plan

I spent two meetings with Josh to talk about the material inputing. The main issue is current input of materials is blended with all other parameter inputs. Though it's possible to do large test problems using current input method, it's gonna be bulky. My first idea about modifying this was to use .xml input to isolate the cross sections from the parameter input. Josh, then propose to blend .xml things with Google protocol buffers, which provides an automatic way of generating parsing functions. The main complain about .xml from Josh was that we have to develop parsers, which is problematic and hard to maintain.

So I think Alex's summer project is quite clear, which consists of the following parts:

- Finish current moving things with current input method. This is still useful in terms of testing as many classes depend on MaterialProperties so we have to have one in working condition.
- Develop .xml format for the cross sections
- Develop script to generate Google protocol buffer string
- Correctly generate parsing function libraries based on Google protocol buffer
- Reimplement MaterialProperties using parsing functions generated by Google protocol buffers
- Provide complete unit testing for the re-implementations.

2.3 Marissa

Three long meetings were scheduled to help Marissa test and debug. What we ended up getting were:

- One analytic solution for multigroup fixed-source problem in infinite medium.
- One analytic solution for multigroup eigenvalue problem in infinite medium.

It seems like the Gauss-Seidel iteration matches the analytic solution for the fixed-source benchmark. But the power iteration still does not give correct solution after hours of debugging. Yet, after hours of debugging, Marissa's code can generate rational values for keff with me fixing a hidden bug, still cannot give correct answers.

So, we changed the direction that she starts to develop NDA and set debugging aside for a little while.

3 Goals/Things will be going on

- Finish debugging
- Design and add unit testing
- Hold a meeting with Josh and Alex about the summer project

4 Links to any related materials

Google protocol buffers is here: https://developers.google.com/protocol-buffers/