Lattice Error Generation

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The lattice

Right now, 'shaken_not_stirred.py' produces a full lattice for FFA2 with a specified number of random errors.
Once a particular number of errors is chosen, the script randomly grabs a number of field strengths, gradient strengths, x offsets, y offsets, angles, magnet lengths, and drift lengths, from the elements in the lattice. The number of these attributes adds up to the desired number of errors.
The script then adds or subtracts (at random) a preset value with the initial value of that attribute for each selected element and attribute.
Finally, the script writes a file containing all parameters and lattice elements, and finally the lattice line itself. This file may safely be run in tao for error studies.

Using 'shaken_not_stirred.py'

First and most importantly, make sure all the libraries are in your PATH variable; that is to say make sure you've installed numpy, random, and sys, as well as stored 'ele.py' and 'passes.py' in a reasonable place, eg the same folder as 'shaken....py.'
Once your libraries are set to go, open (not run, open in an editor) 'shaken....py' and edit the script variables at the top to your liking. These are:

- Nerr: the total number of errors you'd like to see (functionally, just not more than this) in the lattice.
- Ncells: the number of periodic cells you'd like to examine.
- wpass: which pass you'd like to examine.
- pass_init(): make sure to change the # in the name of 'pass#_params()' to be the same as wpass.
- latname: the path to and name of the lattice file you're trying to create.

That's it! after you've edited the variables and made sure the dependencies are in order, you can run the script.
If you have questions about how it actually works, you're welcome to ask: however the python files are (excessively?) commented, and they should be pretty clear.

Preliminary thoughts

I've only been testing this tool today so far, so no firmly quantified results yet. Looking at a couple of lattice outputs, it seems like drift length errors almost don't matter at all, but field and gradient errors matter a lot. As I toy around with the tool this week, I'm going to try to isolate the different effects different errors have on particularly the orbit and dispersion; for a small number of errors (approximately $n \leq 6$) there doesn't seem to be much deviation over the course of the whole arc — for errors around 1% of the nominal value, the orbit deviation balloons to about 10cm before correction.