The MCNP Automated Parameters, MAP, uses User supplied data, points of interest, parameters of interest, and a prepared MCNP input deck in an attempt to create an experimentally observed detector. It accomplishes this task by iterating through all defined points for each parameter while keeping the values that minimize the chi squared value, Equation 2. The process that MAP currently uses to determine which values are the best is a brute force method. By comparing the previous best chi squared value with the current one for every step in the User supplied range it can make a reasonable decision on what would be the best value, size, to use for each parameter. Once it has determined the optimum result it can achieve from that parameter’s given range, it moves on to the next parameter and repeats this process.

Equation 2

Where χ2, chi squared, is equal to the sum over all the data points of interest, Da is the analytical derived point created by MAP, De is the captured experimental data that MAP is trying to match, and σ is the uncertainty of that experimental data. The closer chi squared is to one, the better fit it is to the experimental data.

MAP’s secondary purpose is to automate the collection of relevant data for the purpose of recording what other parameters could be of interest based on how it affects the overall data. This is accomplished by printing out the relative error Equation 3, the average error Equation 4, and plots of the data superimposed upon the experimental data in an easy to read format.

Equation 3

Equation 4

Here E is the relative error of each pair of points, is the mean of the relative error, and N is the total number of relative error points that were calculated. Da and De indicate the same values as above.

To put it simply MAP reads through the MCNP output file to retrieve the wanted information and stores it a more readable fashion. From these outputs, the User can determine if an interested parameter is behaving as expected or if it even affects the model in a meaningful way. This should make it easier to determine what values need to be adjusted as well as what could be occurring to cause a difference in the model versus the experiment. An example of this will be discussed in the next section.

For a list of current assumptions, how to change it to work with other detectors, as well as a more detailed outline of how MAP works, see the User Manual.