

GammaCell Project

Interim Report

December 18, 1998

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INTRODUCTION

Irradiation of samples in a chamber such as the Cornell Gamma Cell often requires knowledge of the dose received and possibly the distribution of radiation within the sample. Computer models provide an easy way of calculating this information as opposed to making tedious dose measurements. Although previous programs to model irradiation have been written, a more extensible one with an easy to use interface was desired. Most of the groundwork has already been laid as described in the May 1998 report, but usability could still be improved and validation against experimental results was not done. The goal this semester was to refine the program and begin validation testing.

ACCOMPLISHMENTS

To improve the usability of the program, several improvements were made. The first improvements were bug fixes such as erroneous mouse clicks being registered after the user double clicks buttons and missing unit conversions when displaying locations of various objects in the coordinate space. New features were also added to the program. By suggestion of Scott Lassell of Ward Laboratory, a percent deviation column was added to the calculation output to allow a quick assessment of the distribution within the sample being irradiated. Sample output with the percent deviation column can be seen in the Appendix. Another feature that is currently being worked on is a graphical gradient plot of doses along a plane in space. A preliminary screen shot of the plot is shown in the Appendix on page 3. All source code changes and additions have been included in the Appendix.

In addition to improvements on the program itself, plans for validation testing have been made. This will involve using a dosimeter to measure doses in space with various source fixture configurations. These configurations will include commonly used ones and also special fixture configurations of interest, which have never been modeled using a computer. Also to be investigated is the shielding effect of the samples by measuring the doses received in various locations on samples of varying density.

PROBLEMS

Problems encountered while working on the program mostly stemmed from bugs in the underlying Java environment requiring some workarounds. Most notable is the Apple implementation (MRJ 1.0) which did not handle lists properly, giving the user false information.

A potential problem in the future may be calculation speed when generating the gradient plots. Depending on the desired resolution and size of the plots and computer capability, it could take less than a second or several minutes to complete. Some code may be optimized in the future to reduce calculation time.

FUTURE WORK

Most of the future work will be focused on performing the validation testing. With the experimental results, the computational results should be adjusted to match. The gradient plot should also be completed so that more complex geometries can be easily examined. While working on the program, more feedback from potential users would be helpful.

APPENDIX

Sample Output

Calculation date: 12/14/1998
 Fixture Annular: Center (0.0, 0.0, 0.0) Radius 1.0 Pencils 6
 Target Rectangular Parallelepiped: Center (10.0, 0.0, 0.0) Height 6.0 Width
 3.0 Length 3.0

Coordinate (Inches)	Dose (Rads/hour)	Deviation from Center
(8.5, -1.5, -3.0)	9122.5	21.18 %
(10.0, -1.5, -3.0)	6860.9	-08.86 %
(11.5, -1.5, -3.0)	5332.7	-29.16 %
(8.5, 0.0, -3.0)	9374.2	24.53 %
(10.0, 0.0, -3.0)	7001.2	-07.00 %
(11.5, 0.0, -3.0)	5416.8	-28.04 %
(8.5, 1.5, -3.0)	9122.5	21.18 %
(10.0, 1.5, -3.0)	6860.9	-08.86 %
(11.5, 1.5, -3.0)	5332.7	-29.16 %
(8.5, -1.5, 0.0)	9994.4	32.76 %
(10.0, -1.5, 0.0)	7367.5	-02.13 %
(11.5, -1.5, 0.0)	5644.2	-25.02 %
(8.5, 0.0, 0.0)	10292.1	36.72 %
(10.0, 0.0, 0.0)	7527.9	00.00 %
(11.5, 0.0, 0.0)	5737.8	-23.78 %
(8.5, 1.5, 0.0)	9994.4	32.76 %
(10.0, 1.5, 0.0)	7367.5	-02.13 %
(11.5, 1.5, 0.0)	5644.2	-25.02 %
(8.5, -1.5, 3.0)	9122.5	21.18 %
(10.0, -1.5, 3.0)	6860.9	-08.86 %
(11.5, -1.5, 3.0)	5332.7	-29.16 %
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(10.0, 1.5, 3.0)	6860.9	-08.86 %
(11.5, 1.5, 3.0)	5332.7	-29.16 %

Calculation time: 0.377 s

Screen Shot