Title: RadLab: An Image Processing Tool for Proton Radiography (U)

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Intended for: General outside audience including job interviews
RadLab: An Image Processing Tool for Proton Radiography (U)

Jeremy Fait

Rad Lab is an image display, analysis and processing code that includes standard image processing functions as well as custom functions designed for analysis of Proton Radiography images. The code also includes a radiographic forward modeling and Monte Carlo capability.

It is derived from an existing analysis code, NewDisplay, LA-CC-04-110, with an enhanced graphical user interface.

I will speak of some of the coding techniques, algorithms and software development I have done on this project.
RadLab: An Image Processing Tool for Proton Radiography (U)

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- Radiograph Processing
Reasons for New Design – Old Program

- Combined static image analysis methods with dynamic physics algorithms
- Unreliability – Exception handling
- Restriction of 20 opened images
- Complicated and time consuming functions
- Non-appealing / Non-trivial interface
- Limited Documentation
- No shortcuts
- Menu options are hard to find
- All image data is expressed in 2D when 1D could be used
- Fortran Support in the future?
- Lack of Testing Suite
List of Image Processing Functions

- Area
- Auto Beam Shift
- Circle
- Classify
- Composite
- Edge
- Fast Fourier
- Gaussian
- Average
- Background
- Camera Stripe
- F Calibrate
- Flatten
- Mask
- Math
- Rebin
- Star Correction
- Star Median
- Center
- Rotate
- Scale
- Transform
- Transpose
Radiograph Processing
Rotation

Unclassified, LA-UR# XXX
Star Correction
F Calibrate
ReadMe
Automated Testing

Open_Gauss2D.bat - Notepad

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Test Case: Open relative path file and perform Gaussian2D with default values

Actions to perform:
1. Insert file '02nprad0270shotB.tif' at .\SourceFiles\02nprad0270shotB.tif
2. Run this batch file

Expected Results:
- Fitted center (x,y), rms: 0.4518E+00 0.7225E+02 0.6041E+00
- Fitted sig (x,y,ave): 0.6371E+00 0.2842E+02 0.1453E+02
- Fitted sum, angle: 0.6702E+08 -0.1282E+01

Difference between fit and data:
- Total cnts: 5.8441E+10
- Mean: 4.052E+4  RMS: 3.193E+5 ZMin: 0 ZMax: 9.534E+6
- Xbar: -2.872 Xrms: 0.2297 Ybar: 0.7975 Yrms: 1.857

Note: open will only work for a relative path inside the current directory

open
1, .\SourceFiles\02nprad0270shotB.tif
0
comment
opens files, ignoring z scale determined by first argument. 0 terminates file list.
twodgaussf
0
0, 0, 0, 0, 0, 0,
1, 1, 1, 1, 1, 1,
-1.47, -1.315, 1.535, 1.58
0, 0, 0, 0
1
fit a twod gaussian