1. Feature Extraction from the simulated (s-Rs) and experimental (e-Rs) radiographs

Natasha Andronova, Nick Paterson, Eric Myra, Carolyn Kuranz, James Holloway, Gabor Toth

Main goals:
Automatically detect shock waves to quantitatively characterize their dynamics necessary for uncertainty quantification. Keep it simple and applicable for both s-Rs and e-Rs.

Previously (Paterson et al, 2009):
- Using IDL the wall boundaries, the position of the shock front, and the angle of the deflected primary shock;
- Based on filtering the normalized dot product between the normal vector of the feature and the gradient across the image intensity, where the direction of the normal is from black to white, by choosing threshold values for the wall, shock front, and DPS, which vary from image to image.

- The primary difference between the experimental and simulated radiographs is noise. The experimental radiographs pass through a mean filter, which is instrumental in distinguishing critical features from noise. The simulated radiographs, in contrast, lose information when filtered in the same manner.
- Nick’s method worked well for the e-Rs, but not for s-Rs, due to their fine structures. Additionally, for some radiographs the calculation took long time.

Planed Sensitivity Analysis with the s-Rs:

CRASH Input:
- i. AMR (levels of refinement, other AMR parameters?)
- ii. Multi-group (number of groups; group structure); compare to results of improved atomic physics model
- iii. Heat Conduction

CRASH Output:
- i. Primary shock location
- ii. Triple point location
- iii. Measure of non-planarity of shock
- iv. Measure of entrained Xe in synthetic radiograph
- v. Angle of trailing dense Xe feature

Some pdf statistics for the s-Rs

Three simulations have the second max lower than the front max, thus the method needs to be adjusted and tested on other cases.

S-Rs made like e-Rs:

Three output measures can be quantified: I. and II. by aligning local Xe’s maxima along x- and y- directions; and III. by counting the number of not filtered points or area (#points by pixel size).

For the CRASH simulations a 10% threshold was chosen to do the analysis, based on the pixel’s PDF.