Weighting ARFs & RMFs

Aim

CIAO 2.2 will contain a tool to create a single ARF and RMF that can be used to analyze a spectrum of an extended source.

mkwrsp

This script will take a weight map (WMAP) – the count distribution in the detector coordinate system – and an optional spectral model of the source (via an ASCII file) and create the weighted ARF and RMF. It consists of two tools, **mkwarf** (new for CIAO 2.2) and **mkrmf** (enhanced to handle multiple FEFs).

Caveats

- It is assumed that there are no *spatial* variations of the source spectrum, so $S(E, \hat{\boldsymbol{r}}) = S(E)\rho(\hat{\boldsymbol{r}})$.
- The response of the telescope is assumed to be constant over 32 by 32 pixel regions (this matches the size of the regions over which the FEF and QEU files are defined for the ACIS-S3 chip).

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Algorithm

- Find the number of counts in each "response region" using the WMAP.
- Weight the ARF for each region. There are two schemes:
  1. use the raw counts (count weighting); this is the approach taken by the calcarf/rmf package (A. Vikhlinin's code, available from the Chandra contributed software list).
  2. correct the counts for the telescope response - e.g. vignetting and chip QE - using a user-supplied spectral model (model weighting).
- Add the weighted ARFs to get the output ARF.
- Use the weighted ARFs to combine the RMFs, producing the output RMF.