Detection of X-Ray Sources in PROS

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The problem of detecting discrete sources in x-ray images has much in common with the problem of automatic source detection at other wavelengths (see, for example, Stetson 1987, P.A.S.P., v.99, pp. 191-222). In all cases, one searches for positive brightness enhancements exceeding a certain threshold, which appear consistent with what one expects for a point source, in the presence of a (possibly) spatially variable background. Multidimensional point spread functions (e.g., dependent on detector position and photon energy) are also common. At the same time, the problem in x-ray astronomy has some unique aspects. For example, for typical x-ray exposures in current or recent observatories, the number of available pixels far exceeds the number of actual x-ray events, so Poisson, rather than Gaussian statistics apply. Further, extended cosmic x-ray sources are common, and one often desires to detect point sources in the vicinity or even within bright, diffuse x-ray emission. Finally, support structures in x-ray detectors often cast sharp shadows in x-ray images making it necessary to detect sources in a region of rapidly varying exposure.

We have developed a source detection package within the IRAF/PROS environment which attempts to deal with some of the problems of x-ray source detection. We have patterned our package after the successful Einstein Observatory x-ray source detection programs. However, we have attempted to improve the flexibility and accessibility of the functions and to provide a graphical front-end for the user. Our philosophy has been to use standard IRAF tasks whenever possible for image manipulation and to separate general functions from mission-specific ones. We will report on the current status of the package and discuss future developments, including simulation tasks, to allow the user to assess detection efficiency and source significance, tasks to determine source intensity, and alternative detection algorithms.