

A Robust Routine for Star Shots Calibration

Introduction: The radiographic star-shots test is a commonly used for checking the isocenter accuracy by various angle-shots. The manual calibration using densitometer to identify lines on film is time-consuming and its accuracy is limited by the densitometer's resolution. The film-digitized star-shots could make calibration more accurate and faster. The study presents an algorithm that can be easily applied to programming routine or spread sheet. **Method:** The methodology solves the intersection of any two lines on the film by tracking the horizontal (or vertical) separation of any two lines, and the extrapolated zero-separation is the location of intersection. Because this algorithm is based on the separation of lines in star patterns, overflowing, for example the infinity slope (vertical line), is unlikely to occur. A satisfactory result only requires few points sampled points per line. To identify lines in a digitized star-shots film needs the signal-to-noise ratio larger than 10. If the processes would be applied to an automatic routine, the only manual process is to rotate the film to let beam-legs roughly symmetric to the horizontal (or vertical) line containing the pivot point (i.e. maximal peak). **Result:** The regression results with 2~8 sampled points per line all shows ~0.5% accuracy, and as such workload, it is even feasible by spread sheets.