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Approximate Local Rings and Local Solution of Nonlinear Systems. Preliminary report.

In a recent paper with Zhonggang Zeng (2005), we showed how to compute the structure of the local ring of an isolated zero from an approximate estimate of the zero, adapting a method of Macaulay (1916) by using approximate rank revealing. By further relaxing the tolerance, information can be obtained on a Euclidean neighborhood of the point. The existence of nearby points can be deduced and initial points can be calculated by the eigenvalue method. These can be used to find the nearby points using Newton iteration or LVZ deflation. A criterion is suggested to distinguish an approximate multiple zero from a zero cluster, given an approximate system. (Received December 06, 2005)