Geometric numerical schemes for curve evolution

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We are interested in motion of plane curves when the normal velocity is equal to a power of the curvature. These equations arise in image processing in the fields of smoothing and shape recognition. We describe a geometric scheme (i.e. that does not depend on the parameterization) and that satisfies the same geometric properties as the equation itself. This scheme, based on an idea of Ishii, generalizes the results of Moisan in the case of the affine invariant evolution. The scheme is also monotone and hence, inconditionnaly stable. The monotonicity allows to extend it to real valued function for which it converges in the sense of viscosity solutions. We propose an implementation that can handle power larger than 1/3 and up to 5 or more in certain cases.