Material point method modeling of crack propagation for interacting
and intersecting explicit cracks

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Numerical crack propagation modeling of multiple, explicit cracks
requires methods that can resolve interacting, and potentially
intersecting, cracks as well as methods to calculate crack-tip
parameters with sufficient accuracy for predicting when and where
cracks will grow. The material point method (MPM) can solve
interacting crack problems using the CRAMP method (for CRacks in MPM),
but J integral calculations needed to predict crack propagation have
to be modified whenever other cracks intersect the J contour of a
propagating crack. If the tip of an intersecting crack is inside the J
contour, the contour has to be adapted to avoid that tip. This talk
will describe robust J calculations for interacting and intersecting
cracks. Several examples show that the revised J methods are accurate
even when J contours are intersected. Selected crack propagation
examples show the new methods have sufficient accuracy for interacting
crack propagation calculations. The calculations work with a regular
background MPM grid without any need to remesh or to highly refine
crack-tip regions.