Interpolation constraints and thermal distributions

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Abstract

An approximation to a distribution governed by temperature readings taken at the edge of a polygonal domain can be constructed using interpolation functions which satisfy first order, constancy and linearity, conditions. The values prescribed by the normed interpolation function should be bounded between zero and one. This restriction is especially necessary when representing temperature, since negative values for temperature in Kelvin are physically unacceptable. Compliant interpolation functions can be constructed on all convex polygonal domains including those bounded by vertex and mid-side nodes. Using constructed interpolation path-lines concave domains can also be represented. Within non-concave domains these path-lines are linear. In concave domains they are necessarily non-linear. These formulations allow for smooth representation of data collected at discrete points.

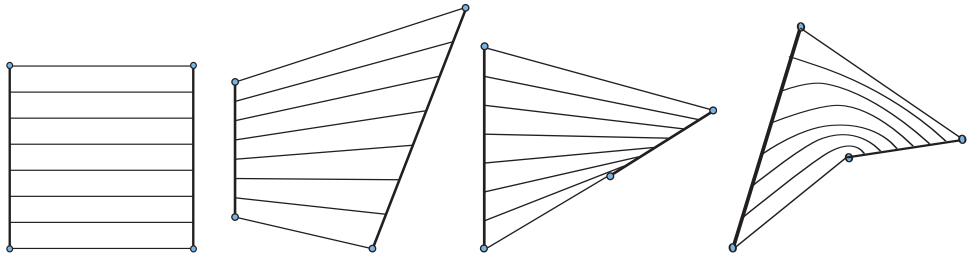


Figure 1: Interpolation paths within quadrilateral domains

Keywords: Temperature distribution, mid-side node, concave finite element

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