Direct localization of poles of a meromorphic function from incomplete boundary measurements

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We proposes an algebraic method to reconstruct the positions of multiple poles of a meromorphic function from the values of the function on an arbitrary simple arc. We first obtain a differential equation that can equivalently determine the meromorphic function. From it, we derive linear equations that relate the elementary symmetric polynomials of the pole positions to the weighted integrals along the simple arc with end-point terms. Eliminating the end-point terms based on an appropriate choice of weighting functions and a combination of the linear equations, we obtain a simple system of linear equations for solving the elementary symmetric polynomials. We also show that our algorithm can be applied to a 2D electric impedance tomography problem. The effects of the proximity of the poles, the number of measurements and noise on the localization accuracy are numerically examined.