Desingularization of First Order Linear Difference Systems with Rational Function Coefficients

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It is well known that for a first order system of linear difference equations with rational function coefficients, a solution that is holomorphic in some left half plane can be analytically continued to a meromorphic solution in the whole complex plane. The poles stem from the singularities of the rational function coefficients of the system. Just as for systems of differential equations, not all of these singularities necessarily lead to poles in a solution, as they might be what is called removable. In our work, we show how to detect and remove these singularities and further study the connection between poles of solutions, removable singularities and the extension of numerical sequences at these points.