Spectral analysis of a difference equation with interface conditions and hyperbolic eigenparameter on the whole axis

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Difference equations with interface conditions are a tool for mathematically explaining processes that are subject to sudden changes. These sudden changes depend on external factors and are negligibly short compared to the whole time. These equations were examined in detail by [5, 6, 7]. Recently, many researchers attach importance to such problems. Because difference equations with interface conditions have emerged in many areas of mathematical modeling such as physics, chemical, biotechnology, industrial robotics, ecology, population dynamics, optimal control, industrial robotics, medicine, control theory and so forth [1, 2, 3, 4, 8]. Although the theory of difference equations with interface conditions has many applications, there are insufficient studies examining the spectral analysis of these problems. This work investigates spectral analysis of a difference equation with interface (discontinuity) conditions and hyperbolic parameters on the whole axis. Firstly, we introduce the solutions of this difference equation. Then, we obtain resolvent operator, Green function and continuous spectrum by using these solutions. Finally, we present a condition which guaranties that the difference equation with interface condition has finite number of eigenvalues and spectral singularities with finite multiplicities.

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