

Abstract

Sturm-Liouville operators and Jacobi matrices have so far been developed in parallel for many years. A result in one field usually leads to a result in the other. However not much in terms of spectral theory has been done in the discrete setting compared to the continuous version especially in higher order operators. Thus, we have investigated the deficiency indices of fourth order difference operator generated by a fourth order difference equation and located the absolutely continuous spectrum of its self-adjoint extension as well as the spectral multiplicity using the M-matrix. The results are useful to mathematicians and can be applied in quantum mechanics to calculate time dilation and length contraction as used in Lorentz-Fotzgeralds transformations. The study has been carried out through asymptotic summation as outlined in Levinson Benzaid Lutz-theorem. This involved: reduction of a fourth order difference equation into first order, computation of the eigenvalues, proof of uniform dichotomy condition, calculating the deficiency indices and locating absolutely continuous spectrum. In this case we have found the absolutely continuous spectrum to be the whole set of real numbers of spectral multiplicity one.