An Efficient Discrete Chaos in Generalized Logistic Maps with Applications in Image Encryption

Authors : Ashish Ashish

Abstract : In the last few decades, the discrete chaos of difference equations has gained a massive attention of academicians and scholars due to its tremendous applications in each and every branch of science, such as cryptography, traffic control models, secure communications, weather forecasting, and engineering. In this article, a generalized logistic discrete map is established and discrete chaos is reported through period doubling bifurcation, period three orbit and Lyapunov exponent. It is interesting to see that the generalized logistic map exhibits superior chaos due to the presence of an extra degree of freedom of an ordered parameter. The period doubling bifurcation and Lyapunov exponent are demonstrated for some particular values of parameter and the discrete chaos is determined in the sense of Devaney's definition of chaos theoretically as well as numerically. Moreover, the study discusses an extended chaos based image encryption and decryption scheme in cryptography using this novel system. Surprisingly, a larger key space for coding and more sensitive dependence on initial conditions are examined for encryption and decryption of text messages, images and videos which secure the system strongly from external cyber attacks, coding attacks, statistic attacks and differential attacks.