

SOME ASPECTS OF THE INTEGRABLE DISCRETE LOTKA-VOLTERRA SYSTEM

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The integrable Lotka-Volterra (LV) system [2] is known as a dynamical systems which gives a mathematical description of food chain structure. The discrete LV system (dLV) system [1] is derived from a skillful time-discretization of the LV system.

In this talk, we mainly discuss an application of the dLV system to computing matrix singular values. We also review the positivity of dLV variables through considering orthogonal polynomials, and deeply investigate the asymptotic behavior with the help of center manifold theory. In order to accelerate the convergence rate, we explain how to introduce the shift of origin from the viewpoint of matrix theory. Some examples are given for numerically confirming that the computed singular values are high relative accurate. Additionally, we describe an interesting relationship between the dLV system and the well-known Fibonacci sequence.

References

- [1] S. Tsujimoto, R. Hirota and S. Oishi, *An extension and discretization of Volterra equation I*, Tech. Report IEICE NLP 92-90, 1993.
- [2] S. Yamazaki, *On the system of non-linear differential equations $\dot{y}_k = y_k(y_{k+1} - y_{k-1})$* , J. Phys. A: Math. Gen., 20 (1987) pp. 6237-6241.