STABILITY ANALYSIS OF MULTIPLICATION OF PLANKTON USING PARAMETER IDENTIFICATION

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This paper presents a numerical method for the abnormal multiplication of plankton that happens by the water pollution. When the abnormal multiplication of plankton occurs, a lot of fish and shellfishes die from breathing difficulties. Because a lot of plankton uses a lot of oxygen and the water is lacking in oxygen.

In this paper, an abnormal multiplication is thought as one of the unstable problem. Therefore, in case that there is no problem of water quality, the system is stable. The stability of the system is investigated by introducing the eigenvalues of the basic equation. In this study, the basic equation represents food chain of ecological model. The stability of the system can be judged by the eigenvalue based on the Lyapunov's stability theory. In this paper, Arnoldi-QR method is used to obtaining eigenvalues and eigenvectors of the system. In the result, stability of the system is obtained. The parameter identification technique is employed to obtain the objective eigenvalue from this stability of the system. In this study, as objective eigenvalue, the stable value of the system is selected. Because knowing stable value of the system is linked to prevent abnormal multiplication of plankton. The finite element method is used for the discretization in space.

The lake Kasumigaura, that is placed in Ibaraki Prefecture, Japan, is selected and actual data in 1991 is used in order to investigate the stability on the lake. Mode analysis method is employed to obtain the initial distribution of the lake Kasumigaura.

References

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