A B S T R A C T

Cybernetics deals with the purposeful analysis of complex system with a view to implement control mechanism of the system with optimally required human decision. Cybernetic methods are important tools which may be effectively used in the development and in the forecasting, planning and control of water resources systems.

The present investigation deals with two broad aspects of a water resource system of non-tidal rivers : (1) the real time simulation of hourly and daily river flow for on-line monitoring and (2) real time simulation of the water quality, the dissolved oxygen and the B.O.D of non-tidal rivers.

In the first case the outcome of the present investigation is the development of real time simulation techniques with the cybernetic methods of multilayer and combinatorial group method of data handling algorithms, and recursive instrument variable algorithms with on line adaptiveness in parameter variation. The aforesaid cybernetic methods are modified and improved to make them amenable to the peculiarities of the flows of the hilly rivers of North Bengal. Effectiveness of the developed techniques have been demonstrated with field data observed at different gauging stations of the river Teesta in North Bengal.

In the second case with the help of cybernetic methods of combinatorial group method of Data Handling Learning Identification Algorithms, the real time recursive simulation algorithms with parameter optimisation and with the on-line adaptive instrument variable algorithms, the Biochemical Oxygen Demand and Dissolved Oxygen levels of non-tidal rivers have been simulated, verified and validated with prediction optimisation. The existing methods are

modified and improved to take into account the peculiarities of the water quality behaviour. Applicability of the methods for water quality forecasting purpose has been demonstrated with field data observed in a non-tidal river passing through a highly industrialized zone. Fuzzy control algorithms of technical cybernetics have been suggested to implement reservoir control in accordance with adaptivity determined on on-line and optimally regularised decision of water quality management.

It is hoped that when in near future there will be sophistication in the water resources management in the form of using control centre with computers linked through microwave with on-line water flow and water quality monitoring points, this investigation will be very helpful. The computational procedure to use improved and modified cybernetic methods for flow and water quality simulation have been developed in well organised programme packages in high-level software.