A B S T R A C T

The present work involves the exposition of the surface water hydrology of the Teesta river system. This investigation identifies the physical processes influencing the flow of this Himalayan river in storm periods as well as in normal times in the form of well defined mathematical relationships.

This investigation has six steps. The synopsis of the steps are stated below :

A dynamic model for hourly prediction of river flow by method of computer aided self-organisation of mathematical models correlating the different up-stream flows has been presented. The model has been verified by field measurements at the Coronation Bridge Point of the river Teesta in North Bengal.

A dynamic model for hourly forecasting of river flow by a learning identification algorithm, correlating lagged instant flows at the different up-stream gauging stations has been presented. The model has been verified by field measurements at the Domohani Road Bridge of the river Teesta in North Bengal.

A dynamic model for sixth hourly prediction of river flows by method of computer aided self-organisation of mathematical models correlating the different up-stream flows

and the rainfall at the different gauging stations in the catchment region with the flow at the point of forecasting has been presented. The model has been verified with field measurements at the Coronation Bridge Point of the river Teesta in the Himalayan region.

A simple dynamic model of hourly flow of a river is presented with a minimum of sixth lag instance in the measurement of up-stream flow using heuristic learning algorithm. The model has been verified by simulation against field data.

The operation of large scale water resources systems demands that the real-time monitoring of river flow during a storm period and the on-line control of river flow through different hydraulic structures require a consistent and reliable set of data representing the predicted flow on the basis of past measurements and the system parameters. In a comprehensive and unified manner the role of recursive estimation techniques for real-time forecasting of river flows during a storm period has been presented. The effectiveness of the recursive estimation algorithms has been investigated for real-time prediction of flows of the river Teesta in North Bengal during a short span storm period.

Recursive least square non-stationary time

series analysis techniques of cybernetics has been put to good use in on-line forecasting of daily river flow of a non-tidal river. A simple dynamic model is obtained. When tested with field data the model is shown to simulate adequately the major variations of flows observed in the field measurements of daily river flows at the Domohani Road Bridge Point of the river Teesta in North Bengal.