CURRICULAM VITAE

1   PERSONAL PARTICULARS

Different Numerical Solutions of Steady Gradually Varied Flow in Some Common Open Channels. The dissertation supervisor was Prof. Madan Mohan Das, Department of Civil Engineering, Assam Engineering College, Guwahati, Assam, India.

o *Bachelor of Engineering Project*
  Computer Aided Design of Plated Beam. The project guide was Professor Satyabrata Choudhury, Department of Civil Engineering, Regional Engineering College, Silchar, Assam, India.

3   FOREIGN EXPERIENCE

➢ I have been invited to work as a Research Associate in the Department of Civil Engineering, Dalhousie University, Halifax, Canada for one year. The one year research will focus on the application neural networks and genetic algorithms to groundwater monitoring system and will be working with the computational hydraulics group headed by Prof. M.G. Satish of Dalhousie University I have applied for extra-ordinary leave without pay from my parent Institute for accepting the foreign assignment and it is under process.

➢ Working as a *Visiting Research Scholar* in the Department of Civil and Resources Engineering, Dalhousie University, Halifax, Nova Scotia, CANADA from May 15247.08m Ms5a0r

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11. **Bhattacharjya, Rajib Kumar** (2004) "Optimal Design of Unit Hydrograph Using Probability Distribution Functions and Genetic Algorithms", *Sadhana, Journal of Indian Academy of Sciences,* 29(5), 499-508.

12. **Bhattacharjya, Rajib Kumar** "Derivation of UH and Infiltration parameters using GA", *Journal of Water Management, ICE (under review).*

13. Laskar, A.I., **Bhattacharjya, Rajib Kumar,** "Use of Genetic Algorithm for optimum shape, fenestration, number of storey and orientation of buildings in Indian hilly places"**,** *Journal of Architectural Theory Review (under review).*

14. Laskar, A.I., **Bhattacharjya, Rajib Kumar, "**Search for Efficiency in Multistoried buildings in Cold Regions using Genetic Algorithm", *Journal of Solar Energy Society, India (under review).*

15. **Bhattacharjya, Rajib Kumar,** Datta, Bithin, and Satish, Mysore, G. **"**Performance of ANN Model in Simulating Saltwater Intrusion Process in Coastal Aquifers with Noisy Data" *Journal of Applied Soft Computing, Elsevier, (under review).*

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10. Kumar, U., and **Bhattacharjya, Rajib Kumar** (1998), "Remote Sensing: A potential tool for Environmental Management" in the proceeding of the *Seminar on Environmental Problem in North-East India, Assam University*, Silchar, Assam

9   PEER REVIEWER

➢ Journal of Irrigation and Drainage Engineering published by ASCE

10   INVITED

College, Jorhat, Assam. INDIA.
- *January 1995 – May 1995:* Graduate Trainee, Quality Control Division, Public Health Department, Government of Assam, Guwahati, Assam, INDIA.

12   AWARD AND HONOURS

- Nominated as the member of the editorial board of the International Journal on *Applied Mathematics and Engineering Sciences*.
- Affiliated Member of American Society for Civil Engineering (No. 463890).
- Life member of Indian society for technical education.
- Awarded merit certificate by Gauhati University for obtaining 3rd position in B.E. (Civil) examination, 1993.
- Awarded Institutional merit scholarship for the year 1990, 1991 and 1992 from REC Silchar, Assam, India.

13   EXPERIENCE IN ADMINISTRATIVE RESPOSIBILITIES

- Honorary Project Manager, Jorhat Engineering College building centre, Jorhat, Assam, from November, 1995 to July 1997.
- Member, admission committee, Regional Engineering College Silchar, for the year 1999.
- Coordinator, EPBX System, NIT Silchar, from December 2003 to January 2005.
- Warden, Hostel No. 1, NIT Silchar, Assam from October 2004 to till date.
- Deputy Superintendent, NIT Silchar Centre, AIEEE Examination, 2005.
- Deputy Superintendent, NIT Silchar Centre, AIEEE Examination, 2006.
- Member of DUPC, NIT Silchar, Assam for the 2004, 2005, 2006.
- Member of DPPC, NIT Silchar, Assam for the year 2005, 2006.

(*Rajib Kumar Bhattacharjya*)

ABSTRACT OF DOCTORAL THESIS

Many areas of the world use groundwater as the main sources of fresh water supply. In order to cope with the increasing demand of water due to population expansion, and industrial and agricultural growth, the exploitation of groundwater becomes unavoidable in many parts of the world. Due to the unplanned exploitation of groundwater from the coastal aquifers, the saltwater from the sea or ocean enters into the freshwater aquifers near the seacoast. This intrusion of saltwater into the freshwater aquifers near the coastal region contaminates the freshwater aquifer and makes it unusable for further human utilization. The remedial cost of this contaminate aquifer is also very high and time consuming. Therefore, suitable management policies have to be taken in order to arrest further degradation of the aquifers due to saltwater intrusion.

Saltwater intrusion management models can be used to evolve optimal and efficient management strategies for controlling saltwater intrusion in coastal aquifers. In order to obtain physically meaningful optimal management strategies, the physical processes involved need to be simulated while deriving the management strategies. The heuristic search technique, Genetic Algorithm (GA) may be used as a tool for solving the optimum management model, because of its relative efficiency in identifying global optimal solutions especially for nonlinear non-convex problems.

The simulation of the flow and transport processes involved in coastal aquifers is difficult as the density dependent flow and transport processes are needed to be modeled. Incorporation of this simulation model within an optimization based management model is complex and difficult. However, as an alternative, it is possible to link the simulation model externally with an optimization based management model. The GA based optimization approach is especially suitable for externally linking the numerical simulation model within the optimization model. Further efficiency in computational procedure can be achieved for such a linked model, if the simulation process can be simplified by sufficiently accurate approximation, as very large number of iterations between the optimization and simulation model is generally necessary to evolve an optimal management strategy. A possible approach for approximating the simulation model is to use a trained Artificial Neural Networks (ANN) as the approximate simulator of the flow and transport processes in coastal aquifers. This trained ANN linked to a GA based optimization model can be useful in evolving management

strategies for coastal aquifers. Therefore, a Neural Network-Genetic Algorithm (ANN-GA) based linked simulation optimization model is developed for evolving optimal management of saltwater intrusion in coastal aquifers, using spatially and temporally varying optimal pumping strategies.

In the first step, trained ANN model is developed as an approximate simulator of the three-dimensional density dependent flow and transport processes in the coastal aquifer. A linked simulation optimization model is then formulated to link the trained ANN with a GA based optimization model for solving saltwater management problems. Single and multiple objectives optimal saltwater intrusion management models are developed. Real coded GA incorporating elitism is utilized to solve the single objective optimization problem. The multi-objective optimization problem is solved using Non-dominating Sorting Genetic Algorithm II (NSGA II).

The performance of the ANN model, as simulator for flow and transport processes in coastal aquifer, is evaluated for illustrative study areas, and is found to be satisfactory. The developed ANN model is simple in concept and computationally less time consuming compared to other numerical simulation models for simulating flow and transport processes in coastal aquifers. The ANN model takes considerably less CPU time than other numerical methods.

The performance of the linked simulation optimization (ANN-GA) model is also evaluated using an illustrative study area comprising of a hypothetical coastal aquifer. The evaluation results show the potential applicability of the developed methodology using ANN and GA based linked simulation optimization model for optimal management of coastal aquifers. The formulated single and multiple objectives management models are also solved using the embedded optimization technique for comparison of these solution results with solution results obtained using the ANN-GA approach for a given study area. The nonlinear algorithm available in MINOS is used to solve the embedded optimization model. The Pareto-optimal solutions for the multiple objectives optimization problem are obtained using the $e-$ constraint method. The evaluation shows that the solutions obtained using the ANN-GA model and the embedded optimization model are comparable.