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A Study on Finding the Contamination Level in Water for Domestic Applications

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ABSTRACT: Management and control of Water is a Complex multi-disciplinary task requiring the adequate approaches and techniques. Traditional modeling of physical process is often tries to explain the underlying processes. On this the so called Data-driven technique, borrowing heavily from artificial intelligence techniques, are based on limited knowledge of modeling process and relay on data describing the input and output characteristics. In this project application of widely used particular types of data driven models, namely artificial neural network(ANN) is used to model the water resource management field. Neural network has been successfully applied to wide range of problems covering the variety of sectors. During this ANN evolved from being only a research tool that is applied to many real world problems. Sensors play a vital role in detecting the impurities in water. However, in this project a wide range of wireless sensors are being operated in the water field, to detect the contamination level. In this project sensors namely PH, TURBIDITY, CONDUCTIVITY, HARDNESS and CALCIUM detection sensors are being employed.

KEYWORDS: ANN, CONDUCTIVITY, HARDNESS

I. INTRODUCTION

1.1 Sources of Drinking Water:

Domestic water must be clean and should not contain impurities more than permissible amount for drinking and cooking purpose. Present scenario drinking water is facing new challenges in their real-time operation due to lack of pure water resources, growing population, ageing infrastructure is pressing for greater importance in this direction. There is a need for better on-line water monitoring systems given that existing laboratory-based methods are too slow to develop operational response and do not provide required health protection in real time. Detection of contamination is critical in order to severe several consequences to human health.Traditional methods of water quality control involve the manual collection of water Although, the current methodology allows a thorough analysis which includes chemical and biological tests, it also have several drawbacks: a) the lack of real-time water quality information b) poor locations of coverage c)labor costs are high. d) harmful to environment. e) maintenance cost is high.Thus, there is a need of continuous on-line monitoring with efficient numbers of locations to be sampled. It is imperative by using suitable sensors to access the performance on several level of water contaminations.Further, there is a need of reliable, in-line, continuous, in expensive sensors for monitoring all possible biological and chemical contaminants.The approach of this project is to monitor the water by developing the low cost network using sensors for detection of contamination in water. The sensors deployed for this process can provide us many informations which are useful for controlling quality of water.The main contribution of this project is to design and develop a low cost sensor system that can be used by users for checking the contamination of water constantly so that they can regulate the impurity level of water for domestic consumption.

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II. CONTAMINATION EVENT DETECTION ALGORITHMS

2.1 Literature Survey:

A sensor node is developed for monitoring salinity in ground waters as well as the water temperature in surface waters. In, the authors have developed a WSN and an energy harvesting system (based on a solar panel) to monitor nitrate, ammonium and chloride levels in rivers and lakes. Energy harvesting techniques along with hibernation methods play an important role in extending the lifetime of sensor nodes. A survey on energy harvesting for WSNs is provided in. Finally, an autonomous boat equipped with water sensors is proposed to collect samples from lakes using the A search algorithm. More efficient navigation algorithms for a group of boats with obstacle avoidance are presented in. Next, we provide a number of academic and commercial efforts aim to develop hardware and software platforms for real-time monitoring of the water distribution systems. In a WSN is proposed to monitor hydraulic parameters in order to detect events such as leaks, pipe bursts. A cost effective multisensory probe for monitoring chlorine, conductivity and pressure without any event detection algorithms has been proposed by End etc. Finally, in an optical inter ferometric sensor along with an event detection algorithm to monitor refractive index aberrations in water has been developed.

2.2 Sensors Network:

In this project, a case study was taken in a water plant in mysuru city. Here a number of water samples were collected using Turbidity, Conductivity, PH, Hardness, Sensors. After collection of water samples the samples were simulated using ANN technique.

The overall goal is to detect contamination incidents in time to reduce potential public health and economic consequences. The locations of online sensors can be optimized to help achieve these goals as well as other objectives — for example, minimizing public exposure to contaminants, the spatial extent of contamination, detection time, or costs. These objectives are often at odds with each other, making it difficult to identify a single best sensor network design. In addition, there are many practical constraints and costs faced by water utilities. Consequently, designing is not a matter of performing a single optimization analysis. Instead, the design process is truly a multi-objective problem that requires informed decision making, using optimization tools to identify possible sensor network designs that work well under different assumptions and for different objectives. Water utilities must weigh the costs and benefits of different designs and understand the significant public health and cost. This Project focus on the use of optimization to select sensor locations . However, performing a single sensor placement analysis there are many factors that need to be considered when performing sensor placement, including utility response, the relevant design objectives, sensor behavior, practical constraints and costs, and expert knowledge of the water distribution system.

III. DATA COLLECTION

Water Samples were collected using the above sensors. The following Samples of data were obtained and it is tabulated as follows.

Sampling Point	pH
S 1	6.6
S 2	6.8
S 3	7.8
S 4	7.6
S 5	6.8
S 6	8.3
S 7	8.1
S 8	7.7
S 9	8

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S 10	6.4
S 11	6.5
S 12	6.4
S 13	6.6
S 14	6.7
S 15	6.4
S 16	6.5
S 17	8.1

Table 3 Result Analysis using ANN technique:

As already mentioned water quality in respect of the following attributed are very important and play a vital role in the health of the consumer. Tests were conducted in respect of each of these attributes. PH, TURBIDITY, CONDUCTIVITY, HARDNESS, CALCIUM. Sample values and predicted values using ANN techniques were conducted. The graphical depict the RISK, TREND, AVERAGE, ESTIMATED and missing data if any.

IV. EXPERIMENTAL RESULTS

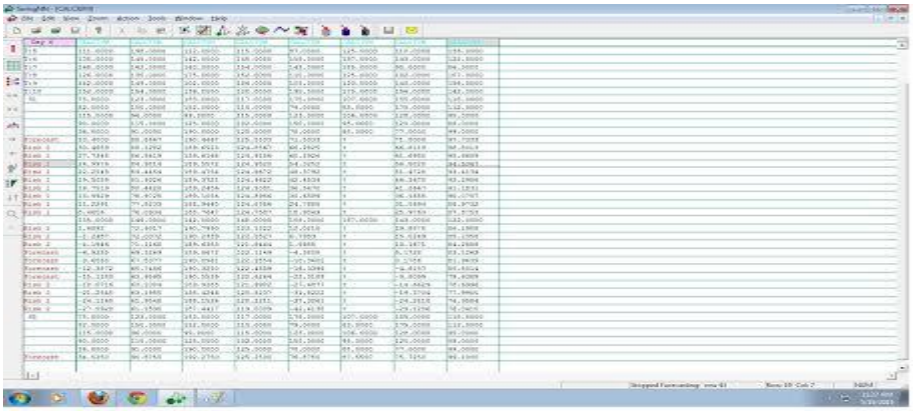

Fig 4.1 Data Collection

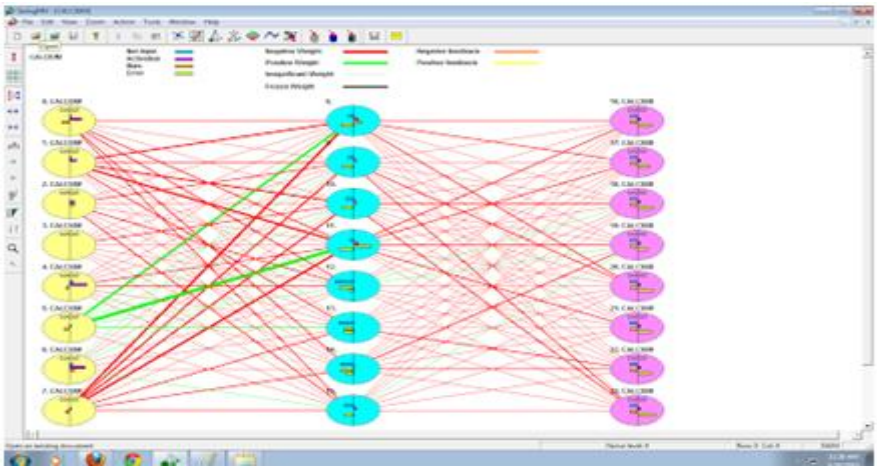

Fig 4.1.1 Typical multi layer perception (MLP) ANN network diagram of Conductivity.

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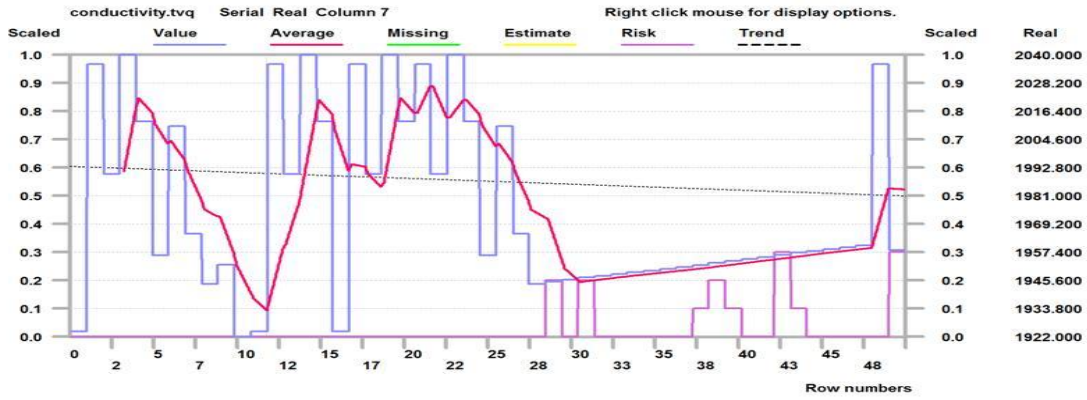

Fig 4.3. Sample Value of data of Conductivity using ANN technique.

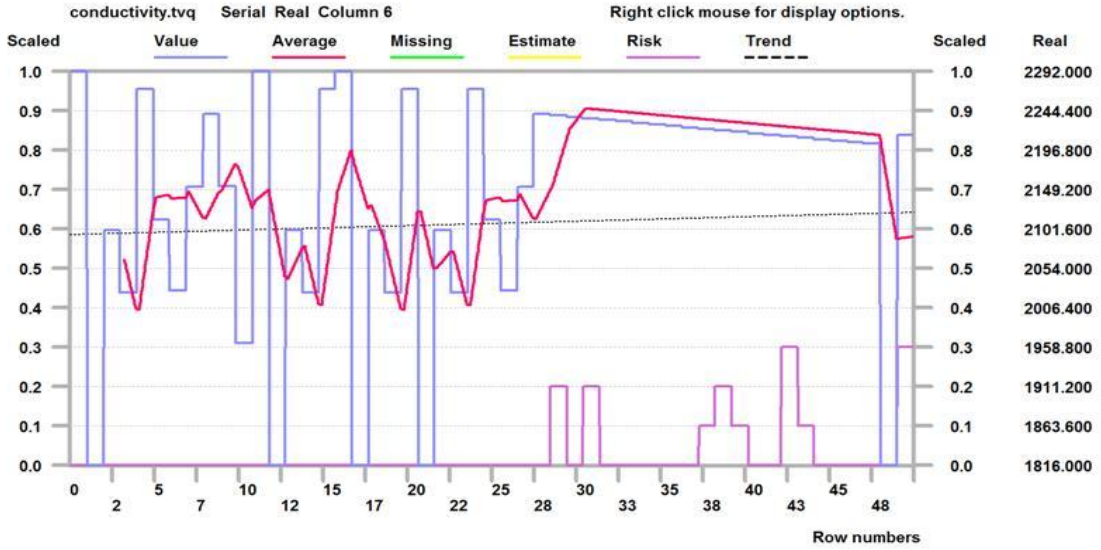

Fig 4.4. Predicted Value of data of Conductivity using ANN technique.

V. CONCLUSION

It has been clearly established by experiments that by deploying suitable sensors for detection of contaminants in drinking water can be achieved and has been clearly demonstrated in the experiments that are conducted. The proposed sensor node consists of several in-pipe water quality sensors. Unlike commercially available analyzers, the developed system is low cost, low power, lightweight and capable to process, log, and remotely present data. ANN system can monitor environmental and water quality parameters constantly because of its real-time detection capability. Drinking water quality detection is useful for the authorities to diagnose immediate characteristic variations in the water quality and take the necessary measures. Real-time monitoring can also be used for environmental hazard assessment, water resource management and protection, and natural hazard alert, etc.

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Largely available time-series data through real time monitoring can also be used for statistical purposes such as short and long-term trend of complete chemical and microbiological, biochemical, and ecological analysis. In this study, we aim to describe the real-time system based on ANNs for detecting drinking water quality condition with a credible real-time and stable performance, and for protection against health risks from a number of hazardous contaminants in drinking water. The project presented here attempts to address the cost and contaminant specific issues mentioned previously. The basic premise of this project is that readily available and relatively in-expensive equipment can be used with advanced data analysis techniques like artificial neural networks to determine when a contamination event in a distribution system has occurred. This will also ease the way to extract more information from the same or similar data to satisfy a critical need of the water industry, that is, distribution system security.

VI. FUTURE SCOPE

In this Project the accuracy of a data driven model used in water control can be significantly improved when different approaches are combined, e.g. ANN being complemented by reinforcement learning techniques. In spite of the multiple successful experiments and applications described in the project, it can be stated that acceptance of artificial neural networks (ANN) in water-related industries is slower than in other industries. Still much to be done in "bringing the message" to the practitioners through refined research into less explored areas of data-driven modelling and machine learning, demonstrations of convincing experiments and promising prototype applications in various areas of water management.However, sensors should also be designed so that cost of these detecting sensors should be low and more effective.Water industry must install the system in several locations of the water distribution network to characterize system/sensors response and wireless communication performance in real field deployments.

REFERENCES

[1] Abebe, A.J, Price, R.K, 2000, Application of neural networks to complement physically based hydrodynamic models, Proc. 4th International Conference on Hydroinformatics, Iowa City, USA, Balkema, Rotterdam.
[2] Amdisen, L.K et al, 1994, Model-based control - a hydroinformatics approach to real-time control of urban drainage system, Journal of Hydraulic Research, vol. 32.
[3] Bhattacharya, B, 2000, Application of artificial neural network in stage-discharge relationship, Proc. 4th International Conference on Hydroinformatics, Iowa City, USA, Balkema, Rotterdam.
[4] Solomatine, D.P and Avila Torres, L.A, 1996, Neural Network Approximation of a hydrodynamic Model in Optimizing reservoir operation, Proceedings of Hydroinformatics '96 conference, pp 201-206.
[5] T. P. Lambrou, C. C. Anastasiou, and C. G. Panayiotou, "A nephelo-metric turbidity system for monitoring residential drinking water quality," in Sensor Networks Applications, Experimentation and Logistics. New York, NY, USA: Springer-Verlag, 2009, pp. 43–55.
[6] T. P. Lambrou, C. G. Panayiotou, and C. C. Anastasiou, "A low-cost system for real time monitoring and assessment of potable water quality at consumer sites," in Proc. IEEE Sensors, Oct. 2012, pp. 1–4.
[7]G.Ramachandran,T Muthumanickam, B.SuganyaAbiramavalli, T.Sheela,,Arunkumar Madhuvappan,L.Vasanth" Study and implementation of Green Power in Campus Environment" International Journal of Electronics and communication Engineering & Technology, ISSN:0976-6472, Pages . 325-331 Vol:3,Issue:1
[8]G.Ramachandran, N.Manikanda Devarajan, T.Muthumanickam , S.kannan,C. ArunKumarMadhuvappan, PM Murali " Comparative study and Implementation of Mixed Level and Mixed Signal Simulation Using PSPICE and VHDL, International Journal of Computational Engineering Research, ISSN:2250-3005,Vol No:2 Pages 218-228,,
[9]T.Sheela , T.Muthumanickam G.Ramachandran, A. Nagappan "Low Power and High Speed CMOS Circuits" International Journal Of Innovative Research In Electrical, Electronics, Instrumentation And Control Engineering (IJIREEICE),ISSN:2321-2004,Vol. 2, Issue 11,
[10]G.Ramachandran, T.Muthumanickam, P.M.Murali, Sajith.S.Nair, L.Vasnath"Vedic Multiplier in VLSI for High Speed Applications" International Journal of Innovative Research in Computer and Communication Engineering ISSN(Online): 2320-9801page 2353-2356 Vol. 3, Issue 3,
[11]G.Ramachandran, T.Muthumanickam, T.Sheela , R.Thirunavukkarasu" Simulation Transfer of Files from PC To PC Using LAN Trainer Kit" International journal of trend in research and developments. ISSN 2394-9333 Page 1-6 Volume-2 Issue-2
[12] J. Hall et al., "On-line water quality parameters as indicators of distribution system contamination," J. Amer. Water Works Assoc., vol. 99, no. 1, pp. 66–77, 2007.
[13] M. V. Storey, B. Gaag, and B. P. Burns, "Advances in on-line drinking water quality monitoring and early warning systems," Water Res., vol. 45, no. 2, pp. 741–747, Jan. 2011.
[14] Hach HST, GuardianBlue Early Warning System Brochure. Loveland, CO, USA: Hach Company, 2008.
[15] BioSentry Contamination Warning System Overview, JMAR, Wyoming, MI, USA, 2006.