Assessment of Fluoride Contamination and other Pollutants in the Groundwater using Internet of LoRa Things (IoLT) and Edge Computing Techniques.

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Abstract

Water is necessary for life, but water pollution is a serious threat that we face today. Water quality has a direct impact on public health and the environment. The presence of various types of pollutants, ranging from organics to heavy metals, turbidity, hardness, and chemical concentrations, can have serious environmental and marine life consequences. Fluoride levels in water are high in most part of the world due to Industrialization. Fluoride consumption above a certain threshold level causes skeletal fluorosis, dental fluorosis, and, in some cases, blindness. The characteristics of ground water quality can be assessed using Internet of Long Range (LoRa) enabled edge nodes along with Low Power Wide Area Network (LPWAN) gateway. Before validating the results, LoRa edge node sensors will be calibrated on a regular basis. Resource scaling is possible by increasing the number of gateways and edge nodes, and hence more ground water samples can be covered. Each gateway can handle more than 50 edge nodes and listen to multiple uplink frequencies at the same time. The proposed LoRA technology for water contamination monitoring has an increased battery life time for around ten years, thus lowering the battery replacement costs for the sensors. The groundwater samples will be collected in the in-situ region and analysed for TDS, salinity, and EC levels using LoRa sensors. With the collected raw data, an optimised ensemble based classifier will be developed to predict the Water Quality Index (WQI) and compare it with WHO standards. The WQI index levels at the in-situ region can be visualized through an interactive real-time dashboards using power BI tools. The delivery pipeline includes all stages of edge level computations and noise filtering.

Keywords: Groundwater contamination, Internet of LoRa Things , Edge computing, Low power wide area network, Water Quality Index.

Biography

Dr. Sujatha is an Associate Professor in the Department of Embedded Technology, School of Electronics Engineering, VIT University, Vellore Campus. She received her Ph.D from Anna University, Chennai in the field of information security. She has 23 years of teaching and research experience in reputed Institutions. Her research interests includes Industrial Internet of Things, Data Engineering in Cloud and Information Security in cloud platform. She received a speaker Award at the UK Cloud Asia Summit-2019, Cambridge University, UK. Dr.Sujatha has organized an Industry Academia Conclave in the IoT domain at VIT, symposium on "AI and Cloud computing" at Purdue University, Indiana Polis, USA and a symposium on "Recent Trends in Engineering" at UTeM, Malaysia jointly with VIT. She has delivered technical lectures in the cutting edge technologies for national and international students, faculty communities. She has published research articles in peer-reviewed national, international journals and conferences. Received a DST SERB CRG grant for IoT-LoRa enabled detection and prediction of pollutants in ground water in an open dumping yard. Received Seed Grant for LoRa enabled water pipeline monitoring and green house management. She is a AWS certified cloud computing practitioner and trainer. She has completed a consultancy project in "Industry

automation through cloud-based environmental factor monitoring" for Transcend Solar Systems, Chennai. Dr.Sujatha is the In-charge and active member of "Intelligent Industrial IoT and computing lab" at the School of Electronics Engineering, VIT, faculty representative and a mentor for the students IoT Club, at VIT.Currently her focus is on achieving secured long-range data connectivity for Industrial IoT using 5G, LoRa networks and Block chain..