Water quality monitoring using the wireless sensor networks

Environment, Nature

For Leak Detection: The application of piezoelectric is in the field of ultrasonic transducers, sonar, resonators, electric filters, accelerometers and delay lines to detect failure at joint connections with factors like corrosive environments, soil layer movement, loading and vibration all can contributing to pipe deterioration over time and eventual leakage. The most commonly used method for detecting leaks in water distribution systems involves using sonic leak-detection equipment, which recognize the sound of water blow up from a pipe. The research is based on detecting and instantaneously processing acoustic signals inside and outside pipes in leak detection.

Acoustic correlation methods are more complicated over direct sound measurements methods where two sensors are used. The sensors in-bracket the leak and the flow time during the acoustic signals detected by the two sensors detects and locates the leak. deduction of the leak signal, while it moves along the pipe, is not linear, i. e. deduction factors of varying frequencies are different depending on material of pipe and the flow parameters. For power considerations: Sensor hubs are normally battery-powered, yet evolving batteries is now and again unthinkable for covered sensor hubs. The battery needs to give enough power to the sensor hub amid the whole working time. The wide band sensor can sense an expansive scope of frequencies; hence, it can distinguish numerous sorts of leak however it has power limitations. There are numerous sorts of acoustic sensors with diverse shapes, sizes and sensitivities. All these sensors have varied advantages and thus varied applications but in all these are very hard for remote sensor hubs and remote installation because it obliges low power

utilization, effortlessness, and cost proficiency. The power generator guarantees that the sensor hub has enough power for its operational lifetime.

Sensors

Wireless Sensor Networks (WSNs) have been achieved widespread applicability in water quality monitoring which is cost effective and more efficient the author has introduced a network with zigbee based sensors Zigbee is a set of communication protocols using low power radio based on IEEE802. 15 [10]. All sensor nodes in the WSN are open hardware based on ZigBee An alarming function is integrated into the Web Server since it is highly required for most monitoring applications. The alarming function could be reused in different WSN-based monitoring applications. The proposed framework can monitor the water quality in real-time and also contains an alarming component that can quickly give a warning email in case any abnormal event occurs this network proved sufficient enough for solving some of the major issuesAs the sensor Networks plays an important role in monitoring and the efficient management of distributed industrial infrastructure. These are used for monitoring operational status with the potential mechanisms issues early on and the benefits of such monitoring include the possibility of performing at a low cost so financial savings. In the architecture two types are used which are a semiconductor manufacturing plant and a North Sea oil tanker. Whereas these dont tly relate to distribution but the findings are relevant as they are presented in terms of general

design insights. Important findings include relationships observed between different sensor hardware configurations and their power efficiency.

In this water management system all nodes including their sensors and radios are water proof. So every sensor node used here is a GSM modem which is capable of GPRS data connectivity and sensor nodes are battery pack with an limited lifetime. Then the analysis was made using the graph which indicates when the short term failure was there and when long term failure. It also indicates the graph during the rainy season. With some of the failures like the security which is not quite good would be solved in the coming years. Water quality monitoring has become a crucial question around the whole world. Traditionally, remote water sensing based on satellites is widely used to monitor the water quality for rivers, lakes, seas and oceans. However, satellites only offer a macro view of the water quality. With the development of communication technology and sensor technology, especially the concept of wireless sensor network and Cyber-Physical System (CPS), many efforts have been made toward building new water quality surveillance technologies based on wireless sensors deployed underwater. Sensors have been developed for underwater environment that are able to collect accurately several water quality parameters such as; temperature, chemical substances, water density etc.

Existing Setup

A wireless sensor network is a system by which we can get the information of water as it monitors within the reservoir. Basically a system is build ofcrossbow motes like MicaZ using such motes based on Xmesh networking

protocol, a proprietary protocol of crossbow will be created. XMesh is a full featured multi-hop, ad-hoc, mesh networking protocol developed by CrossBow for wireless networks which communicates with each other and are capable of hopping radio messages to a base station where they are passed to a PC or other client. It is basically of three distinct software tiers:

1. The Mote

   Tier, where the Xmesh resides is the software that runs on a cloud of sensor nodes forming mesh network.

2. The Server

   Tier is an always-on facility that handles translation and buffering of data coming from the wireless network and provides the bridge between the wireless Motes and the internet clients.

3. The Client

   Tier provides the user visualization software and graphical interface for managing the network. . Crossbow provides free client software called Mote View, but XMesh can be interfaced to custom client software as well and with all the mentioned sytems we get the proposed system for Real Time Monitoring of Water Quality of Dal Lake using Wireless Sensor Network.

This paper presents

Water Quality Monitoring using a Wireless Sensor Network. As this system isn’t a new one but there is always a possibility to invent a technique so the work could become easier for the user. So here the wireless network is made

using the sensors to detect the required parameters of the water system. Sensors like phosphate was used as it is a long-term monitoring device developed within the SmartCoast project. Subsequent to autonomous field trials and sensor validation, this sensor will be integrated with Tyndall's " smart" multi-sensor system and Microfluidic technology is used to minimize the volumes of reagents in turn leading to low reagent/waste storage requirements and low power requirements for fluid handling. The sensor is based on the yellow method for phosphate detection. The resulting solution absorbs strongly below 400 nm. Multi sensor sytem was also used to meet the low power consumption requirements and the communication standard in the WSN is Zigbee implemented on the Tyndall mote. Number of sensors can be used depending on the use of the user like Bluetooth could also be one. So this finally results that a low power wireless sensor network multi sensor implementation is viable and Microfluidic technology is used to minimize the volumes of reagents.

Here basically a wireless sensor are used to detect the parameters by monitoring and managing the system. As most of the countries are facing the issue of the energy comsumption so a low power gateway node was implemented and these systems should be working automatically. The sensored data needs to be collected, and this data needs to be automatically retrived at the other end. So to increase the lifeline of the system the nodes which are not used are basically turned off with the help of the external eSerial board as it is very easy to turn on and off the 90-FLT. As the is used Linux so that the gateway which is developed is very flexible enough to work

in different scenarios and to provide a way to interconnect different networks as it works as a client connected to an access point which is then connected to the Internet. Users could use a web browser to access the data via a web application. Long distances involved, is the best solution is to implement a mesh protocol such as OLSR Using a three-layer architecture, the main features of the newly implemented system and its application to water quality measurement in Malawi. Thus it results in the two challenging issues which are energy consumption of the system and the inter-networking problem. Besides Malawi, the WQWSN has been planned as an extension to this work. Its expansion into a Water Quality Sensor Web (WQSW) is also a further step to the extensions of our proposed WQWSN prototype.

This paper presents the characteristics and showcases the design of a monitoring and management system for water resources for a whole river basin based on water quality monitoring and risk management and also highlights the need for the economic evaluation of water resources services, and presents a brief description of how these services could be valued. The complete system and methodology can be used for the management of water resources, and can also become the starting point for the design and implementation of more general natural resources management schemes and sustainable development policies. The data input in WATERMAN, data processing and evaluation and the decision making follow the process presented. Data come in parallel through 3 channels: the regional inspectors for environmental protection, from an automated radio-computer system and

from satellite images. In order for such a system to be implemented, the following steps are needed:

1. Development of a radio – computer system for the collection of samples from rivers and underground waters.
2. Definition of the phenomena to be observed
3. Definition of the indexes to be measured and technology of their collection
4. The system keeps multiple parameters under consideration and supports the “ sustainable development.

The various groups of water users have, to some extent, developed their own approaches and methods to describe and measure water quality. For many decades river basin management and water pollution control have relied on summary variables, such as biochemical oxygen demand (BOD) and chemical oxygen demand (COD) to quantify sewage discharge and oxygen problems in rivers. For the purpose of human consumption and public water supply, a set of microbiological indicator organisms have been identified and their enumeration is now commonly applied to determine the hygienic suitability of water for drinking).

Protocol

This paper presented a vision of the Water Quality Monitoring System for Inland Lakes (WQMSIL) and aims to reflect the trend of inland lakes environment quality by making full use of advantages of remote sensing data, combined with ground-based observation data. The traditional monitoring methods had many shortcomings, such as long cycle,

discontinuities in time and space, higher cost and so on but no specific method seems to be mentioned. This is a good way to analyze the quality of water, we'd carry dynamic monitoring on water quality to detect the change in the information of the lake in time. It's an automatic system hence less man work is required and the system is incomplete without ground based sensors as not all types of remote sensors are available. The system flows the frame work of 4 subsystems

1. Data management subsystem
2. Data preprocesses subsystem
3. Water quality monitoring subsystem
4. Mapping and Visualization subsystem.

Data layer manages amounts of spatial data and attribute data to realize integrated management of data in the system. Data layer includes remote sensing image database, ground-based observation of database, geographic information database, environment background database and so on. Application layer provides the operational platform to realize the functions of the system. It receives requirements of users and calls the data of data layer to complete the function and output data products. Presentation layer is an environment in which data and products of the system are visualized by a variety of forms.

IoTs concept leads to the requirement of inter-communicability and inter-operability of wirelessly communicating sensor nodes. These nodes are manufactured by different companies that practice a wide variety of communication protocols such as Zigbee, ANT+, Bluetooth Low Energy (BLE)

backward compatible Bluetooth 3. 0 and WiFi and this concept introduced by the author proved very useful and also the gap in the prevailing prototypes in sensor to sensor communication is filled by using this Multi trans receiver protocol Each individual sensor cell that makes up a complete related system needs to communicate between each other for better decision making. there will be a need for a common communication mechanism for the nodes to relay the rooms current characteristics compared to the required characteristics for the nodes to work together in achieving the common goal. Nodes utilizing multiple communication protocols were used for the experiment to assess and prove the capability of the multiprotocol receiver to receive, segregate and process the data from multiple nodes communicating with different communication protocols and programmed for different applications in a centralized manner.