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WSN for Detection of Natural Disaster Using Data Mining

TanushreeTiwari[1], Shubhangi Borkar[2]
ME Student[1], Professor[2]
Department of (ME) Embedded System &Computing
Nagpur Institute of Technology, Nagpur, Maharashtra India

Abstract:
Recently, wireless sensor networks (WSNs) have become mature enough to go beyond being simple fine-grained continuous monitoring platforms and become one of the enabling technologies for disaster early-warning systems. Event detection functionality of WSNs can be of great help and importance for (near) real-time detection of, for example, meteorological natural hazards and wild and residential fires. The field of wireless sensor networks (WSNs) has become a focus of intensive research in recent years, especially for monitoring and characterizing large physical environments, and for tracking various environmental or physical conditions such as temperature, wind and humidity. A wireless sensor network (WSN) consists of a number of sensor nodes (few tens to thousands) storing, processing and relaying the sensed data, often to a base station for further computation [1,2].Wireless sensor networks can be used in many applications, such as wildlife monitoring [3],military target tracking and surveillance [4], hazardous environment exploration [5], and natural disaster relief [6]. Given the huge amount of sensed data, automatically classifying them becomes a critical task in many of these applications. Usually, the life time of a sensor in WSN is very restricted due to limited battery life, and keeping the energy consumption to the lowest level is always a key issue. Though some ad hoc approaches have been developed to address this issue, they have met with limited success, in terms of dynamically managing the energy requirements without compromising the accuracy with which a WSN can perform monitoring, classification or characterisation in the event of sensor failures. Hence, there is an urgent need for intelligent and energy efficient schemes, especially for monitoring and characterization of large physical environments with WSNs with hundreds of heterogeneous sensor nodes.

Keywords: WSN (Wireless Sensor Network), physical environment monitoring, machine learning, data mining, feature selection.

1. INTRODUCTION

Background: A wireless sensor network (WSN) is a wireless network consisting of spatially distributed autonomous devices using sensors to monitor physical or environmental conditions. A WSN system incorporates a gateway that provides wireless connectivity back to the wired world and distributed nodes The wireless protocol we select depends on your application requirements. Some of the available standards include 2.4 GHz radios based on either IEEE 802.15.4 or IEEE 802.11 (Wi-Fi) standards or proprietary radios, which are usually 900 MHz.

WSN Network Topologies: WSN nodes are typically organized in one of three types of network topologies. In a star topology, each node connects directly to a gateway. In a cluster tree network, each node connects to a node higher in the tree and then to the gateway, and data is routed from the lowest node on the tree to the gateway. Finally, to offer increased reliability, mesh networks feature nodes that can connect to multiple nodes in the system and pass data through the most reliable path available. This mesh link is often referred to as a router.

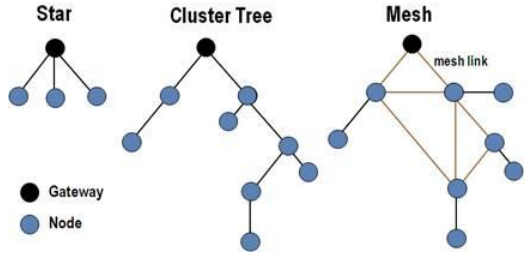

Figure .1. Common WSN Network Topologies

Components of a WSN Node: A WSN node contains several technical components. These include the radio, battery, microcontroller, analog circuit, and sensor interface. When using WSN radio technology, you must make important trade-offs. In battery-powered systems, higher radio data rates and more frequent radio use consume more power. Often three years of battery life is a requirement, so many of the WSN systems today are based on ZigBee due to its low-power consumption. Because battery life and power management technology are constantly evolving and because of the available IEEE 802.11 bandwidth, Wi-Fi is an interesting technology. The second technology consideration for WSN systems is the battery. In addition to long life requirements, you must consider the size and weight of batteries as well as international standards for shipping batteries and battery availability. The low cost and wide availability of carbon zinc and alkaline batteries make them a common choice. To extend battery life, a WSN node periodically wakes up and transmits data by powering on the radio and then powering it back off to conserve energy. WSN radio technology must efficiently transmit a signal and allow the system to go back to sleep with minimal power use. This means the processor involved must also be able to wake, power up, and return to sleep mode efficiently. Microprocessor trends for WSNs include reducing power consumption while maintaining or increasing processor speed. Much like your radio choice, the power consumption and processing speed trade-off is a key concern when selecting a processor for WSNs. This makes the x86 architecture a difficult option for battery-powered devices.

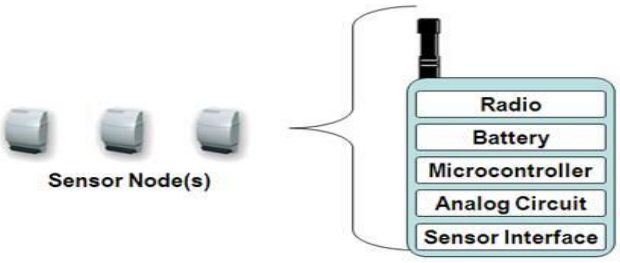

Figure.2. Components of a WSN Node

Applications cum work done:
In this work we developed a system having different sensor interface through wireless. Each sensor is connected Atmega328P microcontroller based Arduino Board. There are various separate microcontroller board for each sensor with wireless transmitter module. One board is having ESP8266 wifi module which is connected to internet. All the peripheral microcontroller based sensor board will send data to base board having wifi, and that base board will perform data logging on wesite (on Local Host performed). We used Gas, temperature, humidity, and vibration sensor. Temperature and humidity is measured using DTH11 sensor module. MQ7 CO sensor is used for gas detection and accelerometer for vibration detection.

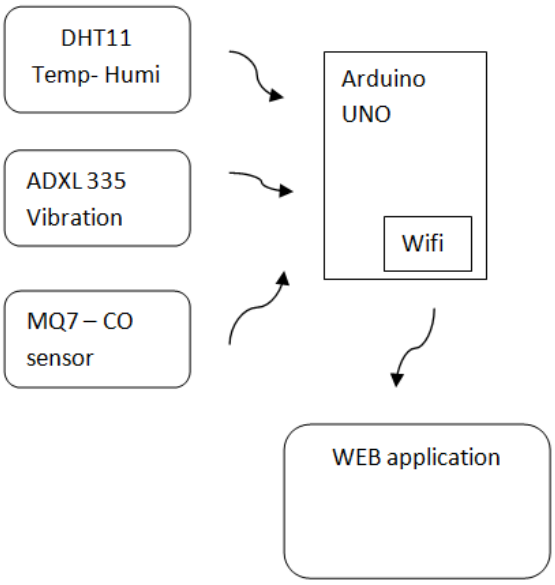

Figure .3. Block Diagram WSN system
Base system used to send the all data to web application using wifi. Web application receive data and show graphical representation of each parameter. Web application is be developed HTML, PHP, Java Script and SQL database.

Web development:
IoT development projects are everywhere, and affordable, advanced technology is the driving force behind this fast-growing phenomenon. Smaller, more accessible hardware and the flexibility to use common programming languages make it easier than ever before to develop these embedded IoT systems. From hobbyists programming their own single-board computers to companies developing devices we can control from our mobile devices, the IoT is rapidly expanding. Whether you're creating a quick prototype or an entire IoT-powered business application, here's a look at the small but incredibly smart technology of IoT development. We'll cover IoT data, hardware, and software considerations, plus the most popular IoT skills on the rise so you'll know what to look for when seeking out top talent for your IoT initiative. The IoT has attracted the attention of companies all across the globe, with many creating internal business units dedicated to IoT development. According to a recent survey from analyst firm, Gartner, 43 percent of organizations are using or plan to implement IoT in 2016. IoT has become a top business initiative for many companies. So who is the talent who will be driving this new technology, and what skills will they need to have? Here's a look at the top growing global IoT categories and skills on the Upwork platform to give you an idea of the scope and demands of IoT projects.

Data science and analytics – 1027%*
Data mining: 230%
- Machine Learning: 199%
- Matlab: 78%

IT & Networking – 120%
- Computer networking: 91%
- Network security: 46%
- Linux system administration: 26%

Engineering & Architecture – 68%
- Circuit design: 231%
- AutoCAD: 217%
- 3D design: 29%

Wearables – 68%
- Electrical engineering: 159%
- GPS development: 66%
- 3D design: 29%

Security – 51%
- Security infrastructure: 194%
- Security engineering: 124%
- Network security: 46%

Connected Home – 41%
- Raspberry Pi: 17100%*
- Circuit design: 231%
- Microcontroller programming: 225%

Web, Mobile and Software Development – 40%
- Node.js: 86%
- MongoDB: 63%
- iPhone app development: 40%

Big data, data storage and processing/backend programming – 17%
- Apache Spark: 1667%*
- Big data: 183%
- MongoDB: 63%

Web development is a broad term for the work involved in developing a web site for the Internet (World Wide Web) or an intranet (a private network). Web development can range from developing the simplest static single page of plain text to the most complex web-based internet applications (or just 'web apps') electronic businesses, and social network services. A more comprehensive list of tasks to which web development commonly refers, may include web engineering, web design, web content development, client liaison, client-side/server-side scripting, WebServer and network security configuration, and e-commerce development. Among web professionals, "web development" usually refers to the main non-design aspects of building web sites: writing markup and coding. Most recently Web development has come to mean the creation of content management systems or CMS. These CMS can be made from scratch, proprietary or open source. In broad terms the CMS acts as middleware between the database and the user through the browser. A principle benefit of a CMS is that it allows non-technical people to make changes to their web site without having technical knowledge. For larger organizations and businesses, web development teams can consist of hundreds of people (web developers) and follow standard methods like Agile methodologies while developing websites. Smaller organizations may only require a single permanent or contracting developer, or secondary assignment to related job positions such as a graphic designer or information systems technician. Web development may be a collaborative effort between departments rather than the domain of a designated department. There are three kinds of web developer specialization: front-end developer, back-end developer, and full-stack developer. Front-end developers deal with the layout and visuals of a website, while back-end developers deal with the functionality of a website. Back-end developers will program in the functions of a website that will collect data. There is open source software for web development like

BerkeleyDB, GlassFish, LAMP (Linux, Apache, MySQL, PHP) stack and Perl/Plack. This has kept the cost of learning web development to a minimum. Another contributing factor to the growth of the industry has been the rise of easy-to-use WYSIWYG web-development software, such as Adobe Dreamweaver, BlueGriffon and Microsoft Visual Studio. Knowledge of Hyper Text Markup Language (HTML) or of programming languages is still required to use such software, but the basics can be learned and implemented quickly with the help of help files, technical books, internet tutorials, or face-to-face training. An ever-growing set of tools and technologies have helped developers build more dynamic and interactive websites. Further, web developers now help to deliver applications as web services which were traditionally only available as applications on a desk-based computer. This has allowed for many opportunities to decentralize information and media distribution. Examples can be seen with the rise of cloud services such as Adobe Creative Cloud, Dropbox and Google Docs. These web services allow users to interact with applications from many locations, instead of being tied to a specific workstation for their application environment. Examples of dramatic transformation in communication and commerce led by web development include e-commerce. Online auction sites such as eBay have changed the way consumers find and purchase goods and services. Online retailers such as Amazon.com and Buy.com (among many others) have transformed the shopping and bargain-hunting experience for many consumers. Another good example of transformative communication led by web development is the blog. Web applications such as WordPress and Movable Type have created easily implemented blog-environments for individual websites. The popularity of open-source content management systems such as Joomla!, Drupal, XOOPS, and TYPO3 and enterprise content management systems such as Alfresco and eXo Platform have extended web development's impact at online interaction and communication. Web development has also impacted personal networking and marketing. Websites are no longer simply tools for work or for commerce, but serve more broadly for communication and social networking. Web sites such as Facebook and Twitter provide users with a platform to communicate and organizations with a more personal and interactive way to engage the public. We developed a web application which receive data from the hardware and stored it in sqldatabse. Web page fetch all the data and accordingly plot the graph for every data. Web application will compare the data pattern and predict the early disaster stage. This is the ultimate goal we achieve.

4. CONCLUSION

This discussion concludes thatWSN is novel techniques to reduce power consumption along with an appropriate result. We can predict early stage disaster using the web application with efficient wireless sensor network.

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