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IOT ON DISASTER INFORMATION ANALYSIS USING WIRELESS SENSOR NETWORK

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Abstract- **Disasters management and emergency services used to protect a person or society from the cost of disasters such as tsunami warning , landslide monitoring, earthquake rescue operation, volcano monitoring, and fire protection.These incidents of mass destruction irrespective of the whether natural calamities or man-made catastrophes cause a huge loss of money, property and lives due to non-planning on the part of the governments and the management agencies. Therefore required steps are to be taken towards the prevention of these situations by pre-determining the causes of these disasters and providing quick rescue measures once the disaster occurs. Wireless Sensor networks (WSNs) typically consist of routers and clients with each node having the capability of operating not only as a host but also as a router. Based on the functionality of the nodes, routers are used to form a multi-hop and multi-path wireless relay backbone capable of communicating with gateways and clients, this communication can be done using IoTs. The IoT allows nodes to be sensed and/or controlled remotely across existing network infrastructure. When IoT is augmented with sensors and actuators, the technology becomes an instance of the more general class of cyber-physical systems. Most of the present routing protocols for WSN's are not designed to adapt congestion , fast transmission, optimal link quality. This paper proposes a routing metric known as Disaster management on Cut Falcon Routing (CFR) for wireless sensor networks. The proposed disaster management scheme performs better with regard to throughput when more data is transmitted through network.**

***Keywords*—** IOT, WSN, Disaster management, CFR,Routing algorithms.

I.INTRODUCTION

The Internet of things is the internet working of physical devices, vehicles (also referred to as "connected devices" and "smart devices"), buildings and other items— embedded with electronics, software, sensors, actuators, and network connectivity that enable these objects to collect and exchange data. In 2013 the Global Standards Initiative on Internet of Things (IoT-GSI) defined the IoT as "the infrastructure of the information society." The IoT allows objects to be sensed and/or controlled remotely across existing network infrastructure, creating opportunities for more direct integration of the physical world into computer-based systems, and resulting in improved efficiency, accuracy and economic benefit. When IoT is augmented with sensors and actuators, the technology becomes an instance of the more general class of cyber-physical systems, which also encompasses technologies such as smart grids, smart homes, intelligent transportation and smart cities. Each thing is uniquely identifiable through its embedded computing system but is able to interoperate within the existing Internet infrastructure..

Typically, IoT is expected to offer advanced connectivity of devices, systems, and services that goes beyond machine-to-machine (M2M) communications and covers a variety of protocols, domains, and applications. The interconnection of these embedded devices (including smart objects), is expected to usher in automation in nearly all fields, while also enabling advanced applications like a smart grid, and expanding to the areas such as smart cities.

"Things," in the IoT sense, can refer to a wide variety of devices such as heart monitoring implants, biochip transponders on farm animals, electric clams in coastal waters, automobiles with built-in sensors, DNA analysis devices for environmental/food/pathogen monitoring or field operation devices that assist firefighters in search and rescue operations. Legal scholars suggest to look at "Things" as an "inextricable mixture of hardware, software, data and service". These devices collect useful data with the help of various existing technologies and then autonomously flow the data between other devices. Current market examples include home automation (also known as smart home devices) such as the control and automation of lighting, heating (like smart thermostat), ventilation, air conditioning (HVAC) systems, and appliances such as washer/dryers, robotic vacuums, air purifiers, ovens or refrigerators/freezers that use Wi-Fi for remote monitoring.

As well as the expansion of Internet-connected automation into a plethora of new application areas, IoT is also expected to generate large amounts of data from diverse locations, with the consequent necessity for quick aggregation of the data, and an increase in the need to index, store, and process such data more effectively. IoT is one of the platforms of today's Smart City, and Smart Energy Management Systems.

Application

Environmental monitoring

Environmental monitoring applications of the IoT typically use sensors to assist in environmental protection by monitoring air or water quality, atmospheric or soil conditions, and can even include areas like monitoring the movements of wildlife and their habitats. Development of resource constrained devices connected to the Internet also means that other applications like earthquake or tsunami early-warning systems can also be used by emergency services to provide more effective aid. IoT devices in this application typically span a large geographic area and can also be mobile. It has been argued that the standardization IoT brings to wireless sensing will revolutionize this area.

Infrastructure management

Monitoring and controlling operations of urban and rural infrastructures like bridges, railway tracks, on- and offshore- wind-farms is a key application of the IoT. The IoT infrastructure can be used for monitoring any events or changes in structural conditions that can compromise safety and increase risk. It can also be used for scheduling repair and maintenance activities in an efficient manner, by coordinating tasks between different service providers and users of these facilities. IoT devices can also be used to control critical infrastructure like bridges to provide access to ships. Usage of IoT devices for monitoring and operating infrastructure is likely to improve incident management and emergency response coordination, and quality of service, up-times and reduce costs of operation in all infrastructure related areas. Even areas such as waste management can benefit from automation and optimization that could be brought in by the IoT.

Manufacturing

Network control and management of manufacturing equipment, asset and situation management, or manufacturing process control bring the IoT within the realm on industrial applications and smart manufacturing as well. The IoT intelligent systems enable rapid manufacturing of new products, dynamic response to product demands, and real-time optimization of manufacturing production and supply chain networks, by networking machinery, sensors and control systems together. Digital control systems to automate process controls, operator tools and service information systems to optimize plant safety and security are within the purview of the IoT. But it also extends itself to asset management via predictive maintenance, statistical evaluation, and measurements to maximize reliability. Smart industrial management systems can also be integrated with the Smart Grid, thereby enabling real-time energy optimization. Measurements, automated controls, plant optimization, health and safety management, and other functions are provided by a large number of networked sensors.

The term IIOT (Industrial Internet of Things) is often encountered in the manufacturing industries, referring to the industrial subset of the IoT. IIoT in manufacturing would probably generate so much business value that it will eventually lead to the fourth industrial revolution, so the so-called Industry 4.0. It is estimated that in the future, successful companies will be able to increase their revenue through Internet of things by creating new business models and improve productivity, exploit analytics for innovation, and transform workforce. The potential of growth by implementing IIoT will generate $12 trillion of global GDP by 2030.

1.2 WIRELESS SENSOR NETWORK

Wireless sensor networks (WSN), sometimes called wireless sensor and actuator networks (WSAN), are spatially distributed autonomous sensors to monitor physical or environmental conditions, such as temperature, sound, pressure, etc. and to cooperatively pass their data through the network to a main location. The more modern networks are bi-directional, also enabling control of sensor activity. The development of wireless sensor networks was motivated by military applications such as battlefield surveillance; today such networks are used in many industrial and consumer applications, such as industrial process monitoring and control, machine health monitoring, and so on.

The WSN is built of "nodes" – from a few to several hundreds or even thousands, where each node is connected to one (or sometimes several) sensors. Each such sensor network node has typically several parts: a radio transceiver with an internal antenna or connection to an external antenna, a microcontroller, an electronic circuit for interfacing with the sensors and an energy source, usually a battery or an embedded form of energy harvesting

Application

Area monitoring

Area monitoring is a common application of WSNs. In area monitoring, the WSN is deployed over a region where some phenomenon is to be monitored. A military example is the use of sensors detect enemy intrusion; a civilian example is the geo-fencing of gas or oil pipelines.

Environmental/Earth sensing

There are many applications in monitoring environmental parameters, examples of which are given below. They share the extra challenges of harsh environments and reduced power supply.

Air pollution monitoring

Wireless sensor networks have been deployed in several cities (Stockholm, London, and Brisbane) to monitor the concentration of dangerous gases for citizens. These can take advantage of the ad hoc wireless links rather than wired installations, which also make them more mobile for testing readings in different areas.

Forest fire detection

A network of Sensor Nodes can be installed in a forest to detect when a fire has started. The nodes can be equipped with sensors to measure temperature, humidity and gases which are produced by fire in the trees or vegetation. The early detection is crucial for a successful action of the firefighters; thanks to Wireless Sensor Networks, the fire brigade will be able to know when a fire is started and how it is spreading.

Landslide detection

A landslide detection system makes use of a wireless sensor network to detect the slight movements of soil and changes in various parameters that may occur before or during a landslide. Through the data gathered it may be possible to know the impending occurrence of landslides long before it actually happens.

Natural disaster prevention

Wireless sensor networks can effectively act to prevent the consequences of natural disasters, like floods. Wireless nodes have successfully been deployed in rivers where changes of the water levels have to be monitored in real time.

II.LITERATURE SURVEY

The aim of this paper is to examine the present disaster information transmission system in Japan, especially focusing on the Tsunami Warnings issued by the JMA and the Evacuation Instructions issued by municipalities from a pragmatic perspective. Examination of the reports of the JMA and the Fire and Disaster Management Agency (FDMA), legal documents, and live recordings (YouTube) of outside speakers when the great tsunamis attacked the Tohoku area should clarify the problems of disaster information transmission and indicate some proposed improvements for the whole transmission system. This article also suggests that pragmatics can be a useful framework for constructing the literacy of disaster prevention communication.

One problem that may occur is due to the multiple sources of warning information. Local residents receive information from a number of different media, so they could easily be confused by the Tsunami Warnings and the Evacuation Instructions. In addition, unreliable information reaches local residents via Twitter and SNS (simple notification service) through PCs, cell phones, and tablets. Information is also sent through many different media, and many residents who answered the JMA's survey said, "They are sent to the people over a broad area and we didn't know whom the warnings were meant for. So after a while we stopped paying attention to them.[1]

This paper proposes and studies a WSN based system for generic target (animal) tracking in the surrounding area of wildlife passages built to establish safe ways for animals to cross transportation infrastructures. In addition, it allows target identification through the use of video sensors connected to strategically deployed nodes. This deployment is designed on the basis of the IEEE 802.15.4 standard, but it increases the lifetime of the nodes through an appropriate scheduling. The system has been evaluated for the particular scenario of wildlife monitoring in passages across roads. For this purpose, different schemes have been simulated in order to find the most appropriate network operational parameters. Moreover, a novel prototype, provided with motion detector sensors, has also been developed and its design feasibility demonstrated. Original software modules providing new functionalities have been implemented and included in this prototype.[2]

This paper discusses how wireless sensor networks (WSNs) can increase the spatial and temporal resolution of operational data from pipeline infrastructures and thus addresses the challenge of near real-time monitoring and eventually control. It focuses on the use of WSNs for monitoring large diameter bulk-water transmission pipelines. It outline a system, PipeNet, we have been developing for collecting hydraulic and acoustic/vibration data at high sampling rates as well as algorithms for analyzing this data to detect and locate leaks. Challenges include sampling at high data rates, maintaining aggressive duty cycles, and ensuring tightly time synchronized data collection, all under a strict power budget. We have carried out an extensive field trial with Boston

Water and Sewer Commission in order to evaluate some of the critical components of PipeNet [3]

This paper reports about an extensive experimental study on the behavior and performance of WSNs in tunnels. The analyzed the behavior of the physical layer in real road tunnels, and its impact on the operation of commonly-employed MAC and routing protocols. We showed that some popular networking techniques are ill-suited to the tunnel environment, and provided guidelines to support the design of more efficient solutions. [4]

This paper proposes a minimum energy scheduling (MES) algorithm for multi-hop wireless networks with stochastic traffic arrivals and time-varying channel conditions. It showed that our algorithm is energy optimal in the sense that the proposed MES algorithm can achieve an energy consumption which is arbitrarily close to the global minimum solution. Moreover, the energy efficiency of the MES algorithm is achieved without losing the throughput-optimality. In other words, the proposed MES algorithm is still throughput optimal whereas the average consumed energy in the network is significantly reduced, as compared to the traditional MaxWeight algorithm. The theoretical results are substantiated via simulations.[5]

This paper proposes the Interlaced Extended Information Filter (IEIF) for self-localization in Sensor Network has been introduced. The centralized formulation has been distributed by neglecting any coupling factor in the system and assuming an independent reduced-order filter running on-board each node. The original formulation has been successively extended by an interlacement technique which aims to alleviate the error introduced by neglecting the cross-correlation terms by "suitably" increasing the noise covariance matrices.[6]

This paper proposes DistressNet. It is a WSN architecture for disaster response, advantages of this work include1)An extensible, scalable, heterogeneous network addressing the challenges of disaster response by providing area-wide situational awareness through large-scale integration of static and mobile elements with common protocols and a robust support infrastructure2)Novel network management and configuration strategies that handle arrival and departure of elements, minimize congestion through the use of multi-channel communications, maximize message delivery with opportunistic and delay-tolerant protocols, and offer guaranteed levels of service for safety-critical messages3)Distributed collaborative sensing and robust, adaptive localization and location-based services that provide accurate, detailed data that enhances decision support, situational awareness, and general C2 activities.Its accuracy rate is very low. So It can increase the falls alarm rate.[7]

In this paper EASINET protocol is proposed. This protocol is intended for use by wireless sensor networks. It offers quick adaptation to dynamic link conditions, low processing and memory overhead, low network utilization, and determines unicast routes to destinations within the network. It uses destination sequence numbers to ensure loop freedom at all times (even in the face of anomalous delivery of routing control messages), avoiding problems (such as "counting to infinity") associated with classical protocols. Its system complexity is high which slows the overall process. Since it uses more energy for processing, it can drain the nodes very quickly.[8]

III.EXISING SYSTEM

The Media access control (MAC) is an important technique that enables the successful operation of the network. One fundamental task of the MAC protocol is to avoid collisions so that two interfering nodes do not transmit at the same time. There are many MAC protocols that have been developed for wireless voice and data communication networks. Typical examples include the time division multiple access (TDMA), code division multiple access (CDMA), and contention-based protocols like IEEE 802.11.It follow the steps below to choose MAC schedule and establish its schedule table,

1)The node first listens for a certain amount of time. If it does not hear a schedule from another node, it randomly chooses a time to go to sleep and immediately broadcasts its schedule in a SYNC message, indicating that it will go to sleep after t seconds. We call such a node a synchronizer, since it chooses its schedule independently and other nodes will synchronize with it

2)If the node receives a schedule from a neighbor before choosing its own schedule, it follows that schedule by setting its schedule to be the same. We call such a node a follower. It then waits for a random delay td and rebroadcasts this schedule, indicating that it will sleep in t − td seconds. The random delay is for collision avoidance, so that multiple followers triggered from the same synchronizer do not systematically collide when rebroadcasting the schedule.

3)If a node receives a different schedule after it selects and broadcasts its own schedule, it adopts

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both schedules (i.e., it schedules itself to wake up at the times of both is neighbor and itself). It broadcasts it own schedule before going to sleep.

It is expected that nodes only rarely adopt multiple schedules, since every node tries to follow existing schedules before choosing an independent one. On the other hand, it is possible that some neighboring nodes fail to discover each other at beginning due to collisions when broadcasting schedules. They may still find each other later in their subsequent periodic listening. To illustrate this algorithm, consider a network where all nodes can hear each other. The timer of one node will fire first and its broadcast will synchronize all of its peers on its schedule. If instead two nodes independently assign schedules (either because they cannot hear each other, or because they happen to transmit at nearly the same time), those nodes on the border between the two schedules will adopt both. In this way, a node only needs to send once for a broadcast packet. The disadvantage is that these border nodes have less time to sleep and consume more energy than others. Another option is to let the nodes on the border adopt only one schedule, which is the one it receives first. Since it knows another schedule that some other neighbors follow, it can still talk to them. However, for broadcast packets, it needs to send twice to the two different schedules. The advantage is that the border nodes have the same simple pattern of period listen and sleep as other nodes.

IV.PROPOSED SYSTEM

The proposed CFR is used for fast data transmission under critical situation. It increases the data rate and accuracy of network. Since it consists distributed energy efficient routing, it also reduces the overall energy consumption.CFR employs three control packets, RREQ, RREP and RERR, in addition to data packets. RREQ is a broadcast and RREP, RERR and data are unicast packets. For each of these unicast packets, CFR uses the following overhearing mechanism.

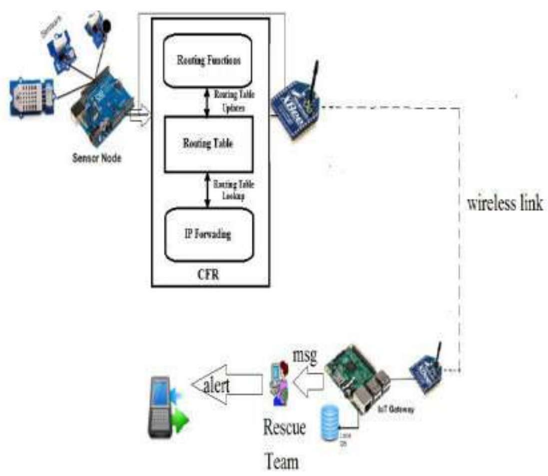
• Randomized overhearing for RREP packets: A RREP includes the discovered route and is sent from the destination to the originator of the corresponding RREQ packet. Node D sends a RREP to node S. Intermediate nodes as well as node D will Rcast this message to allow randomized overhearing.Unconditional overhearing of RREP is not a good idea because CFR generates a large number of RREP packets.

• Randomized overhearing for data packets: In CFR, every data packet includes the entire route from the source to the destination. Each intermediate node as well as the source node will demand randomized overhearing for these packets so that neighboring nodes can overhear them randomly.

• Unconditional overhearing for RERR packets: When a broken link is detected, an upstream node transmits a RERR to the source. Nodes will overhear this message unconditionally because the stale route information must be invalidated as soon as possible from nodes route caches.

V.ARCHITECTURE DIAGRAM

In this architecture diagram ,if any disaster occur in buildings then the sensor sense the information then it pass the data to rescue team as well as people lives in building through the IOT by using cut falcon algorithm(CFR).This algorithm is used to fast transmission of data. It increases the data rate and accuracy of network. Since it consists distributed energy efficient routing, it also reduces the overall energy consumption.



VI.CONCLUSION

In this work I have discussed the system architecture and the evaluation of the information for an emergency scenario monitoring using energy efficient wireless sensor nodes using CFR protocol. The development of specific soft and hardware components were also presented.

A collision-free transmission of the data was possible with the help of a unidirectional communication protocol. Sensors calibration was done in a shock tube for a concrete block which is similar to concrete used in the test hall. The recorded data of the shock strength from the sensors was used to assess the degree of damage in three stages, i.e., no damage in concrete, cracks in concrete and critical damage in concrete (broken).

In the field test, I have demonstrated the functionality of the monitoring system and the wireless sensor nodes. After an explosion, the emergency event data was collected in a system server and a damage report was made available for the decisions of the fire fighters and related staff about infrastructure images and the possibility of building collapse.

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