



Wireless Sensor Network Using Flood Monitoring

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Abstract— Wireless Sensor Network is architecture with a variety of potential application. Wireless sensor network have emerged as an important application of the ad-hoc networks paradigm, such as for monitoring physical environment. These sensor networks have limitations of system resources like battery power, communication range and processing capability. There is a crucial link between safety and survival of any transportation organization. History has proved time and again that, over Indian Railways, bridges and track on bridges are one of the weak links in ensuring the required level of safety during floods. Accelerating economic growth demands Indian Railways to increase the traffic, passenger as well as freight, to a new heights and thus necessitating for a greater and automatic real time safety measures involving least human element. Thus it is important for system to enhance safety of track over bridges against any unforeseen flash floods and breaches.

Keywords— Flood level sensor; LPC 2148 Microcontroller; RF Transceiver; wireless sensor network; ZigBee

I. INTRODUCTION

Wireless Sensor Networks (WSNs) have been attracting increasing interests in the development of a new generation of embedded systems with great potential for many applications such as surveillance, environment monitoring, emergency medical response and home automation. A WSN is typically composed of a large set of nodes scattered in a controlled environment and interacting with the physical world.

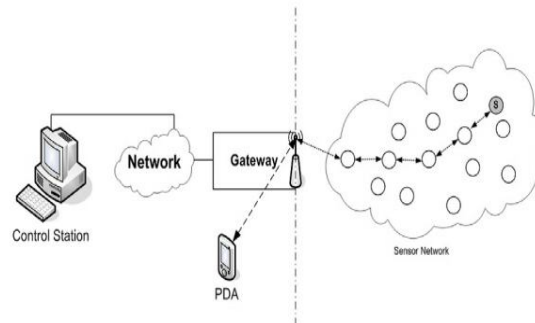


Fig1- Typical Topology of Wireless Sensor Network

This set aims the collection of specified data needed for the monitoring/control of a predefined area/region. The delivery of sensory data for process and analysis, usually to a control station, is based on the collaborative routing work of the WSN nodes.

In this report “FLOOD MONITORING USING WIRELESS SENSOR NETWORK USED FOR PROTECTION SYSTEM OVER BRIDGES DURING FLOODS AND BREACHES” for the bridges . The system has been designed and installed in a way, that, when the water level on a bridge reaches to a particular water level/levels (say Warning/Danger Level), then this rise in water level will be sensed by the electromechanical float sensor and sends the signals provided to the Central Processing Unit (CPU), which activates the signal erected at the bridge approaches and put it to ‘ON’ (RED) position and simultaneously triggers the GSM modem fixed at the signal location, which in-turn sends a predefined SMS, based on the water level position, to predefined GSM/CDMA cell phones (any numbers) with other particulars of the bridge. so as to enable controller to alert the adjacent block section station masters and warn the driver through SM’s via VHF set, WLL phones, provided to the drivers and guards. Thereafter SM’s can put back the station signals to “ON” position and update the information to the control office in real time, so as to enable control to disseminate emergency message to all concerned and plan for tackling any Unusual. Some portions of the track on Indian railways runs parallel sea coast. The route from Visakhapatnam to Chennai runs parallel to the Bay-of-Bengal coast and is prone to cyclones and natural disasters. There had been washouts in past, causing huge loss to the life of passengers in addition to great loss of railway property. This paralyses the rail traffic and results in both direct and indirect losses to the railways. In the present project a system which can discharge both the functions of stopping the train at signal erected at bridge site and simultaneously informing other

engineering officials regarding the flood water level at bridge site. An effort has been made to provide an appropriate solution.

II. WSN USING FLOOD MONITORING

It is an implement a WSN system base on using ZigBee, which consist of microcontroller and WSN comprising of different sensors.

It is proposed to sense, flood monitoring system with wireless communication. The system block diagram consist of

- A) Wireless sensor node.
- B) Base station.

A) Wireless Sensor Node

The sensor node is controlled by an ARM LPC 2148 16-bit processor running at 12MHz and it is supplied with a 3.3V (7.6 Ah) battery. It utilizes a Chipcon CC2420 RF transceiver radio operating at 2.4 GHz ISM band for communications and two connectors for supporting multiple sensors: a flood level sensor.

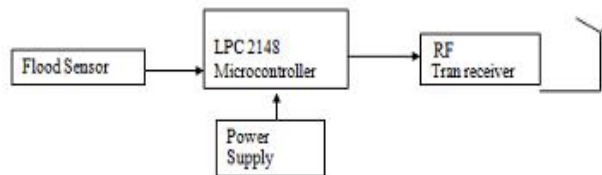


Fig2- Wireless Sensor Node

Sensor

In the proposed system the sensor to be used are float sensor, ultrasonic sensor. Sensor nodes equipped with water level and flow velocity sensors are deployed in the upstream and downstream region of rivers. Two sensor nodes are deployed basically in the upstream and downstream area of a river in order to estimate the difference between them.

RF Transceivers

In the proposed system the RF transceivers like CC 2420 can be used together with a microcontroller and a few external passive components. This transmits & receives data from base station to wireless node & vice versa.

Microcontroller unit

The LPC2148 microcontrollers are based on a 16-bit/32-bit ARM7TDMI-S CPU with real-time emulation and embedded trace support, that combine microcontroller with embedded high-speed flash memory ranging from 32 KB to 512 KB. A 128-bit wide memory interface and unique accelerator architecture enable 32-bit code execution at the maximum clock rate.

B] Base station

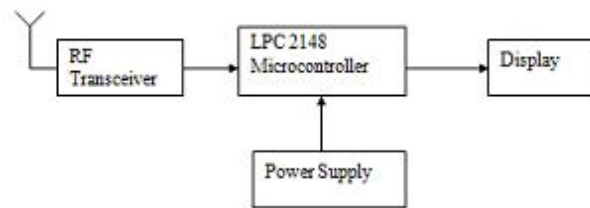


Fig3- Base Station

Base station consists of the same RF transceiver, microcontroller and LCD which displays, monitor and controls the signals depending on the programmed data.

RELEVANCE

Low power sensor network detect, locate and identify flood level, for this a set of sensor nodes spread over a river area, these nodes are capable for sensing and communicating with each other by means of wireless network. The sensor may be controllable, possibly aimed and commanded to sense and transmit data to their neighbours. Though each node is an independent hardware device, they need to co-ordinate their sensing, computation and communication to acquire relevant information about their status so as to accomplish some high-level task.

III. ATTRIBUTES OF SENSOR NETWORKS

Sensors Size: Small (e.g. micro-electro mechanical systems (MEMS), large (e.g. radars, satellites)

Number: small, large.

Type of Sensor: Passive (e.g., acoustic, seismic, video, IR, magnetic), Active (e.g. radar, lidar)

Composite or mix: Homogeneous (same type of sensors), heterogeneous (different types of sensors).

Spatial Coverage: Dense, sparse.

Deployment: Fixed and planned (e.g., factory networks), ad hoc (e.g., air dropped).

Dynamics: Stationary (e.g., seismic sensors), mobile (e.g., on robots).

Sensing entities of interest Extent: Distributed (e.g., environmental monitoring), localized (e.g., target tracking).

Mobility: Static, dynamic.

Nature: Cooperative (e.g., air traffic control), non-cooperative (e.g., military targets).

Operating Environment: Benign (factory floor), adverse (battle field).

Communication Networking: Wired, wireless.

Bandwidth: High, low.

Processing architecture: Centralized (all data sent to a central site), distributed (located at sensor or other sites), hybrid.

Energy availability Constrained: (e.g. in small sensors), unconstrained (e.g., In large sensors).

IV. ADVANTAGES OF WSN

- **Sensing accuracy:** The utilization of a larger number and Variety of sensor nodes provides potential for greater Accuracy in the information gathered as compared to that Obtained from a single sensor.
- **Area coverage:** This implies that fast and efficient sensor network could span a greater geographical area without adverse impact on the overall network cost.
- **Fault tolerance:** Device redundancy and consequently information redundancy can be utilized to ensure a level of fault tolerance in individual sensors.
- **Connectivity:** Multiple sensor networks may be connected through sink nodes, along with existing wired Networks (e.g. Internet). The clustering of networks enables each individual network to focus on specific areas or events and share only relevant information.
- **Minimal human interaction:** Having minimum human interaction makes the possibility of having less interruption of the system.
- **Operability in harsh environments:** Sensor nodes, consisting of robust sensor design, integrated with high levels of fault tolerance can be deployed in harsh environments that make the sensor networks more effective.
- **Dynamic sensor scheduling:** Implying some scheduling scheme, sensor network is capable of setting priority for data transmission.

V. WIRELESS SENSOR NETWORKS ZIGBEE BASED

- Based on the IEEE 802.15.4 standard
- Small form factor
- Relatively Inexpensive
- Low Power Consumption
- Low Data Rate of Communication
- Self Organising, Self-Healing...multi-hop nodes
- Integrated Sensors
- Ideal for Wireless Sensor Network Applications

VI. ZIGBEE AND OTHER TECHNOLOGIES

Market Name	ZigBee™	---	Wi-Fi™	Bluetooth™
Standard	802.15.4	GSM/GPRS CDMA/1xRTT	802.11b	802.15.1
Application Focus	Monitoring & Control	Wide Area Voice & Data	Web, Email, Video	Cable Replacement
System Resources	4KB - 32KB	16MB+	1MB+	250KB+
Battery Life (days)	100 - 1,000+	1-7	.5 - 5	1 - 7
Network Size	Unlimited (2 ⁶⁴)	1	32	7
Bandwidth (KB/s)	20 - 250	64 - 128+	11,000+	720
Transmission Range (meters)	1 - 100+	1,000+	1 - 100	1 - 10+
Success Metrics	Reliability, Power, Cost	Reach, Quality	Speed, Flexibility	Cost, Convenience

VII. APPLICATIONS OF WSN

1. Flood Monitoring
2. Environmental Observation and Forecasting
3. Disaster Prevention
4. Agricultural Management
5. Structure Health Monitoring
6. Habitat Monitoring

VIII. CONCLUSION

Wireless sensor Network nodes are used for flood measurements due to its tiny size and low power consumption. This paper is providing a solution to enhance the safety of the trains, automobiles at the bridges against flood water and avoid the loss to life and property.

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