



Design of Noise Pollution Monitoring System Using Wireless Sensor Network

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Abstract-This concerns with the field of environmental monitoring by wireless sensor networks, in particular manner, our objective is the noise pollution monitoring in urban and industrial areas. The network is formed using random topology and overall synchronization is obtain. Transmission arrangement is implemented in this network because of noise monitoring is time consuming and uninterruptable. The a variety of protocols are use to build this purpose. The final idea of this work is to obtain a distributed network, with a large number of sensor nodes, for realizing a constant and autonomous acoustic monitoring, without human intervention in the interested region. Wireless Sensor Networks are very challenging research field for automation embedded system design, which should enforce stringent constraints such as power and cost. Day by day noise pollution is drastically increased, so that we create such type of environments and deployed the WSN nodes.

Keywords-routing, scheduling, noise measurement, synchronized network, environment monitoring.

I. Introduction

Sound that is unwanted or disrupts one's quality of life is called as noise. When there is lot of noise in the environment, it is known as noise pollution.

II. Effects of Noise Pollution:

- a. It interferes with communication. communication is not proper if there is lots of noise in surrounding.
- b. Noise leads to behavioral & emotional stress person feel disturbed in the presence of loud noise.

III. Noise Measurement Instruments & Techniques

Noise measuring instruments normally use a sensor to receive the noise signals emanating from a source. A sensor conversely, not just detects the noise from the resource, but also any ambient environment noise. Thus, detecting the value of the measured noise is inaccurate, since it includes the ambient surroundings noise. The traditional way of conducting noise measurements is inconvenient. A technician always to carry a Sound Level Meter (SLM) to a measuring location noise. The drawback of this method are given below:

- 1) A commercial SLM is expensive, making large-scale measurements very costly,
- 2) point-to-point measurements compose the results incoherent time wise.

The loudness of a given noise source is therefore better represented by the average of the time-varying sound pressure level $L_p(t)$ over a given period of time T :

$$L_{eq} = \frac{1}{T} \int_0^T 10^{\frac{L_p(t)}{10}} dt \text{ (dB)}$$

The equivalent sound level pressure L_{eq} defined as the quantity that is typically measured by a sound level meter and that drives the computation of most commonly used noise indicators.

Wireless sensor network (WSN) which consists of number of signal processing devices called as nodes. When these nodes are properly programmed and networked, nodes in a WSN should be cooperate to perform advanced signal processing tasks with robustness and versatility, thus WSN is an attractive low-cost technology for a wide range of sensing and environmental monitoring applications. Wireless sensor node is built no. of nodes from one to a several hundreds or thousands. The LEACH protocol is a protocol for forming clusters in a self-organized homogeneous sensor network when the base station is located far from the sensors. In LEACH some nodes are elected as cluster-heads while the other nodes communicate with the base-station through the nearest cluster-head. This protocol randomly rotates the job of cluster-head based on the node's remaining energy in order to uniformly distribute the energy consumption throughout the network. In this calculate the optimum average energy cost for transmitting data to base-station, when three types of nodes are randomly deployed in a large area. consider only random deployment of sensor and aggregators nodes and find node

densities as well as initial energy of aggregators and sensors such that total cost of allocating energy is minimized.

The noise usually consists of three inter-connected fundamentals the source, receiver and transmission path followed by the noise to reach receiver. This transmission path is generally the atmosphere through which sound is propagated, however can include structural materials of any structure containing the receiver. Differentiation and discrimination between noise and sound also depends upon the pattern and interest of the person or species receiving it, the ambient situation and impact of the sound generated during that particular period of time., to minimize environmental noise the main prerequisite is the continuous monitoring of the noise throughout time in various locations that can be problematic in dense urban areas. noise is a multimedia signal that needs to be appropriately processed and transmitted to the destination. In this paper propose a system capable of transferring noise data from large number of sensors by the means of Wireless Sensor Network (WSN). On the assessment of noise pollution in urban areas if the noise levels is exposed to 85 dB, it means there is maximum amount of noise is present. In order to actuate exposures are at or above this level, it is necessary to monitor or measure the original noise levels in the area and to estimate the noise exposure. Noise monitoring or measuring must be conducted only when exposures are at or above 85 dB.

Considered the Tmote Sky platform and sensors were deployed to measure noise. The large-scale noise measurement using a WSN solution is possible. However, the measurement accuracy are not mentioned, and the node calibration was left as an open issue in their work. The sampling rate is at 8kHz because of CPU/ADC limit, which does not cover the accurate acoustic frequency range. As stated that wireless sensor network is feasible for the use in environmental noise monitoring. It also evaluated three hardware platforms and two data collection protocols. Their protocol comparison results showed that CTP (Collection Tree Protocol) with LPL (Low Power Listening) provides good performance in terms of energy efficiency compared to CTP and DMAC protocols. By selecting suitable duty cycles, the lifetime of the designed battery-powered measurement network can be extended to months. The network should cover several hundred square meters. In a network size this means that it has 2-3 clusters which each required 3 to 6 noise sensors. The sensors are able to measure the acoustic noise continuously for a long enough period, generally for a complete weekend, and the cost of sensor nodes must be minimized.

The design issue is such that the sensor nodes near the SINK relay data for the remote sensors. But it is found that it had a many scaling problem when the number of sensors increase. In order to overcome the burst traffic, the relay nodes are introduced for the remote sensors. Thus the WSN contains a SINK node, noise sensor nodes, and set of relay node. The network uses multi-hop tree topology with SINK as the root of the tree. The sensor nodes can be placed at various arbitrary locations in the area concerned. The role of relay nodes is to take care of relaying sensor packets to the sink. SYNC has four basic functions: Let the entire network become synchronized, Let the relay nodes set up a route back to SINK, Let the sensor nodes choose the finest relay node.

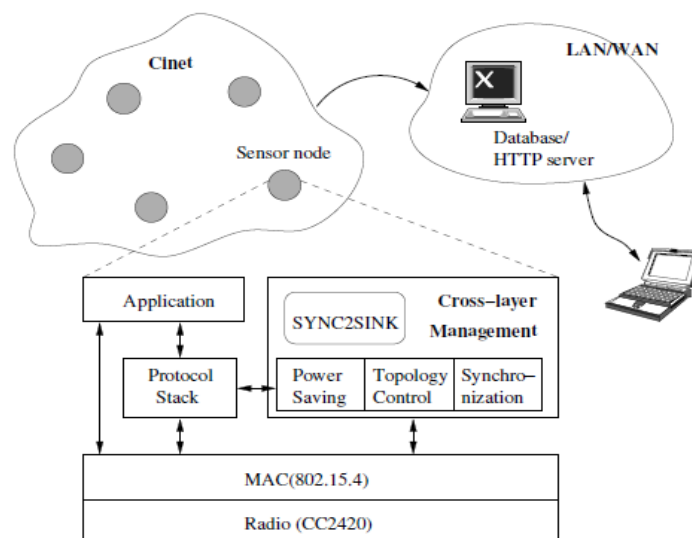


Figure 2. System and node architecture

In this method an integrated synchronization and routing protocol such as SYNC2SINK to achieve the objectives. The SYNC2SINK protocol uses to enables the nodes for establish and maintain a route to the sink using the data contained in synchronization frames. SYNC2SINK protocol is design on the CiNet protocol stack which is cross layer architecture in which time; radio link state, battery and topology information are shared by sensing, packet transmission and reception, and route table maintenance. The architecture of CiNet can be seen in above Figure. In case of SYNC2SINK protocol the nodes are work periodically in 4 phases: a

synchronization phase, a sensing phase, a data communication phase, and an optional sleep phase for energy saving. In this domain the noise measurement has to be done continuously so that the sleep phase is removed. Power efficiency is one of the most important design parameters for WSN nodes, and consequently a lot of efforts have been made to propose energy efficient implementations of such devices. To design an energy-aware WSN node, it is obligatory to analyze its power dissipation characteristics. Along with, computation and communication subsystems use bulk of the power budget and it is generally accepted that efforts toward energy reduction should target both of them in particular. Communication energy is concerned, there have been maximum efforts put on the communication stack energy optimization and low power RF technology, including energy efficient routing algorithms, low power MAC protocols, efficient error correction codes and power-aware transmission techniques. In our first design, the relay/sensor nodes establish the route path to the SINK by taking parameters of the first received SYNC frame (i.e., a greedy algorithm). found that the DATA frame Packet Receive Ratio (PRR) to SINK was very poor. This is due to the fact that radio links established by the strategy may be poor, because the first arrival SYNC usually comes from a node over the maximum distance. In order to overcome this problem we used link state routing protocol.

V. Simulation Result

First deployment of five noise sensor nodes in a class room to examine the synchronization performance. Figure shows the time-line of the measurement results, and it can be seen that they are time-correlated. Then we set up a test network which has nine relay nodes

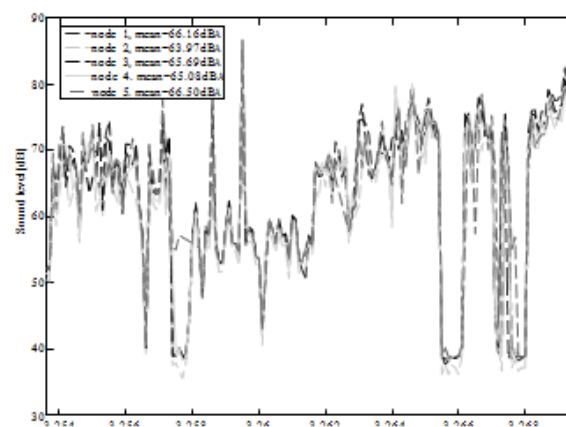
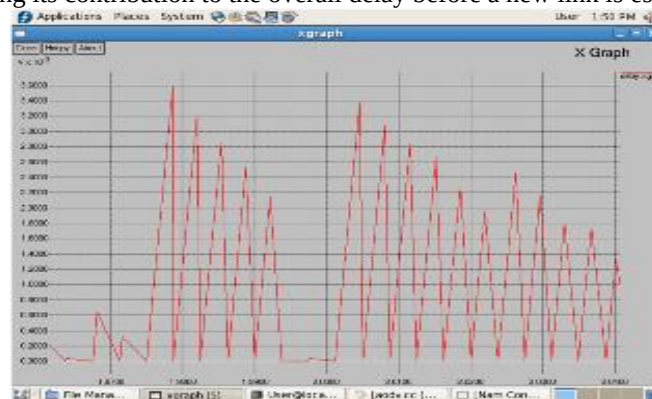


fig. shows the measurement result of 5 nodes in class room.

we tested the algorithm for near about 1 day and synchronization was obtained very good, with delay is only 0.0789ms. In figure, we have plotted the delay in noise monitor by the node against the time spent in network. It shows that as there is maximum amount of noise in a particular region so the delay is increased for transmission of data from one node to sink node. This is because all the layers in the communication protocol stack contribute to the delay in a noise. Depending on the entrance skill, a mobile node may go through several steps with each step adding its contribution to the overall delay before a new link is established.



VI. Conclusion

As per above description, Collecting accurate actual noise pollution data relying on the current measurement procedures is costly and cumbersome and does not scale with the demand for higher data granularity. Collecting fine-grained noise measurements through the manual collection clearly inefficient and expensive. In this paper report the design of a protocol suite for a WSN application which measures the instantaneous environmental acoustic noise in a given area with the help of ns 2 software. The measure aspect of this project is to support of

multi-hop communication, which is capable of large amount of noise monitoring, which is fundamental requirement for improving the efficiency of the signal.

VII. References

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