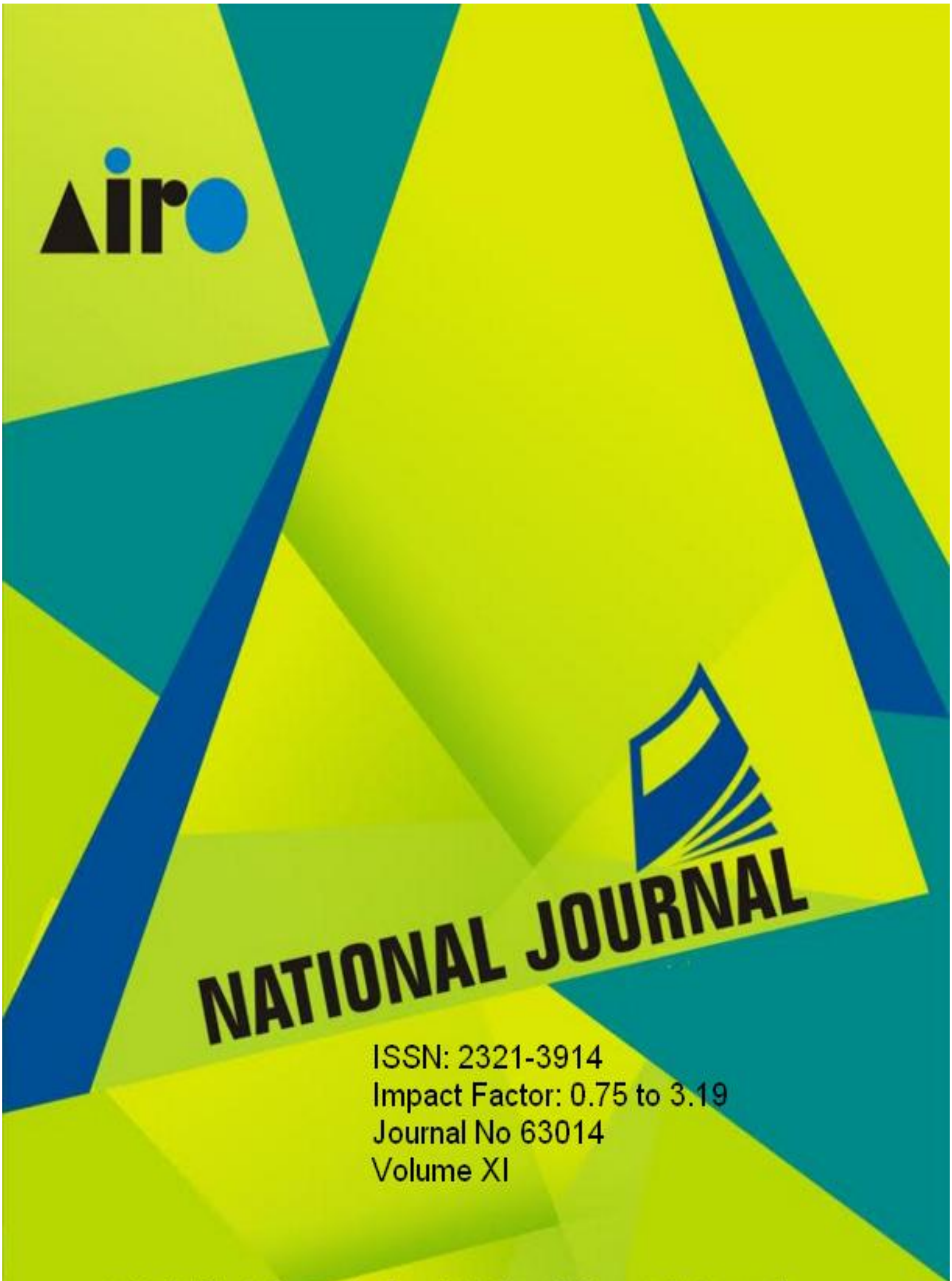
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PRODUCTION OF ENERGY EFFICIENT WIRELESS NETWORK WITHOUT INFRASTRUCTURE

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ABSTRACT

*This Paper first describes the characteristics of wireless network without infrastructure and their idiosyncrasies with respect to traditional, conventional packet networks. It then describes the effect these differences have on the design and evaluation of network control protocols with an focus on routing performance evaluation considerations regarding to the energy efficient mechanism. Pervasive networks of wireless and networks offer to revolutionize the ways in which we understand and construct difficult physical systems. Sensor networks must be scalable, long-lived and robust systems, controlling over the energy limitations and a lack of pre-installed infrastructure. We explore three themes in the design of self-configuring sensor networks: tuning density to trade operational quality against lifetime; using multiple sensor modalities to obtain robust measurements; and exploiting fixed environmental characteristics. We illustrate these themes through the problem of localization, which is a key building block for sensor systems that it requires coordination. Wireless sensor networks are expected to find broad applicableness and increasing deployment in the near future. In this paper, we approach a formal classification of wireless networks, based on their mode of functioning, as proactive and reactive networks. Reactive networks, as opposed to passive data collecting proactive networks, respond rapidly to changes in the regarding parameters of interest. We also introduce a new energy efficient protocol, TEEN (***Threshold** *sensitive* **Energy Efficient** *sensor* **Network** *protocol) for reactive networks. We evaluate the performance of our protocol for a simple temperature sensing application. In terms of energy efficiency, our protocol has been observed to outperform existing traditional wireless network protocols.*

Keywords*: non-centralized, wireless network*

INTRODUCTION

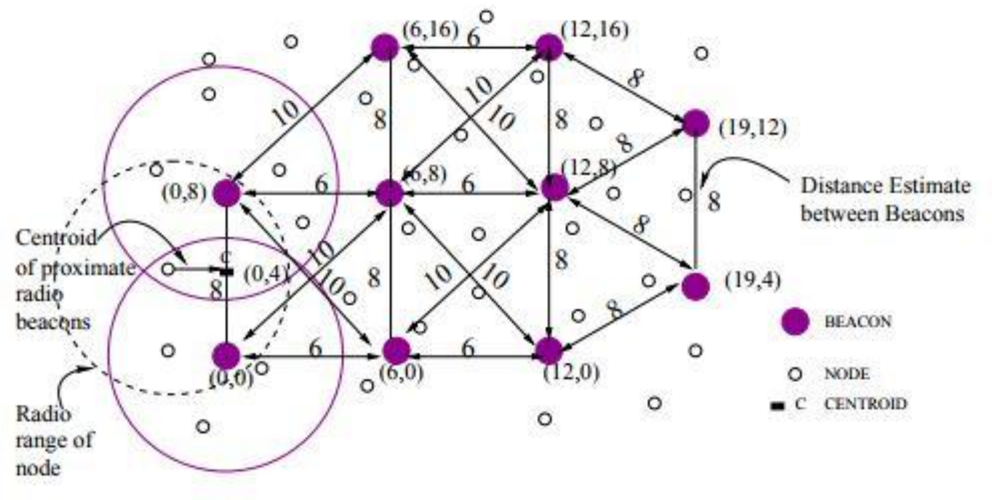
In past years, the use of wired networks is being supported for a number of applications. Some examples include dispersion of thousands of wires over strategic locations in a structure such as an airplane, so that conditions can be consistently monitored both from the inward and the outward and a real-time warning can be issued when the investigated structure is about to fail. Wireless networks are usually unattended and need to be fault-finding so that the need for maintenance is minimized. This is especially required in those applications where the sensors may be embedded in the structure or are in irregular terrain and are inaccessible for any service. The new modification in technology has made it approachable to have extremely small, low powered devices equipped with programmable computing, multiple parameter sensing and wireless communication capability. Also, the low cost of sensors makes it possible to have a network of hundreds or thousands of these wireless networks, thereby increasing the reliability and accuracy of data and the area coverage as well. Also, it is necessary that the network be easy to deploy Protocols for these networks must be designed in such a way that the limited power in the sensor nodes is efficiently used. In addition, environments in which these nodes operate and respond are very dynamically stand able, with fast changing physical parameters. There are many potential applications of sensor networks: physiological monitoring; environmental monitoring (air, water, soil, chemistry); condition based maintenance; smart spaces; military surveillance; precision agriculture; transportation; factory instrumentation and inventory tracking. This paper will redress the requirements and design themes for these densely distributed, physically coupled and wireless sensor networks.

REVIEW OF LITERATURES

Consciousness of environmental problems tied to Green House Gases (GHG) increased during the recent years. All around the world, various studies started highlighting the devastating effects of massive GHG emissions and their consequences on the climate change. According to a report published by the European Union, a decrease in emission volume of 15%–30% is required before year 2020 to keep the global temperature increase below 2◦C. GHG effects are not limited to the environment, though. Their influence on economy has also been investigated and their financial damage has been put in perspective with the potential economical benefits that would follow GHG reduction. In particular, projected that a 1/3 reduction of the GHG emissions may generate an economical benefit higher than the investment required to reach this goal. Political powers are also seeking to build a momentum around a greener industry, both in the perspective of enforcing a sustainable long-term development, and as a possible economic upturn factor on a shorter perspective. GHG reduction objectives involve many industry branches, including the Information and Communication Technology (ICT) sector, especially considering the penetration of these technologies in everyday life. Indeed, the volume of CO_2 emissions produced by the ICT sector alone has been estimated to an approximate 2% of the total man-made emissions. This is similar to the one exhibited by the global airline industry, but with higher increase perspectives. Moreover, when considering only developed countries such as the United Kingdom, this figure rises up to 10%. As the precise evaluation of these numbers is a difficult process, these projections are likely neither entirely accurate, nor up-to-date. Nevertheless, these studies all agree on the fact that ICT represents an important source of energy consumption and GHG emissions. Even if the incentives are still not clear (e.g., in term of regulations), there seems to be a clear innovation opportunity in making network devices and protocols aware of the energy they consume, so that they can make efficient and responsible (or "green") decisions.

RESEARCH AND METHODOLOGY

Localization is an important building block for wireless networks and is itself a sensor network. We use it as our example to inspire the requirement for automatic self-configuration through adaptive localized algorithms. A localized algorithm is a distributed computation in which sensor nodes achieve a desired global objective while constraining their communication to sensors within some neighbourhood. In this paper, we explore coordination in wireless sensor networks based on adaptive localized algorithms that exploit both the local processing available at each node as well as the redundancy available in densely distributed sensor networks. We introduce the design themes of density, multiple sensor modalities and adaptation to fixed environments, and show how they can be applied to build self-configuring localization systems.



Node Localization

Unlike the Internet, wireless sensor networks are organized around the naming of data, not nodes. Nodes are neither unique nor reliable; applications express a need for a particular data element or type of data by naming it directly. By eliminating indirection, e.g. the mapping from a name to a node address to a route, a sensor network can eliminate the maintenance overhead associated with constructing and maintaining these mappings and directory services. Because sensor data are intrinsically associated with the physical context of the phenomena being sensed, spatial coordinates are often a natural way to name data. Spatial coordinates are also employed by collaborative signal processing algorithms (e.g. beam forming) that combine data from multiple sensor nodes for such tasks as target tracking. Furthermore, geographic assistance in ad hoc routing promises significant reductions in energy consumption.

Design Themes

Because sensing and actuation define a physical scope to a node's influence, localized algorithms provide a natural design paradigm for physically distributed sensor networks. More importantly, localized algorithms are attractive because of their scalability and robustness. Localized algorithms scale well with network size since scaling is influenced by density rather than physical extent; therefore algorithm complexity grows with the degree and not total size of the graphs. Since they are self-configuring, they can also be self-re-configuring and thus can be robust to network partitions and node failures. In this section, we elaborate upon a few design themes that arise in the application of adaptive localized algorithms for scalable coordination and self-configuration in wireless sensor networks.

Reactive Network Protocol:

TEEN In this section, we present a new network protocol called TEEN (Threshold sensitive Energy Efficient sensor Network protocol). It is targeted at reactive networks and is the first protocol developed for reactive networks, to our knowledge.

Functioning

In this scheme, at every cluster change time, in addition to the attributes, the cluster-head broadcasts to its members,

Hard Threshold (HT): This is a threshold value for the sensed attribute. It is the absolute value of the attribute beyond which, the node sensing this value must switch on its transmitter and report to its cluster head.

Soft Threshold (ST): This is a small change in the value of the sensed attribute which triggers the node to switch on its transmitter and transmit.

RESULTS AND DISCUSSIONS

We executed 5 runs of the simulator for each protocol and for each mode of TEEN. The readings from these 5 trials were then averaged and plotted. A lower value of the energy-dissipation metric and a higher number of nodes alive at any given time indicates a more efficient protocol.

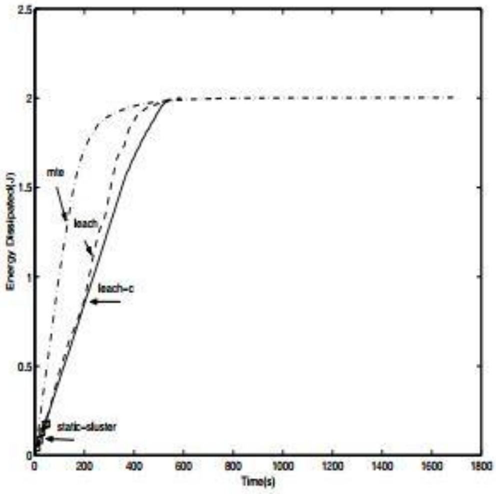
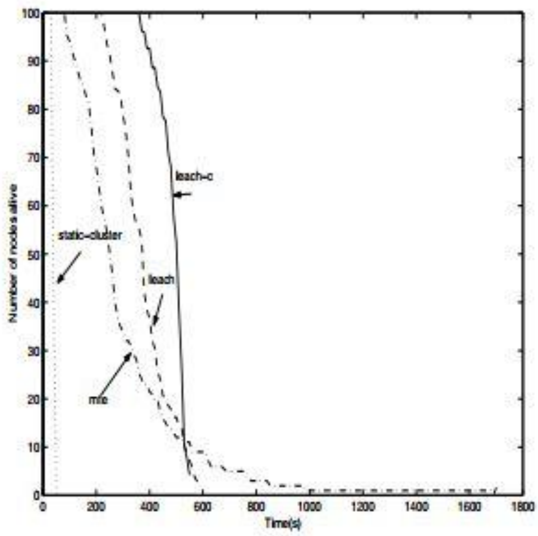
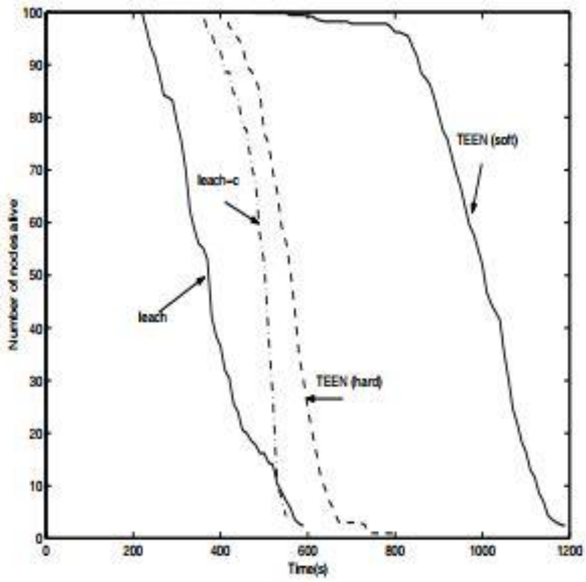


Figure shown above the behaviour of the network in proactive mode. This comparison was originally done in LEACH. It is repeated here taking into account the modified radio energy model. Of the four protocols, mte (minimum transmission energy) lasts for the longest time. However, we observe from Fig that only one or two nodes are really alive. As such, leach and leach-c (a variant of leach) can be considered the most efficient protocols, in terms of both energy dissipation and longevity. In Figures shown below we compare the two protocols. We see that both modes of TEEN perform much better than leach. If the cluster formation is based on the leach-c protocol, the performance of the TEEN protocol is expected to be correspondingly better. As expected, soft mode TEEN performs much better than hard mode TEEN because of the presence of the soft threshold.





The performance of TEEN is studied in two modes, one with only the hard threshold (hard mode) and the other with both the hard threshold and the soft threshold (soft mode).

CONCLUSION

In this paper, we present a formal classification of sensor networks. We also introduce a new network protocol, TEEN for reactive networks. TEEN is well suited for time critical applications and is also quite efficient in terms of energy consumption and response time. It also allows the user to control the energy consumption and accuracy to suit the application. Also, Localization is a key building block for sensor network applications and is a sensor network in and of it. We exemplified three design themes that will be important in wireless sensor networks generally density, multiple sensor modalities for robust measurements and adapting to fixed environmental features. Also, in this paper, we have seen that how TEEN and localization are the best method to rectify the traditional system over the wireless network without infrastructure.

REFERENCES

[1] J. Broch, D. Maltz, D. Johnson, Y. Hu, and J. Jetcheva. "A Performance Comparison of Multi-Hop Wireless Ad Hoc Network Routing Protocols". In Proceedings of the Fourth Annual ACM/IEEE International Conference on Mobile Computing and Networking(MOBICOM), ACM, October 1998.

[2] J. Elson and D. Estrin. "An Address-Free Architecture for Dynamic Sensor Networks". Technical Report 00-724, Computer Science Department, USC, January 2000.

[3] D. Estrin, R. Govindan, J. Heidemann, and S. Kumar. "Next Century Challenges: Scalable

[4] Coordination in Wireless Networks". In Proceedings of the 5th Annual ACM/IEEE International Conference on Mobile Computing and Networking(MOBICOM), pages 263–270, 1999.

[5] W. Heinzelman, A. Chandrakasan, and H. Balakrishnan. "uAMPS ns Code Extensions". http://wwwmtl.mit.edu/research/icsystems/uamps/ leach.

[6] W. Heinzelman, A. Chandrakasan, and H. Balakrishnan. "Energy-Efficient Communication Protocols for Wireless Microsensor Networks". In Proceedings of Hawaiian International Conference on Systems Science, January 2000.

[7] W. B. Heinzelman. "Application-Specific Protocol Architectures for Wireless Networks". PhD thesis, Massachusetts Institute of Technology, June 2000.

[8] D. Pamlin and K. Szomolanyi, "Saving the Climate @ the Speed of ´ Light–First Roadmap for Reduced CO2 Emissions in the EU and Beyond." World Wildlife Fund and European Telecommunications Network Operators' Association, April 2007.

[9] W. D. Nordhaus, "To Slow or Not to Slow: the Economics of the Greenhouse Effect," The Economic Journal, vol. 101, pp. 920–937, July 1991.

[10] Global Action Plan, "An Inefficient Truth." Global Action Plan Report, http://globalactionplan.org.uk, Dec. 2007.

[11] M. Webb, "SMART 2020: Enabling the Low Carbon Economy in the Information Age." The Climate Group. London, June 2008.

[12] K. W. Roth, F. Goldstein, and J. Kleinman, "Energy Consumption by Office and Telecommunications Equipment in Commercial Buildings Volume I: Energy Consumption Baseline," Tech. Rep., National Technical Information Service (NTIS), US Department of Commerce, Jan. 2002.

[13] S Cui, AJ Goldsmith, A Bahai - IEEE Journal on selected areas …, 2004 - ieeexplore.ieee.org
[14] Y Sankarasubramaniam, IF Akyildiz… - Sensor Network …, 2003 - ieeexplore.ieee.org
[15] CE Jones, KM Sivalingam, P Agrawal, JC Chen - wireless networks, 2001 - dl.acm.org