Wireless Sensor Network

Submitted By- Mitali Bidwai , Drashti Bariya

Guided By-Prof.Garima Pathak,

Department of MCA,Parul University Vadodara.

ABSTRACTION

Wireless sensor networks (WSNs) enable new applications and require nonconventional paradigms for protocol design due to several constraints. Owing to the requirement for low device complexity together with low energy consumption (i.e., long network lifetime), a proper balance between communication and signal/data processing Capabilities must be found. This motivates a huge effort in research activities, standardization process, and industrial investments on this field since the last decade.

This survey paper aims at reporting an overview of WSNs technologies, main applications and standards, features in WSNs design, and evolutions. In particular, some peculiar applications, such as those based on environmental monitoring, are discussed and design strategies highlighted; a case study based on a real implementation is also reported

KEYWORDS

INTRODUCTION

A wireless sensor network (WSN) consists of 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 bidirectional, 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.

WSN TECHNOLOGY

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.

A sensor node might vary in size from that of a shoebox down to the size of a grain of dust, although functioning "motes" of genuine microscopic dimensions have yet to be created. The cost of sensor nodes is similarly variable, ranging from a few to hundreds of dollars, depending on the complexity of the individual sensor nodes. Size and cost constraints on sensor nodes result in corresponding constraints on resources such as energy, memory, computational speed and communications bandwidth. The topology of the WSNs can vary from a simple star network to an advanced multi-hop wireless mesh network. The propagation technique between the hops of the network can be routing or flooding.

APPLICATIONS

The original motivation behind the research into WSNs was military application. Examples of military sensor networks include large-scale acoustic ocean surveillance systems for the detection of submarines, self-organized and randomly deployedWSNs for battlefield surveillance and attaching microsensors to weapons for stockpile surveillance (Pister, 2000). As the costs for sensor nodes and communication networks have been reduced, many other potential applications including those for civilian purposes have emerged. The following are a few examples.

ENVIROMENTAL MONITORING

Environmental monitoring (Steere et al., 2000) can be used for animal tracking, forest surveillance, flood detection, and weather forecasting. It is a natural candidate for applying WSNs, because the variables to be monitored, e.g. temperature, are usually distributed over a large region. One example is that researchers from the University of Southampton have built a glacial environment monitoring system using WSNs in Norway (Martinez et al., 2005). They collect data from sensor nodes installed within the ice and the sub-glacial sediment without the use of wires which could disturb the environment.

HEALTH MONITORING

WSNs can be embedded into a hospital building to track and monitor patients and all medical resources. Special kinds of sensors which can measure blood pressure, body temperature and electrocardiograph (ECG) can even be knitted into clothes to provide remote nursing for the elderly. When the sensors are worn or implanted for healthcare purposes, they form a special kind of sensor network called a body sensor network (BSN). BSN is a rich interdisciplinary area which revolutionizes the healthcare system by allowing inexpensive, continuous and ambulatory health monitoring with real-time updates of medical records via the Internet.

TOOLS AND TECHNOLOGY

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,amicrocontroller, an electronic circuit for interfacing with the sensors and an energy source, usually a battery or an embedded form of energy harvesting.

There are many different wireless technologies used for Wireless Sensor Networks (WSN) in the world today, based on the specific needs, availability of power (battery driven or not), local radio frequency regulations, density of sensors, distance to the sensor, how often sensors need to be read, the amount of data, the infrastructure, etc

. Radiocrafts offer a broad range of solutions for WSN, each with their unique properties to fit the needs of each particular situation. Some solutions are based on proprietary communication protocols, and others are based on industry standards. Among the standardized protocols we find Wireless M-Bus, KNX RF Multi, ZigBee and 6LoWPANbased solutions (Wi-SUN and ZigBee IP). As for proprietary protocols we offer point-topoint, point-to-multipoint, multi-hop (RC232) and mesh (Tinymesh).

Wireless M-Bus and KNX RF Multi are standards optimized for battery operation. The most common operating frequency is 868 MHz, giving better range than solutions based on 2.45 GHz. KNX RF can also be operated at 433 MHz, while Wireless M-Bus also offer a narrowband option at 169 MHz giving the best range of any technology. The data rate is limited (2.4 – 67 kbps depending on mode) and not intended for large data transfer. Wireless M-Bus can be used with single hop repeaters, and KNX RF with multi-hop repeaters.

RC232 is a transparent protocol that can be used for any UART based communication as a “cable replacement”. Because this protocol can run on all module platforms, there is a wide choice of radio frequencies and data rates to meet any specific application. A static multi-hop feature can be used to extend the range.

ZigBee and Tinymesh are mesh protocols that increase coverage by using the mesh nodes as “step-stones”. ZigBee operates at 2.45 GHz, which gives a shorter range than sub-1GHz, but because of the mesh the coverage can be good and reliable with redundant paths, as long as there are enough nodes in the network. An advantage is that 2.45 GHz is a world-wide license free frequency. Tinymesh can run on most module platforms, so there is a wide choice of radio frequencies and data rates to meet any specific application. These mesh protocols need constant power for the routers, and are therefore not suitable for battery operation.

IEEE 802.15.4 based protocols in combination with 6LoWPAN will give a standard based IPv6 system. The well-known concepts used in Internet IP communication is then extended all the way to the sensor nodes, providing a seamless operation with the rest of the IP world. Implementation of an IP stack takes more resources, and hence these solutions tend to be higher cost than the simpler protocols.

Unique features such as pulse counting inputs and sensor interfaces makes it very easy to build a complete wireless sensor. Our family of ultra narrowband modules provides the best performance in terms of radio range and noise immunity, which can be of importance in industrial environments. Our multi-hop (RC232) and mesh solutions (Tinymesh and ZigBee) can be used to cover a large area with multiple sensors. 6LoWPAN is a technology that enables IPv6 communication all the way to the end node, for seamless integration with the internet. And the Sigfox modules are the solution for mobile sensors, or sensors that are installed throughout a city or even larger geographical areas.

Current/1ltest R&D works in the field

Various issues in the design of wireless sensor networks ─design of low-power signal processing architectures, low-power sensing interfaces, energy efficient wireless mediaaccess control and routing protocolshave been areas ofextensive research in recent years. Gupta and Kumar have analyzed the capacity of wireless ad hoc networks [18] and derived the critical power at which a node in a wireless ad hocnetwork should communicate to form a connected networkwith probability oneMany clustering algorithms in various contexts have alsobeen proposed in the past ,but to our knowledge,none of these algorithms aim at minimizing the energy spent inthe system. Most of these algorithms are heuristic in nature andtheir aim is to generate the minimum number of clusters suchthat a node in any cluster is at the most d hops away from theclusterhead. In our context, generating the minimum number ofclusters might not ensure minimum energy usage.

Bibliography/References

https://www.cise.ufl.edu/~sahni/papers/sensors.pdf

https://arxiv.org/ftp/arxiv/papers/1312/1312.4082.pdf

https://www.google.com/search?q=wireless+sensor+network+research+paper&oq=wirless+sensor+network+reserch+&aqs=chrome.1.69i57j0l7.24157j0j1&sourceid=chrome&ie=UTF-8

https://link.springer.com/chapter/10.1007/978-3-642-22577-2_55