Multidisciplinary

Review: identification for wireless sensor networks

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Abstract
Features of remote sensing that espionage purposes and monitoring enemy facilities. Space uses for scientific research and monitoring planets and stars with satellites. Possibility of studying the urban environment. It provides cities with two types of information:
*Fixed phenomena information: the size of the city, its number, roads and their sizes, functions of its areas (residential - commercial, industrial).
*Variable phenomena information: phenomena that cannot be seen due to rapid changes or are invisible, such as traffic, social and economic characteristics and population statistics.
Recording data that the naked eye cannot see, as the human eye is sensitive to visible rays. Making rapid and highly accurate measurements of distances, areas and heights.

Keywords: computer networks, remote sensing, GPS, FireNet

Introduction

In less than one decade, information technology has become a major part of our lives. The ability of advanced computers to perform complex operations has influenced progress in both computer networks and embedded systems affect many aspects of human life, and are currently used High-resolution cameras connected to computers in many security applications, for example [1]. It is used to monitor important facilities and airports, in addition to monitoring traffic. Many researchers and companies have been attracted to developing wireless sensor networks, as there is a belief that this type of network will become a mainstream technology in a few years. In the future, for example, companies are spending millions of dollars to design smart sensors Similar to dust particles, these devices are expected to transform the physical world into its digital counterpart by collecting information related to the environment in which these devices are deployed [2]. Previous sensors suffered from high cost and large size, which is what attracted them. Scientists are investigating the possibility of building and developing smaller, less expensive sensors, for example to measure (weC), the University of Berkeley produced a sensor called (Berkeley), for example. Temperatures and lighting intensity, despite its small size, it is equipped with an antenna. Its frequency is 916.5 MHz and its range reaches twenty meters. Another example is called dust. Its volume is 11.7 cubic mm, noting that this device derives its energy from Golem Dust [3]. The sun is capable of two-way communication. Many experimental models have been designed that demonstrate the feasibility of publishing a large number of sensors on a limited area, where they cooperate to form a communication network. Wireless devices aim to monitor and observe the phenomenon under study, and this type of device is deployed. Either according to a specific scenario or they are spread randomly, in the first type it is the spread field. The landmarks are known, and the locations of the deployment of the sensors can be determined in advance, whether or not random deployment is usually deployed by helicopters, and in both cases, devices. Sensors deployed in the field to be studied transmit the monitored data to the station. The main one, which in turn is made available to the user [4].

Since its first appearance in the early sixties of this century (the term remote sensing was used). For the first time in 1960 AD) it is the science and art of obtaining information about an object or area or a phenomenon that needs to be studied or monitored, and this technique relies primarily on information and data and processed space images, where satellites, space laboratories, or aircraft send them images and data are transmitted to ground stations [5], which in turn receive this information on films Or magnetic tapes, then processing of this data takes place through a data processor or through a processor. Movies, this basically depends on the type of spacecraft and on the receivers on it. In the past decade, the field of wireless sensor networks has received increasing attention as a result of expansion. It is notable in its practical fields and technical developments, as wireless communication has facilitated ease. The spread and communication of information exceeds the capabilities of the wired Internet. Currently, devices can. [6] Wireless can exchange information among themselves or over the wired Internet field through a gateway. On the other hand, sensor technology made it easier for the user to discover his surroundings and (Gateway). Gaining valuable information that may be as simple as measuring temperature or as complex as when used in the military fields.

The development of this technology has been significantly linked to the advancement of infrastructure technologies such as semiconductors Battery power and memory efficiency, in addition to the fact that the size of the sensor is small [7]. Continuous, which allows these devices to be deployed in one

area and thus double the coverage area network, so a group of wireless sensors can form a temporary network. Between them, they work as if they are a single sensor with broader coverage and more functions (Ad-hoc) diversified, but there are still noteworthy challenges facing the growth of this field, for example, the topology of this type of network makes it weak for several reasons, including the movement of devices. The sensor and its lifespan, and these two considerations play an essential role in the strength of the connection wireless [8].

In this research, we will talk in some detail about wireless sensor networks and their development. The technology, its use, and practical applications, as well as the idea of its work, its advantages and disadvantages, and the challenges that face it. They faced each other.

Definition of remote sensing

There are many definitions of remote sensing, and the following is a presentation of the four most important of these definitions:

a) Remote sensing means a set of processes that allow obtaining information about something What, without there being a direct connection between it and the device that captures this information [9].

b) Remote sensing is a science that uses the properties of electromagnetic waves reflected or emitted from terrestrial objects, from the air, or from sea and ocean water Get to know her.

c) Remote sensing can be viewed as a set of methods, such as aircraft or satellites. Artificial balloons, data capture devices, receiving stations, and a software package Processing received data, which allows understanding materials and phenomena through their spectroscopic properties [10].

d) Remote sensing - It is a science that enables obtaining reflectance and spectral behavior data. For things, which can be transformed into information through processing and induction processes.

So, the phrase "remote sensing" is used to mean the set of data that we obtain from a certain distance; Resulting from the interaction of electromagnetic radiation energy with matter or appearance. We study it, and it is measured by one of the means of remote sensors. Although these definitions are comprehensive, they are sometimes very complex [11]. It includes the study of earthly materials and resources, which are not far from devices, makes. The use of the term “remotely” is sometimes questioned. Some also believe that other media violating radiant energy, such as sound, should be included in these definitions.

Types of remote sensing

Remote sensing can be classified according to the type of data received into:

Active remote sensing: The received data contains spectral reflections, as the platforms carrying the sensors send electromagnetic waves to the targets to be studied, impact them, and are reflected to be received by the sensors that send them to ground receiving stations [12].

Passive remote sensing: The data received is the spectral emission from objects.

Remote sensing techniques

Remote sensing techniques rely on carrying multiple types of sensors. To record the phenomena to be studied and measured, based on the concept of; Everybody radiates and reflects a range of Electromagnetic energy is often in distinct bands, called "spectral signatures." Shows information about a specific property of an object.

In general, radiation can be transmitted through the body, absorbed by the body, or scattered by the body, or the radiation may be reflected, which means that the radiation returns without change, The body in this case is like a mirror. Choosing one of these previous reactions determines the wavelength of each substance, which essentially depends on [13]. Its surface properties and molecular structure, and these are the rules for measurement by remote sensing. It is worth noting that the Earth's atmosphere has some of its own characteristics that influence the choice optical bands in sensing.

The accuracy of each sensor device differs from the other in the degree of differentiation it achieves in monitoring targets, and this depends on the properties of each material in terms of reflecting the rays falling on it, or absorbing these rays, partially or completely [14].

Remote sensing mechanism

The remote sensing mechanism takes place in four stages:

- Collecting information by sensors and transmitting it to ground receiving stations.
- This information undergoes preliminary processing, corrections, and then final processing.
- Interpreting this data after converting it into images.
- Using images to draw accurate data and maps that serve different fields.

Definition of wireless sensor networks

It is a group of sensors that are used to transmit or monitor a specific physical or chemical phenomenon (such as temperature, humidity, vibration, light, etc.) and then transfer information about the phenomenon wirelessly to the data processing center to benefit from it without a human being in the place of the physical phenomenon [15].

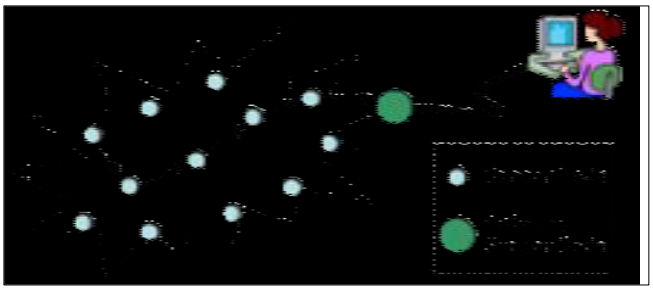

Fig 1

What is the sensor?

The sensor is a device that contains a microprocessor and has

monitoring capabilities. Wireless connectivity, which may also have a small screen to display the readings, usually suffers. The sensor has a small size, both fixed and volatile, and suffers from limitations energy stock [16].

Components of the sensor and how it works

The components of the sensor, as shown in the figure, consist of the following units:

1-Sensor unit

2-Data storage and processing unit

3-Transmission and reception unit

The sensor unit consists of a sensor and a tool for converting data from analog to digital. The main task of this unit is to convert sent or received data into suitable forma. The nature of the data used in the storage and processing unit, initially the received signal is strengthened from the sensor and then converted into digital form through a data conversion tool. Storage and processing: It is a microchip with a limited memory unit and data processor. As a complement to the previous two units, there is a transmitter and receiver unit, and this unit consists of a device to send and receive radio waves through the antenna installed on the sensor. In addition to the aforementioned units: There are three optional units [17]:

Location unit - its design depends on the type of application used - and its function. Determine the coordinates of the sensor in the monitoring field compared to a fixed point. The mobility unit is used to move the sensor from one place to another depending on for network requirements. A power generation unit in which the energy stock is refilled [18].

Modern applications in the field of wireless sensors require specialized devices. Long lifespan on the other hand, these devices usually have a limited power source. There are also several factors that affect energy consumption. For example, energy is affected by the following factors:

- Number of device inputs ·(Processing)
- Number of services performed
- Transmission and reception duration
- Surrounding environmental conditions such as temperature
- Accuracy of required readings
- Radio waves used.

Energy

Each sensor is usually supplied with two rechargeable AA batteries, but with hundreds of thousands of these devices being used in the monitoring field, recharging the batteries is a matter of concern. This is an impractical method, and therefore it is necessary to search for new strategies to rationalize energy, as in the process [18].

Integrating logic programming chips with a sensor. It is also possible to benefit from renewable energy such as solar energy or energy generated by vibration, which is one of the important means by which the energy problem can be overcome.

Memory size

The sensors contain small memory modules, which leads to a short circuit. The period of time required to store data before analyzing it or sending it to neighboring devices It was found that older types of sensors use volatile (computer) memory technologies of both types, SRAM and SDRAM, while new sensors contain both types of memory, but they are integrated with the device chip itself, in addition to using flash memory [19].

External, for example, the sensor contains a built-in memory of 256 KB, 32 MB of SRAM, 32 MB of SRAM, in addition to 32 MB of flash memory, although memory technology flash requires more space on the device chip compared to computer memory units of the SDRAM or SRAM type, but it is the most efficient in saving energy, but it is less efficient in the case of frequent writing [20].

Ability to process data

The processor in the sensor plays an important role in analyzing and processing the data monitored by the device itself or received by other devices. After completing the analysis process, this data is sent in a message - which may be encrypted - to neighboring devices. This requires controlling the radio waves and dealing with the message code and storing it. In addition, [21] the processor may perform another function, which is collecting data. This collection is usually the responsibility of a specific sensor that combines local and received data. Some of this collected data may be rejected and some may be sent to neighboring devices. One of these modern devices with high-efficiency processors is the PXA271 Intel. This device uses a processor of the type Imote 2. It also supports low frequencies - 13 MHz - and can operate in low-power mode - 8.5 volts - XScale, which is suitable for complex applications such as monitoring using digital cameras [22].

Contact

The radio is one of the most important components of the sensor, and it is also the most energy-consuming unit, and it is estimated that 97% of the energy consumed is related to transmission and reception, either by direct use of the unit or as a result of the processor waiting for the radio unit to finish transmitting or receiving. It has been noted that current radio technology works on the basis of sending data on short waves, for example, UWB, ZigBee, and Bluetooth. This includes standard technology such as ZigBee technology, which allows 254 sensors to communicate simultaneously at a frequency of 2.4 MHz. Other non-standard technologies may be used to transmit different data, and this may limit the capacity of sensor networks [23].

Applications of sensors

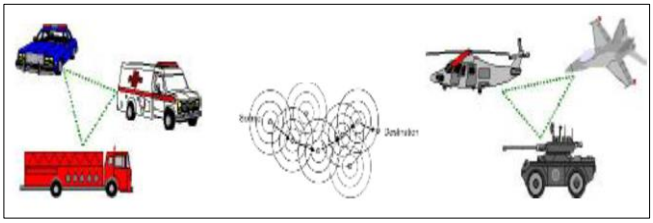

Fig 2

Uses and applications of wireless sensors

Sensor networks can be used in various applications including environmental monitoring, border security, healthcare, some military applications, and disaster management. These applications can be classified based on sensor network operations into three categories: data-driven, event-driven, or a combination of both. In the first category, the base station may request a specific set of sensors to monitor some phenomena, while in the second category, the sensors send a report on the monitored data when an event occurs. Below, we review some applications in each of [24]:

Data-driven applications

Used in applications where data is extracted from sensors via a language. This method is effective if we consider the amount of energy consumed, similar to SQL because the number of messages transmitted between sensors is as low as possible [25], but this method requires the use of smart sensors that can store data for long periods and deal with various inquiries sent from the main control station, and these features may not be available for small sensors. Examples of this include reading temperatures and humidity by a specific sensor in the monitored field, and also smart homes for the elderly, which are another example of these applications where an elderly person can ask the sensor to know whether the main door is closed or not, or if the TV is off or not, or to ask to know if there is a shortage of food available in the refrigerator (fridge), and in addition, in some complex applications, it may require more than one sensor to study a phenomenon in a specific geographical area [26].

In the field of disaster mitigation and natural and man-made hazards: such as floods, earthquakes, torrents, tracking and searching for victims, nuclear explosions and their impact on surrounding areas, and forest fires. In an example of these applications, we mention the FireNet structure for fire rescue. This network assumes the presence of sensors with firefighters (FireNet) and in fire trucks, while the main car is equipped with a portable computer that acts as a gateway (GPS), and the locations of firefighters are determined using GPS devices. Based on this structure, the sensors can report the information they have to the substations in addition to receiving commands from the main stations [27].

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