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Comparison Between Domestic and Hostile Applications of Wireless Sensor Networks

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Abstract

Man has been benefited a wholesome with the idea of sensors. Sensors not only help us in gathering data, but also provide us a solution to many unsolvable problems. Applying them over a wide area is quite a tough task, Hence the idea of Wireless Sensors Networking has been introduced. This idea has boosted the success rate of different experiments in the fields of health, Finance, Security, etc. where simple factors like temperature, motion, smoke, pressure etc. are used to muster the required data. These Wireless sensors are basically connected and are allowed to share their information over a network which indeed is connected to the main data center. Simply said this accumulation of sensors wirelessly has provided immense advantage for today's era. Sensors have extended the sustainability of mankind by making work easy in both domestic and hostile environments.

Keywords: Sensors, Wireless, Domestic, Hostile.

1 | Introduction

A lot of advancement in the field of sensor systems has led to a much more developed culture of living [1]. Apart from their advantages, these sensors have to crossover many challenges depending on the environments they are put in. Domestic and Hostile are the 2 main domains in which these sensors are usually put to work [2]. Domestic hear refers to the components in our day to day living like home automation, healthcare, temperature control, energy consumption monitoring etc. [3]. Hostile on the other hand relates to the areas where human motion is not possible [4]. Connecting these sensors involves a lot of man work and whole a lot of hardware like cables, connectors etc. To make this job a much more organized and managed the concept of wireless sensors has been introduced in both domestic and hostile environments [5]. What needs to be taken care is where to use what kind of sensors and at what quantity should they be organized to work [6]. Understanding their differences and implementing them makes a half job done [7].



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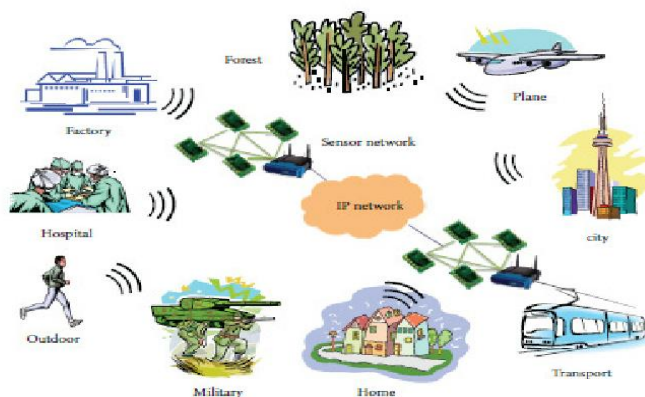


Fig. 1. Different applications of WSN.

2 | Literature Study

AWSN is a set of sensors used for observing, monitoring, and recording physical conditions in the surrounding area [8]. This is accomplished after observing and recording the behaviour of sensors; then the data collected is consolidated at one location [9]. In WSNs, sensors are spatially distributed and independent to measure and monitor physical conditions [10]. They assist in passing collected information through the internet to a central host [11].

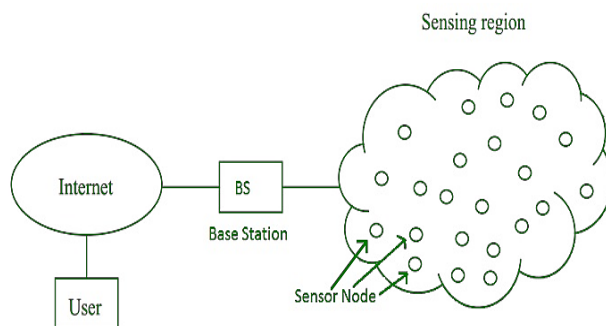


Fig. 2. WSN architecture.

Nodes are the main part of WSNs [12]. Sensor networks generally contain tens to hundreds or thousands of relatively small nodes, each equipped with one or more sensing devices [13]. Every node in the WSN is linked to one or more sensors [14]. Such nodes normally feature several components: a radio transceiver with an inner antenna or a connection to an exterior antenna, a microcontroller, an electric circuit for connecting to the sensors, and usually a battery or other form of energy collection [15].

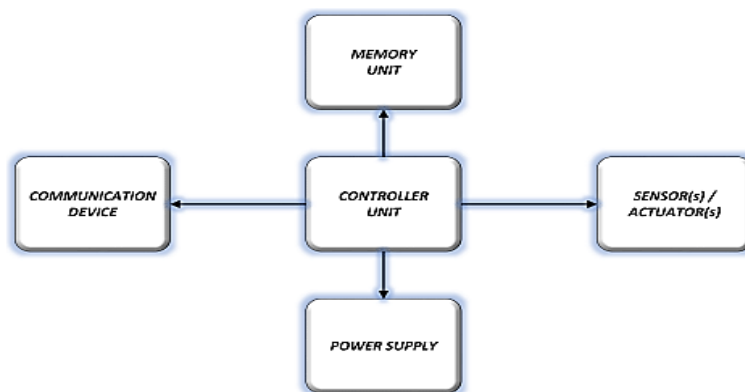


Fig. 3. Different components of WSN.

Characteristics of WSNs. WSNs have several important aspects, such as low power consumption, fault tolerance, mobility, heterogeneity of nodes, homogeneity of nodes, and ability to deploy widely, capability to survive harsh environmental conditions, helps to use easily [16]. A variety of characteristics may be

appropriate for different applications, while few may be common [17]. In many cases, characteristics may vary depending on the application [18]. In some instances, characteristics may be acceptable, while in others, they may not be considered at all.

Applications of WSN. When it comes to the applications of sensors especially of those which are wireless, we break down our discussion to 2 categories - Domestic and Hostile [19]. Domestic as said above majorly deals with the areas which involve less distance operations. As we can see, the different zones where sensors are usually kept to work in a domestic environment. Places like transport, physical activities, and household are the most common examples. Places like forest, city, and military make out to be the best examples of hostile applications [20].

Domestic Applications. The predominant application that raises the idea of domestic environment is Health monitoring systems. The health monitoring system can cover a wide range of issues. Bio-compatible wearable sensors allow a great deal of data to be collected and analysed for clinical trials, reducing the burden and inconvenience of doctors' visits [21]. For example-Advanced techniques were used to track diabetes using a WSN or a blood pressure sensor suitable for wireless biomedical applications. Patients could be monitored and tracked at home, in hospitals, and even in ICUs [22].

Hostile Applications. Any nation's pulse is its military. Tracking the whereabouts of the enemies is not everyone's cup of tea. We need to be extra cautious when it comes to launching or defending attacks. Thanks to WSNs, because they have made this task a comfortable one by setting up advanced sensors like motion detectors, camera sensors, infrared and wearable sensors. Force protection and vehicle navigation add extra feathers to WSNs. Managing these hostile environments is a task which cannot be ignored. Generally, these regions are more prone to destructions due to which the sensors life span and their self-repairable features are to be taken care thus making them cost effective.

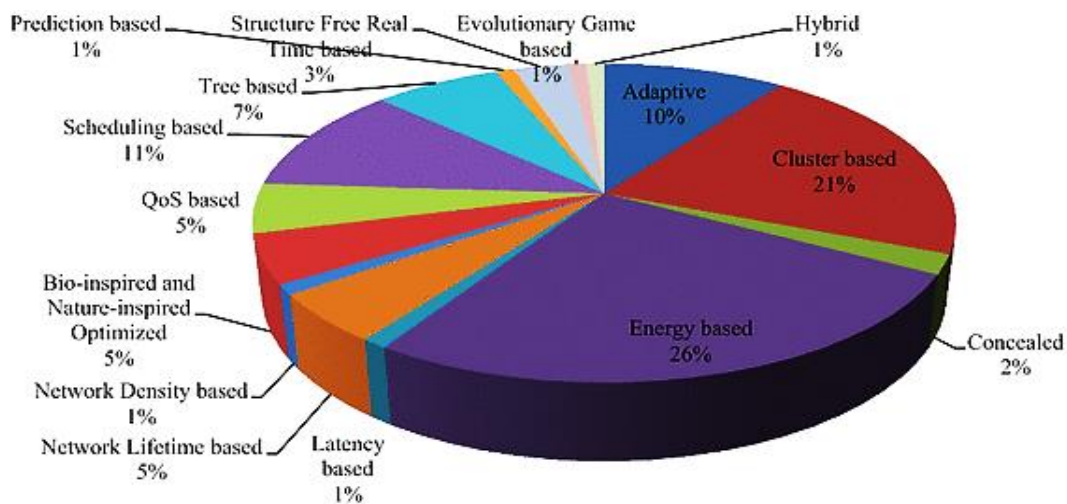


Fig. 4. Data aggregation in WSNs.

WSNs with large scales are extremely vulnerable to attacks since there are many miniaturized devices that have resource constraints, interact closely with their physical environment, and communicate through wireless links. In hostile environments such as battlefields, WSN vulnerabilities are exacerbated when they must operate unattended. As a result, adversaries pose a physical threat to all sensor nodes; that is, an adversary may intercept any sensor node containing critical security data, including keys for confidentiality and authentication. Consequently, it is imperative that secure key management services be delivered to WSNs in such environments which, in addition to being efficient, are highly resistant to attacks.

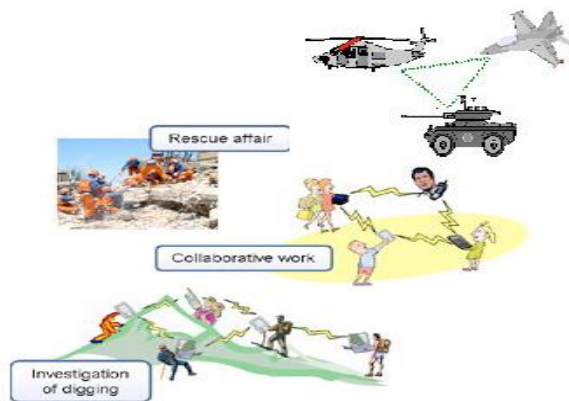


Fig. 5. MANETS-Military wireless sensor networks.

3 | Result and Discussion

Usually, a wireless sensor network consists of a small number of nodes, each with its own sensing, computation, and wireless communication capabilities. Many pathfinding, power management, and data dissemination protocols are designed specifically for wireless sensor networks where energy awareness is an essential design issue. This wide range of applications will eventually make sensor networks an indispensable part of our lives. Sensor networks need to meet the constraints imposed by factors such as fault tolerance, scalability, cost, hardware, dynamic topology, and environment.

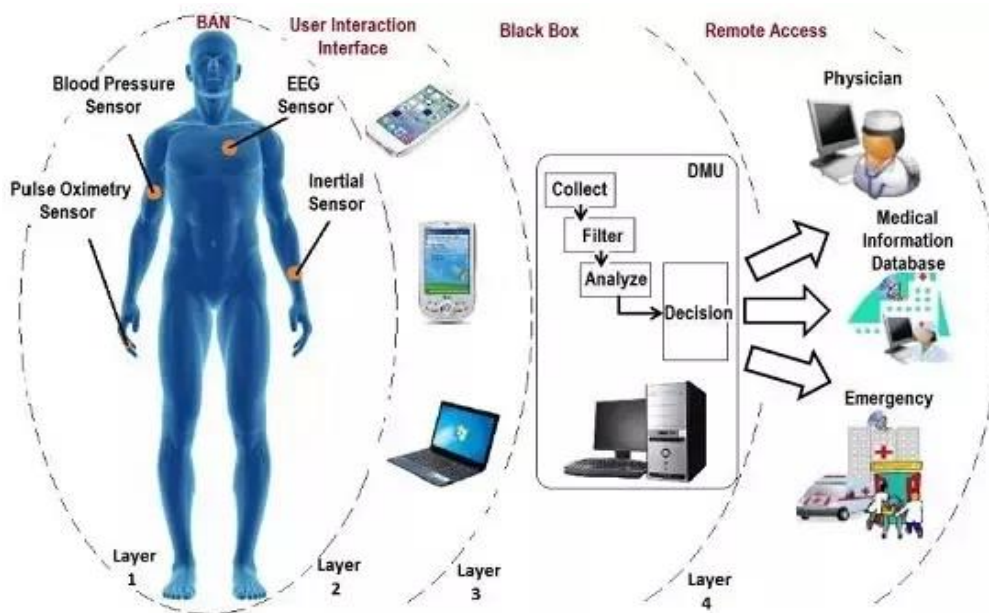


Fig. 6. Different applications of WSN.

Although WSNs have many advantages, they need to take care about the challenges that occur while dealing them in different environments. Especially when they are placed in hostile areas. Mountain destructions, volcanic eruptions, floods, forest fires, military, animal sanctuaries etc are some of dangerous regions of hostile environments.

4 | Conclusions

Analysing the elements that differentiate the major applications of wireless sensor networks, one can easily conclude that each of them has their own style of working. To be precise domestic weighs up than the hostile in many areas where humans are benefited personally. While on the contrary the hostile proves the fact that even the darkest, scariest, hardest places can be kept under our eye just with ease. The only thing

that pulls down them is their life time of working. This has been resolved by protocols and algorithms and is still striving towards a much more optimal solution.



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