



# Agents- based method for Wireless Sensor Networks

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## 1. INTRODUCTION

Recently, the trendy technology introduces an excellent facilitate in manufacturing wireless sensing element devices. These devices will observe and live the physical parameters of their environments [1]. A wireless sensing element network (WSN) consists of an excellent range of little, cheap, robust, co-operated and low power sensing element nodes [2]. every sensing element node constructs from 2 main parts: (1) a sensing unit accustomed live the environment' parameters, and (2) a process unit that's the core component accustomed method the detected data, memory, battery and transceiver for communication [3]. A high range of those sensing element nodes square measure deployed across the region to realize nice accuracy of WSNs. These sensing element nodes square measure self-ordinate parts. they'll re-arrange themselves to perform a standard task, and collaborate to live the conditions of their encompassing surroundings [4]. On the opposite aspect, topology of WSNs changes terribly oftentimes and also the communication between the nodes primarily use broadcast paradigm. sensing element nodes square measure restricted power, computation capabilities, memory and typically the batteries of the nodes aren't reversible [5]. The WSNs will be effectively employed in several observation applications in military, fireplace detection, security, home ground observation, industrial automation, earthquake, agriculture irrigation, radiation, health applications, etc. [6]. On the opposite hand, WSNs square measure long-faced with some limitations, such as: (1) will increase within the range of applications, (2) increase the quality of their style, (3) the problem of the runtime interaction. to beat these limitations, researchers have steered an answer to those issues by victimization additional helpful designed and distributed systems' algorithms. But, this kind of algorithms is incredibly complicated and high pricey. Therefore, additional recently, a replacement resolution is recommended by making associate autonomous wireless sensing element network. It will react dynamically to changes once needed. Also, autonomous WSN will increase the system longevity and also the coverage density [7]. So, victimization the agents-based approach for WSNs will improve their performance that has been applied within the planned system. The reminder of this paper will be organized as follows: Section a pair of provides an outline of agent-based design for wireless sensing element Networks. While, section three deals with the connected work. Section four represents the planned agent-based WSN system. Section five explains the pertinency of the planned agents primarily based system for 3 WSNs applications and their results. Finally, section half dozen handles some closing remarks.

2. an outline of Agent-based design for Wireless sensing element Networks The intelligent agent may be a new software package entity. it's associate autonomous software package program that may collect info regarding its encompassing surroundings through its sensors. Then, supported this gathered info, it takes action appropriate for achieving the goal [8]. For multi-agents systems, coordination of the agents is one amongst their main properties. On the opposite hand, any WSN has sensors those have co-operated actions to realize the system's main goals. While, WSNs square measure characterised by many options, such as: physical distribution, resource quality, unsure info, massive scale, localized management and adaptiveness [9]. These properties will be handled by agents within the agent-based systems. Therefore, the agents-based methodology has been with success applied in developing the WSNs for several engineering, coordination, and negotiation applications [10]. the current analysis proposes new system that uses the agent-based methodology in modeling and simulating the wireless sensing element networks.

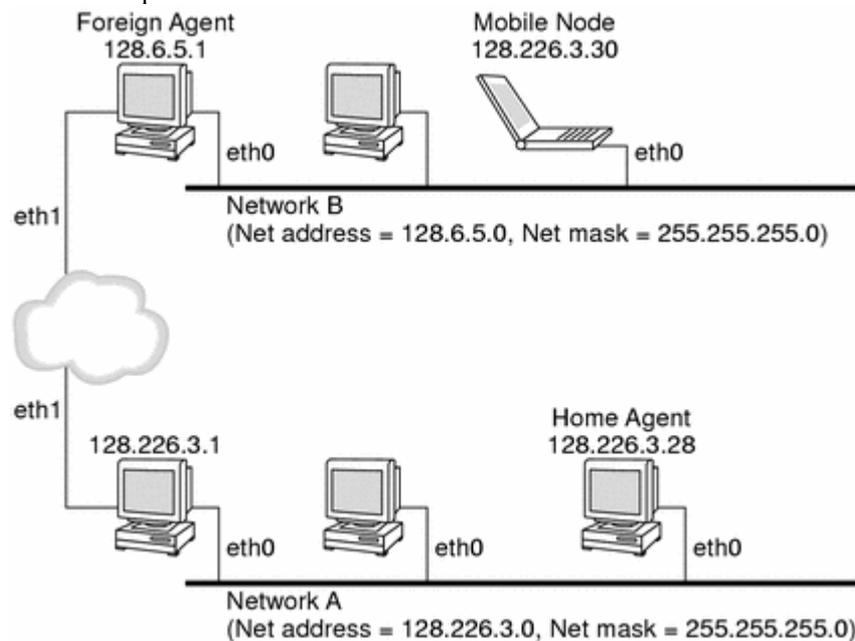
## 3. CONNECTED WORK

Researchers have developed plenty of labor within the space of wireless sensing element networks to contend with their nice spreading all told areas of our lifestyle. They recently have involved on providing high level abstractions of complicated low level ideas to application programmers. C.Fok et al., have planned Agilla system that's a sensing element network middleware uses associate agent primarily based approach [11]. A. Boulis, et., al., have planned the UCLA's SensorWare system. it's a full of life sensing element framework terribly near the mobile agent primarily based approach [12]. Y. B. Reddy has attenuated the packets transfer in wireless sensing element networks victimization the

agents [13]. S. Vupputuri et al., has introduced the uses of agents to enhance network time period of wireless sensing element networks with dependability constraints [14].

#### 4. PLANNED AGENT-BASED WSN SYSTEM

In the recent years, wireless sensing element networks space is become one amongst the most wide used techniques in period life. Therefore, there's an excellent work has been developed to beat the drawbacks of the WSNs and improve their performance. But, there square measure still some open challenges until currently those will be ended as: (1) quality of their styles to contend with many alternative sorts of applications, (2) high price of the trendy styles, (3) decreasing the time period of the network, and (4) high power consumptions of WSNs' processes. The steered system is taken into account one member within the family accountable regarding finding these issues. It introduces the uses of the agents-based approach for the wireless sensor networks (WSNs). Its main ideas based on using the agents enable the system to: 1. Decrease the bandwidth consumption. As, the agents can move the data processing elements to the location of the data as shown in fig. (1). The sensors are usually deployed on a low bandwidth wireless link. So, moving the data must be as minimum as possible.



**Fig. (1):** Agent moves to the nodes

2. Based on inter node distance of the deployment strategy, there is a lot of redundancy in the collected data. By moving the software agent itself to the data, a large amount of the redundancy in closely located nodes can be eliminated. 3. Besides, the proposed agents-WSN system can increase the lifetime of the WSN by decreasing the power consumption of its batteries. As the lifetime of any sensor node depends on its level of the battery power. While, using the WSN systems without the agent can transmit and receive the data among nodes and the processing elements cause high consuming of this battery's power. 4. On the other side, using a single WSN for multiple applications, the system flashes all the nodes with the same code and update them remotely from time to other. This causes complexity, high cost and delay time of the WSN operation. So, to overcome these limitations, a dynamic approach to programmability is needed. However, using the agents-based approach, the system can achieve this main feature. 5. The proposed system enables the users to inject new agents into the network and allowing old ones to die. Therefore, the network can be extended and scalable. The agents can be reprogrammed to adapt the network load balancing. 6. Besides, the agents-based approach can improve the security of WSN by eliminating the motion of the data.

Therefore, the agents' methodology is considered a powerful solution for improving the performance of the wireless sensor networks. To implement the proposed system, the designer must use different types of agents that are classified based on the needed function of the WSN's system. The proposed system has organized these agents in an architecture form. The sensor nodes of the network are divided into several regions depending on the spatial, topological and deployment conditions. Each region is decomposed into several clusters according to the queries, the hardware of the nodes, and data acquisition mechanisms.



## 5. APPLICABILITY OF THE PROPOSED AGENTS-BASED SYSTEM

The proposed agent-based architecture system is used to design three wireless sensor applications. The first one monitors radiation level, light, and security gates for different buildings in a radiation centre. The sensors are placed in four sites: gamma building (GB), accelerator building (AB), Control Room (CR), and Management Room (MR). The proposed system divides the area of sensors' deployment between the four buildings into two regions: region R1 includes GB and AB, and region R2 includes CR and MR. The suggested system defined the regional agents for the deployed sensors in GB and CR. The interface agent is deployed on a PC in CR. The data of the proposed system is obtained from the sensors. On the other hand, the second WSN has been applied as a part of a security system used by an industrial company. While, the third WSN application has been used for a university camp. To evaluate the performance of the proposed system for these three different sites, its obtained results are compared with the results gotten from two traditional WSN systems that have not used the agents [15,16]. Table (1) shows comparisons between the results of the proposed agents based system, an Agilla system and two traditional WSN systems when they applied for the three WSN applications [11, 17, 18]. It is found that, the proposed system can increase the lifetime and the security of the WSN systems, and decrease the complexity and the power consumption of the system. Also, the proposed system can increase the scalability and extendibility of the WSN system.

## 6. CONCLUSION

Recently, there are a great widely spread for the wireless sensor networks in many daily life applications due to the continuously decreasing in the cost and simplifying the deployment methods. But, on the other hand, there is a great complexity of WSNs' structure and distributed processing capacity by increasing their number of nodes. This analysis has steered the uses of the agent primarily based design for the wireless sensing element applications. The planned system has been applied for 3 WSNs applications for observation the radiation levels of a radiation web site, observation the protection state for each associate industrial company and a university camp. The performance of the planned system is compared with those gotten from 2 ancient WSN systems, and one amongst the common agents-based WSN systems. The obtained results have well-tried that the planned system contains a important impact on the WSN' performance. The steered system will increase the time period, dependability and also the security of the network. While, it will decrease the quantity of the transmitted packets through the network and also the power consumption of the network by moving the agents that may execute the desired tasks and processes for the info rather than moving the info for the sensing element nodes accountable regarding the desired tasks. Besides, the planned system will enhance the performance of Agilla system that's one amongst the common agents-based WSNs systems. Therefore, the steered system has smart performance for applying within the real things.

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