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PERFORMANCE ANALYSIS OF WSN USING DIFFERENT CLUSTERING TECHNIQUES

Aarti Lokhande¹, Er. Mukesh Patidar²

Department of Electronics and Communication Engineering
Lakshmi Narain College of Technology, Indore (M.P.)

ABSTRACT

The wireless sensor network refers to a group of spatially distributed and dedicated sensors for monitoring and recording the physical conditions of environment like temperature, humidity, pollution levels, sound, wind speed with direction and pressure. The sensors are self powered nodes which also possess limited processing capabilities and the nodes communicate wirelessly through a gateway. In this project are using fuzzy clustering, k-mean and self-organizing map (SOM) based clustering method. It is observed that overhead in cluster based protocol is not much dependent upon update time. Simulation a result indicates that a cluster based protocol has low communication overheads compared with the velocity based protocol. In the simulation result we consider main approaches Clustering technique (SOM, Fuzzy, K-Means), different-different numbers of node 150 with 5 cluster. The simulation performance analysis on the based comparison of communication overhead and average energy consumption. The result shown between communications overhead versus velocity (m/s) and percentage decay rate of energy for WSN versus Velocity in (m/s).

Keyword: SOM, WSN, K-Means, Fuzzy.

INTRODUCTION

Wireless Sensor networks (WSNs) have become one of the most interesting areas of research in the past few years. A WSN is composed of a number of wireless sensor nodes which form a sensor field and a sink. These large numbers of nodes, having the abilities to sense their surroundings, perform limited computation and communicate wirelessly form the WSNs. Recent advances in wireless and electronic technologies have enabled a wide range of applications of WSNs in military, traffic surveillance, target tracking, environment monitoring, healthcare monitoring, and so on. There are many new challenges that have surfaced for the designers of WSNs, in order to meet the requirements of various applications like sensed quantities, size of nodes, and nodes' autonomy. Therefore, improvements in the current technologies and better solutions to these challenges are required.

It is a wireless network consisting of spatially distributed autonomous devices using sensors to monitor physical or Environmental conditions. A WSN system incorporates a gateway that provides wireless. The wireless protocol you select depends on your application requirements. Some of the available standards include 2.4 GHz radios based on either performance comparison of communication Overhead and Average Energy Consumption using Different Clustering Techniques in Wireless Sensor networks IEEE 802.15.4 or IEEE 802.11 (Wi-Fi) standards or proprietary radios, which are usually 900 MHz. Wireless sensor network (WSN) is an ad-hoc network technology comprising even thousands of autonomic and self-organizing nodes that combine environmental sensing, data processing, and wireless networking. The applications for sensor networks range from home and industrial environments to military uses. Unlike the traditional computer networks, a WSN is application-oriented and deployed for a specific task. WSNs are data centric, which means that messages are not send to individual nodes but to geographical locations or regions based on the data content. A WSN node is typically battery powered and characterized by extremely small size and low cost.

WIRELESS SENSOR NETWORKS

Wireless Sensor Networks for Large Infrastructure Monitoring Wireless sensor network consist of distributed autonomous sensors in which each node is typically equipped with a radio transceiver, a small computing device and an energy source. Energy efficient resource allocation is of vital importance in sensor network.

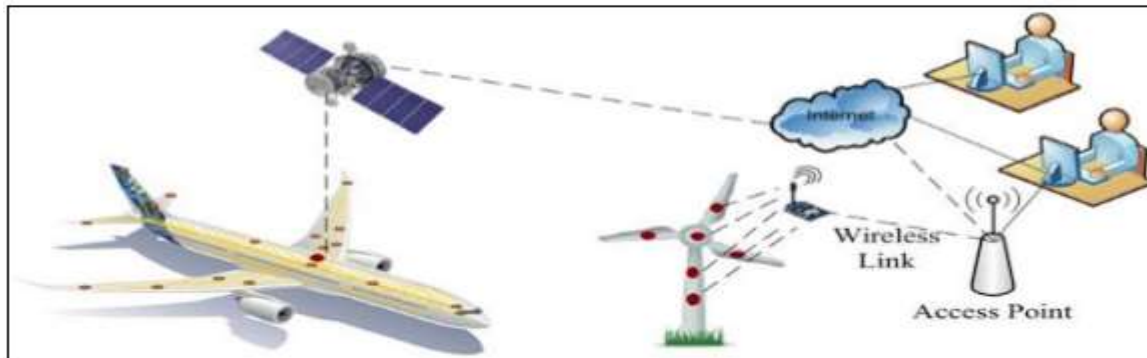


Fig. 1 Wireless Sensor network for Airplane status monitoring

An ad-hoc or short-live network is the network of two or more mobile devices connected to each other without any help of intervening infrastructure. Each sensor is capable of mobile communication and has some level of intelligence to process signals and to transmit data. Application includes Wireless Sensor network for Airplane status monitoring, Wind turbine monitoring, Farm monitoring, etc. as shown in Fig 1.

A. Applications of WSNs

Although wireless sensor networks were first proposed and supported by the U.S. military department, they have various applications as below.

- **Military surveillance:** In a battle field, there is no fixed infrastructure and sensor nodes can be deployed in a self-organized manner to collect dynamic information like sniper's position, soldier and tank's movement etc.
- **Healthcare:** WSNs provide another kind of treatment and care for the disabled or old people. Small sensor devices can be attached to a person to measure his/her physical condition like EEG (electroencephalogram), heart and pulse rate etc. Some high level information like a person's gesture, motion and feeling can also be deduced through WSNs.
- **Wildlife monitoring:** One of the famous examples here is the Great Duck Island experiment which collected information about a special seabird named petrel living on the island. The petrel had once been a very difficult subject for zoologists to study due to the bad climatic condition on the island and abnormal lifestyle.

B. Power Consumption

The wireless sensor network nodes can only be equipped with a limited energy-source. In some application scenarios, replenishment of power resources might be impossible. Therefore, sensor node lifetime shows a strong dependence on battery lifetime. Hence, power conservation and power management take on additional importance. In other mobile and adhoc networks, power consumption has been an important design factor, but not the primary consideration, simply because power resources can be replaced by users. In sensor networks, power efficiency is an important performance metric, directly influencing network lifetime. Power consumption in sensor networks can be divided into three domains: sensing, communication and data processing. Sensing power varies with the nature of applications. Data communication is a major reason for energy consumption.

C. Clustering on WSN

Clustering means dividing sensor nodes in virtual group according to some rules (called cluster) and then, sensor nodes belonging in a group can execute different functions from other nodes. It is a main task of exploratory data mining, and a common technique for statistical data analysis, used in many fields, including machine learning, pattern recognition, image analysis, information retrieval, and bioinformatics, assignment of a set of observations into subsets so that observations in the same subset are similar in some sense.

- 4.1.1 Hard versus Soft Clusterin
- 4.1.2 Flat versus Hierarchical

The System has been implemented in the MATLAB. The wireless sensor network is design with following specification in table 1. The method of design simulation has been given below:

Table 1: Specification Fuzzy, SOM and K-Mean

S.No.	Specification	Value		
		SOM	FUZZY	K-MEANS
1	NO. of Node and cluster	50,100,150		
2	Length of network area	1×1m		
3	Maximum range	500 m		
4	Noise power in dBm	50 dbm		
5	Transmitted power	1 Mw		
6	Operating frequency	2.4 GHZ		

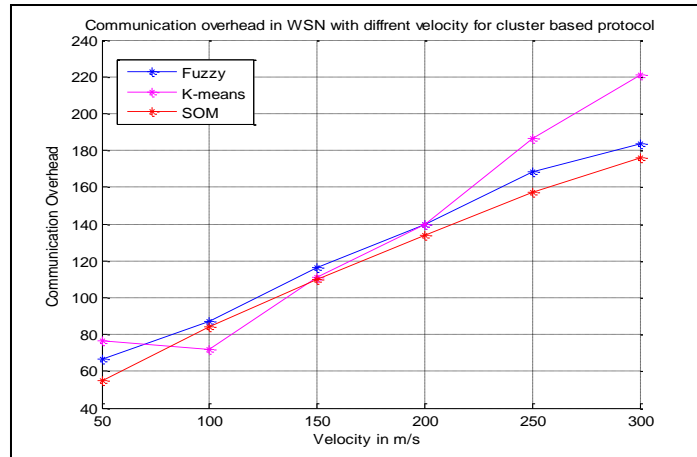


Fig. 2 Performance of Communication overhead in WSN for 150 Nodes

Table 2: Simulation result performance for Communication overhead

No. of node	Velocity in m/s	Communication overhead		
		K-means	Fuzzy	SOM
150	100	71.99	86.82	84.2
	200	139.7	139.9	134
	300	220.8	183.5	176.2

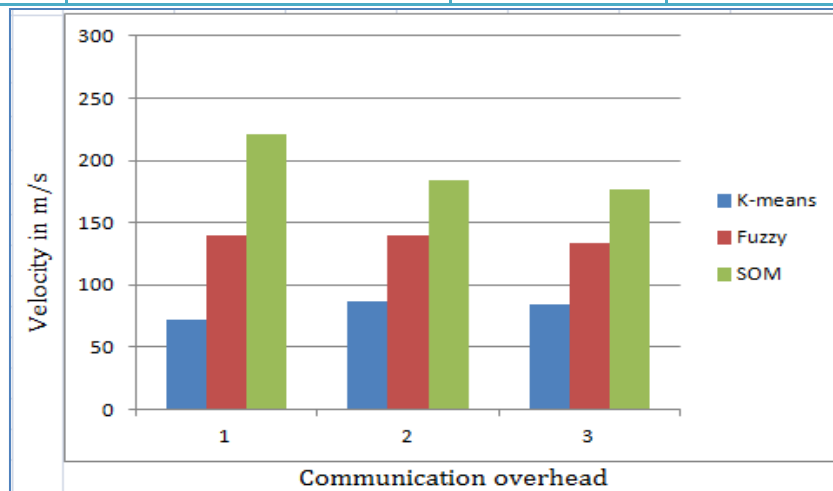


Fig. 3: Result Analysis of Communication overhead in WSN for 150 Nodes

CONCLUSION

Efforts have been made to minimize the energy consumption of wireless sensor networks and lengthen their useful lifetime at different levels and approaches. Some approaches aim to minimize the energy consumption of sensor itself at its operating level, some aim at minimizing the energy spent in the input/output operations at data transmission levels and others target the formulation of sensor networks in terms of their topology and related routing mechanisms.

Advances in wireless communication technology are enabling the deployment of networks of small sensors. These sensor networks have applications in military monitoring, health, industrial control, weather monitoring, commodity tracking, home control etc.

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