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PERFORMANCE INVESTIGATION FOR ANALYSIS OF TRUST AWAREENERGY EFFICIENT ROUTING ALGORITHM IN WIRELESS SENSOR NETWORKS BY USING FUZZY LOGIC

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Abstract

In This paper There is a whole new area of study and development available with wireless sensor networks. Scalability, self-configuration, self-healing, multicast routing, and ease of implementation are just a few of the intriguing features that these kinds of networks theoretically provide. These factors make them suitable for a variety of monitoring, control, surveillance, and distributed sensing applications among many others. For several of these applications, image sensor-based wireless networks are thought to be particularly useful. However, more work needs to be done on the implementation of certain applications, which still need to be identified.

Keywords: WSN, energy efficiency, node trust, improved fuzzy framework.

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1. OVERVIEW

The availability of suitable tools can greatly aid investigation and development of applications for wireless sensor networks. For this purpose, MatlabTM may serve as one appropriate rapid-prototyping tool. Its high-level programming environment would allow easy design, implementation, and emulation of algorithms and applications for wireless image sensor networks if interfaces to wireless motes and image sensors exist. Such interfaces could be realized as standardized libraries, which provide easy-to-use functions to communicate with a variety of image sensors and wireless motes. For these reasons, the Wireless Image Sensor Network Application Platform (WiSNAP) attempts to provide a MatlabTM framework for researching, developing, and investigating applications and algorithms for wireless image sensor network. In particular, WiSNAP consists of two Application Program Interfaces (APIs): an Image Sensor API and a Wireless Mote API. These APIs provide the user with simple, easy-to-use functions for interfacing with image sensors and wireless motes, respectively. Thus, there is no need to deal with hardware- and device-specific details. These are taken care of by underlying device libraries that implement the necessary hardware-specific communications and functions. The APIs and libraries are written to facilitate easy extension to other image sensors and wireless motes or to include some device-specific functionality. At this point, WiSNAP does by no means represent a complete or exhaustive implementation of available image sensors or wireless mote. It rather intends to establish a development structure that can be easily extended by other developers based on their particular application needs.

PROPOSED METHODOLOGY

The Trust Aware Energy Efficient Routing (TAEER) mechanism is designed for improving energy efficiency and packet delivery ratio. The proposed system consists of network model, neighbor discovery phase, cluster formation and CH selection, trust management and Fault tolerant based routing.

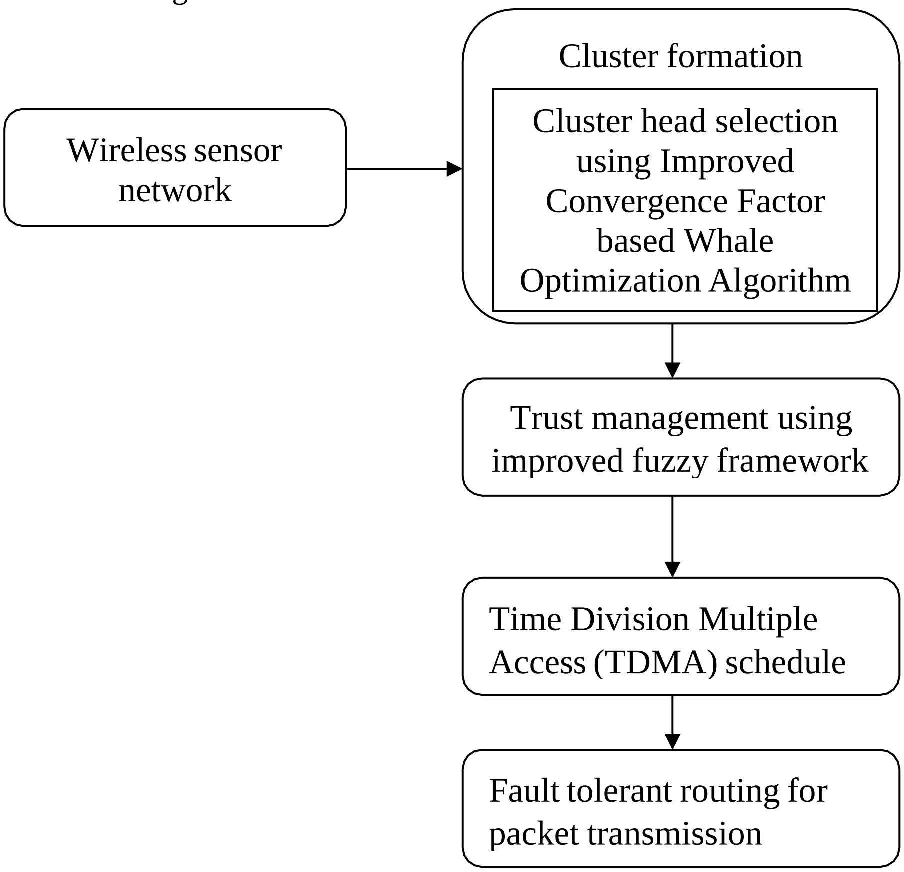

Figure 1: Schematic illustration for the proposed scheme

2. Network model

In WSN, nodes are evenly and arbitrarily disseminated over the section. They are dispersed around a square region, with the sides' lengths denoted by the letter "M". We assume that each node has access to sufficient energy for communication with the BS and is also capable of using various power levels. Nodes and the BS are immobile, and no support is provided for mobility. We analyze a network where the BS is roughly positioned near the field's center, despite the fact that the BS may be situated further from the monitoring field. Within the cluster range of the networks, all of the nodes can communicate with their neighbors in a single hop. It is expected that at the start of each phase, all nodes synchronized at least once. In the interest of simplicity, we'll undertake that the wireless transmission channel is protected. We'll also undertake that the system's functioning time is separated into rounds, with cluster formation occurring at the start of each round.

FLC is dependent to its inputs scaling gains. A label set corresponding to linguistic variables of the input control signals, *e(k) and* ce(k), with a sampling time of 0.01 sec is given Attempt has been made to examine with Seven number of triangular membership function (MFs) namely Negative Big(NB), Negative Medium(NM), Negative Small(NS), Zero(ZO), Positive Small(PS), Positive Medium(PM) and Positive Big(PB) are used. The range on input (error in frequency deviation and change in frequency deviation) i.e. universe of discourse is -0.25 to 0.25 and -0.01 to 0.01respectively and the range of output is -0.007 to 0.007. The Mamdani fuzzy Model is developed and the structure .

This model is developed in MATLAB using GUI tools in Fuzzy Inference System (FIS) file.The FIS methods used for developing are as follows:

And Method	:	min
Or Method	:	max
Implication	:	min
Aggregation	:	max
Defuzzification	:	som

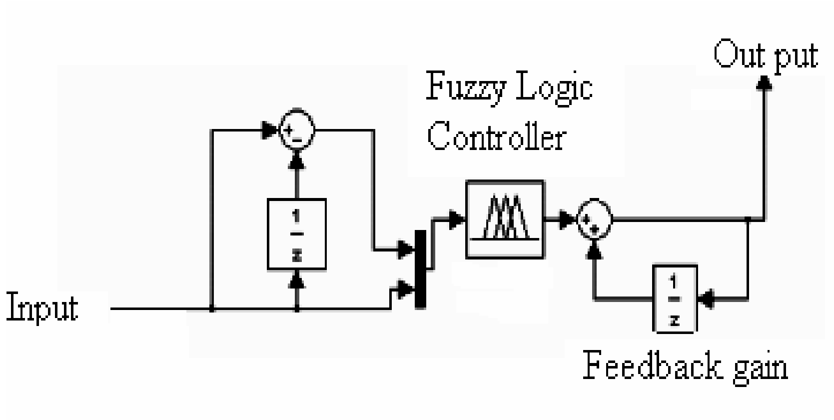

Fig.2 Fuzzy Logic Controller

3. Fuzzification

In this step, input values that are crisp are implemented as fuzzy variables. The degree to which these values correspond to the linguistic membership values (between 0 and 1) in the supplied fuzzy membership functions is determined by the fuzzification of the input. Table 1 shows the fuzzy membership functions for node parameters as LOW (L), MEDIUM (M), and HIGH (H). Every opinion in the input space is plotted to a membership amongst 0 and 1 according to the Membership Function (MF), which is a curve. The Fuzzy model employs both triangular and trapezoidal MFs to produce the desired results.

4. Fuzzy rule base generation

The rule base consists of many IF-THEN fuzzy rules. A set of fuzzy implication IF-THEN rules are used to indicate the relationship between the inputs and outputs (inferential). The full list of IF-THEN rules to determine a node's trust score is provided in Table 1.

Input	***e(k)***							
ce(k)		**NB**	**NM**	**NS**	**ZO**	**PS**	**PM**	**PB**
	NB	PB	PB	PB	PB	PM	PM	PS
	NM	PB	PM	PM	PM	PS	PS	PS
	NS	PM	PM	PS	PS	PS	PS	ZO
	ZO	NS	NS	NS	ZO	PS	PS	PS
	PS	ZO	NS	NS	NS	NS	NM	NM
	PM	NS	NS	NM	NM	NM	NB	NB
	PB	NS	NM	NB	NB	NB	NB	NB

Table 1: Fuzzy rule base

5. EXPERIMENTAL RESULTS

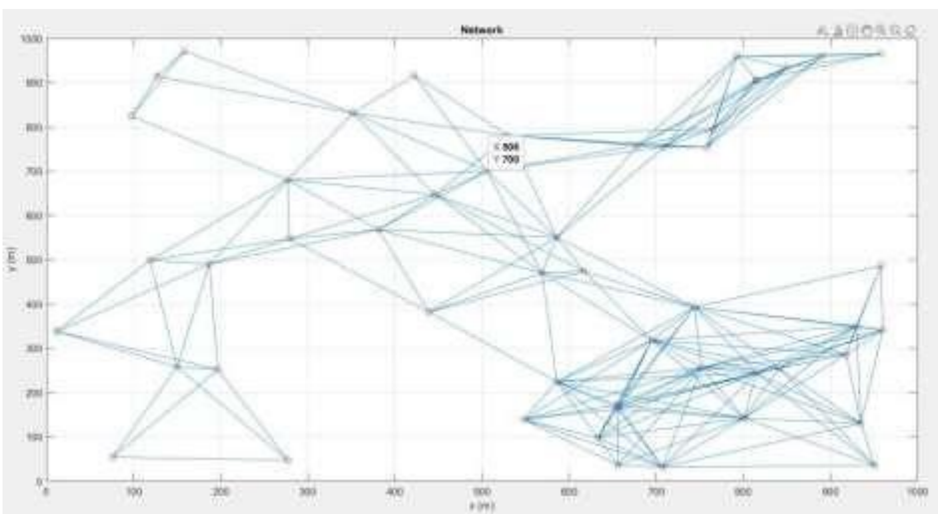

Fig .3

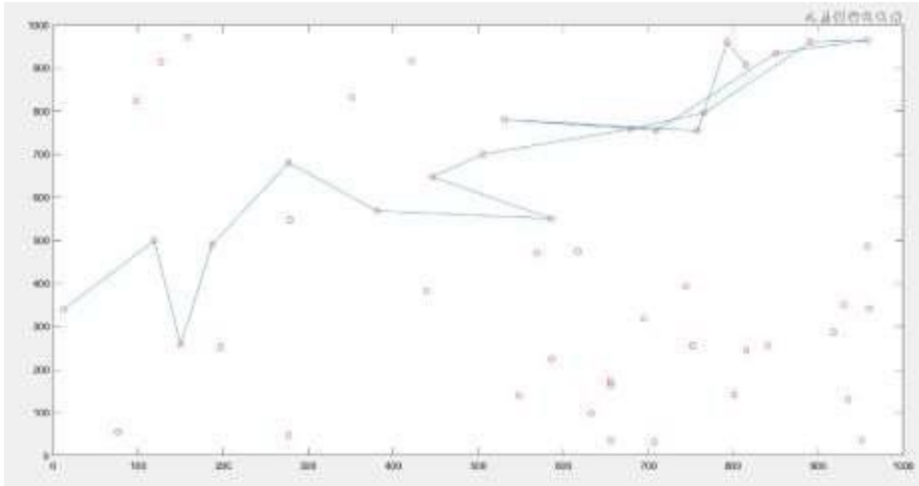

Fig 4

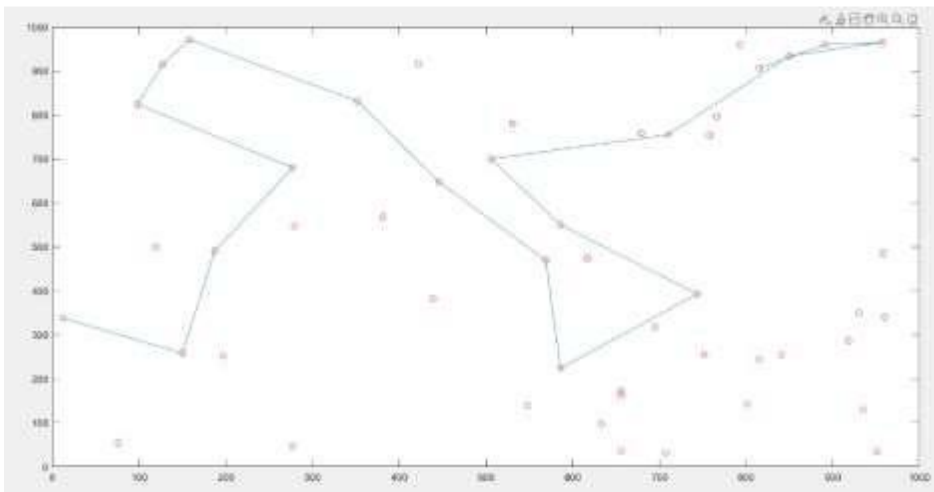

Fig 5

Fig 3,Fig 4, Fig 5 This part offers a comprehensive simulation study and a fuzzy logic-based comparison performance analysis. This method is implemented by using fuzzy logic-based decision rules and trust-based routing. MATLAB's simulation tool for the Windows platform is used to complete the simulation , provides the simulation parameters. Various parameters, including average packet delivery ratio, end-to-end throughput, packet drop rate, and energy usage are taken into account when comparing the entire simulation research.

6.CONLUSION

The suggested system created a Fuzzy Logic strategy for WSN. Clustering and fuzzy logic are used to choose the CH in a sensor network in order to optimize energy efficiency. Improved fuzzy based trust management is used to detect malicious nodes in order to increase network security. Finally, for efficient packet transfer, implement TDMA-based scheduling and fault-tolerant routing. The results of the investigation indicate that the suggested system performs better than the existing system in terms of PDR, energy use, end-to-end delay, and throughput. The methodology will be improved in the future to include more metrics like link quality and adaptive weights, allowing, for example, the weight for energy to increase over time. Additionally, we want to assess the approach on a larger, Network.

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