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A Quality Public Sensing Framework for Heterogeneous IoT

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Abstract: The application areas of wireless sensor networks (WSN) have attracted more number of researchers to add more functionality to these networks with the inclusion of internet access to the devices in a network. These devices create a network by utilization of internet to form Internet of Things (IoT).As the sensors and actuators are collecting various types of data in WSN, the need for storing and manipulating the heterogeneous sensor data is essential.The objective of the current work is to analyze the heterogeneous IoT data obtained from WSN by optimizing the routing path using greedy perimeter stateless routing (GPSR) protocol.Public sensing framework is deployed on large-scale network with low-cost by the utilization of currently available sensors where data already being shared among users.

Keywords*:* WSN, IoT architecture, public sensing, GPSR, cloud computing

I. INTRODUCTION

Miniaturization helps manufacturers to design and develop smaller sensor devices, thus the sensor network can be created anywhere on land, underground, and underwater. Depending on the environment, the challenges and constraints of sensor networks differ. There are five types of WSNs namely terrestrial WSN [1], underground WSN [2] [3], underwater WSN [4] [5], multimedia WSN [6], and mobile WSN [7]. Whatever might be the type of sensor network, data acquisition of the sensors and actuators is crucial due to wide range of availability of heterogeneous data.

WSNs are integrated into Internet of Things (IoT); where sensor nodes connect to internet dynamically. In IoT architecture all the devices which sense environmental parameters are linked together generating a boundless pool of data [8]. This data is not restricted to any single type of parameter, but consists of various heterogeneous data. The IoT model assumes all the devices to be equally tractable, identifiable and connected [9].For e.g. in wireless body area networks (WBANs) the sensors which can be either wearable over body or implanted or embedded inside the body that help to monitor the health condition of a person must be connected to each other to provide necessary information related to patients physiological status. The physiological parameters obtained in WBANs are not limited to any specific type but moreover the parameters will be of various types, and in these networks the must be in synchronization with other devices with the aid of internet.Public (or Participatory) Sensing (PS) is an promising model in IoT architecture which employs large-scale sensor networks at low cost by utilizing common sensory and mobile devices in applications where data is shared among users for the greater public good [10] [11].

The data obtained from the sensor devices might be required for further analysis and indexing. Sensor data analysis is very important to make better decisions in real time, enable improvements in data quality and increase relevance of the derived information. Cloud computing allows consumers to store and process the huge amount of data obtained from these sensor devices efficiently.Prior storing the data into cloud for further manipulation, efficiency and robustness of the system can be defined by reliable data transmission. Reliable and faster data transmissions can be achieved by greedy perimeter stateless routing (GPSR) protocol [12] in WSNs.

II. PROPOSEDSYSTEM

The proposed system for WSN and analysis of sensor data is simulated in MATLAB® 7.10.0 (R2010a) software using MATLAB programming language.

Further Java programming language is used to store and manage sensor data in cloud. The main objective of the proposed system is to analyse the sensor data conveniently and also to achieve public sensing framework. Architecture design of the proposed system is shown in Fig. 1.

WSN Formation, WSN Initialization and Selection of Source & Destination blocks mentioned in Fig. 1 are specified for simulating wireless network of 20 nodes and for the selection of source node and destination node for initialization of a wireless sensor network .For reliable transmission of sensor data from source node to destination node, optimal path must be chosen. The selection of path from source node to destination node is specified by GPSR protocol, which is shown in Path Selection of Source & Destination block from Fig. 1.

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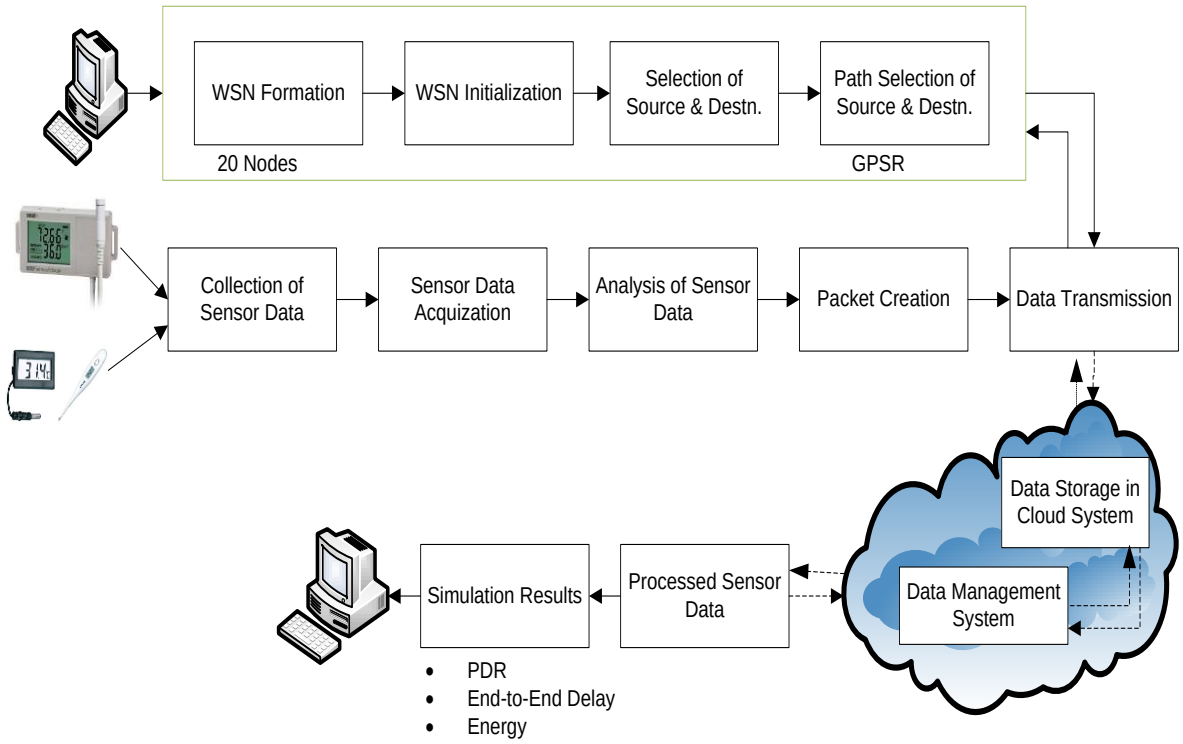

Fig. 1. Architecture design of the proposed system

GPSR: GPSR is a routing protocol which decides the packet forwarding decisions based on the positions of routers and a packet's destination for wireless datagram networks. As the name suggests, GPRS makes greedy forwarding decisions using sole information about a router's instant neighbours in the network topology. In our proposed system the forwarding decision for data transfer is selected based on the immediate neighbour specified between source node and destination node. If a packet reaches an area within a network where greedy forwarding is not possible, this algorithm recovers by routing around the perimeter of the area.

The sensor data is collected from available dataset which contain huge heterogeneous temperature and humidity values obtained from sensors. Once after the collection of data, we have to analyse the data. For data analysis, initially the humidity values are normalized, such that the humidity less than threshold value 30 is considered as low, humidity value in between 30 and 45 are considered as normal and values greater than 45 are considered as high. Thus separate analysis of humidity values is done for low, normal and high humidity values separately. The analysis of the humidity values is shown in Fig.plot 2 and Fig. plot 3.

This analysed data is divided into packets, where each packet has the data size of 1024 bytes. These packets are later stored in Yahoo! Inc. Cloud for further analyses. This processed data is utilized for calculating the packet delivery rate, average end-to-end delay, and energy consumption of the network.

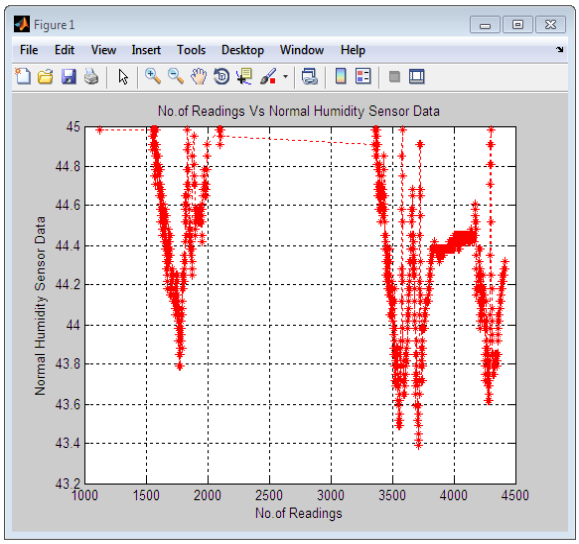

Fig. 2. Plot graph for number of readings Vs. Normal Humidity Sensor Data

III.RESULTS

A graph plot of packet delivery rate versus number of nodes is shown in Fig. 4. Graph plot of average end-to-end delay versus number of nodes is shown in Fig. 5 and energy consumption of the network is shown in Fig. 6.

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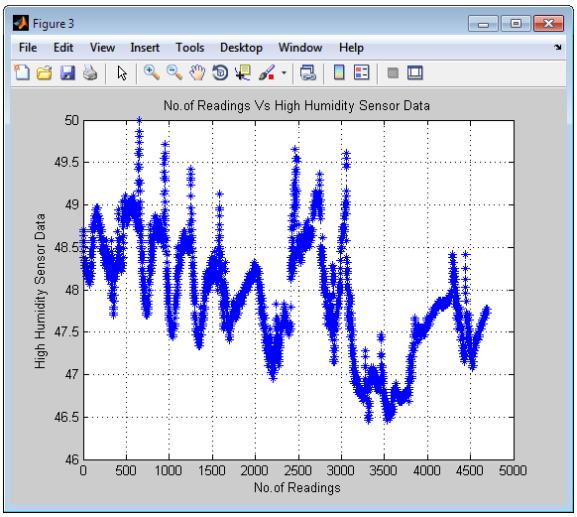

Fig. 3. Plot graph for No. Of Readings Vs High Humidity Sensor Data

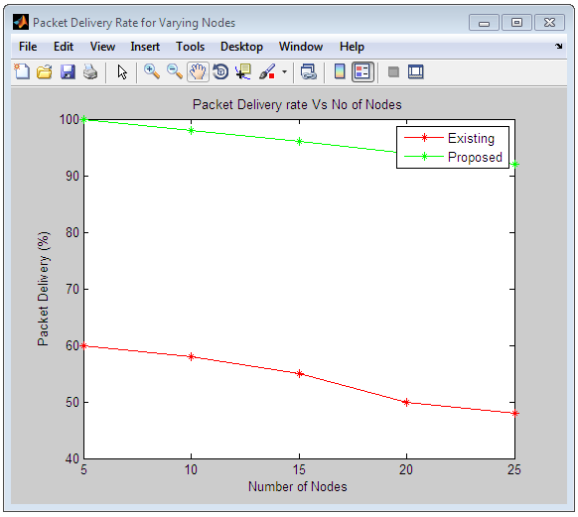

Fig. 4. Packet delivery rate Vs. number of nodes.

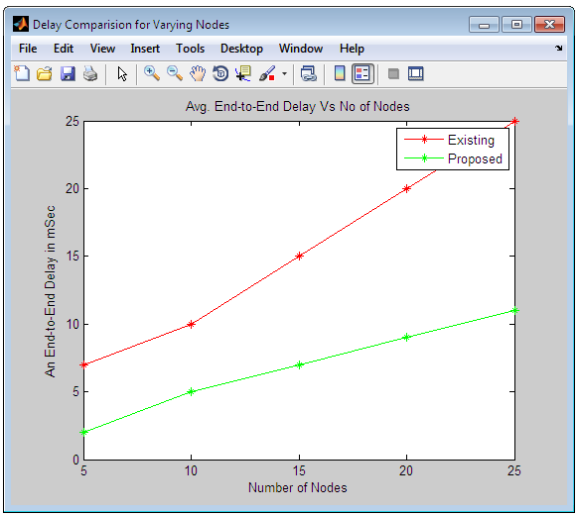

Fig. 5.Average end-to-end delay Vs. Number of nodes.

IV. CONCLUSION

We proposed a framework for sensor data analysis of heterogeneous data from IoT. The humidity and

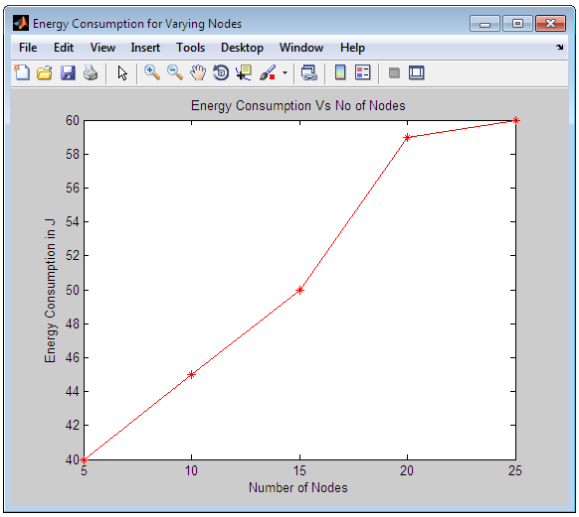

Fig. 6.Energy consumption Vs. Number of nodes.

temperature data acquired from sensors in WSN are transferred from to source to destination node by implementing GPSR protocol for path establishment. Managing and storing analyzed sensor data is done incloud computing architecture. With public sensing framework the data can be monitored and improved in real-time. With efficient analysis of heterogeneous data we can predict the nature of sensing system from previous sensed data and relevance of the data will be increased from the derived information.

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BIOGRAPHIES

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