A Survey of Architecture and Node deployment in Wireless Multimedia Sensor Network

ShikhaSwaroop*, PrashantKrishan*, Ayashasiddiqua*

*Post Graduate Department of Information Technology, Dehradun Institute of Technology

Abstract- Wireless Multimedia Sensor Networks (WMSNs) is networks of wirelessly interconnected devices comprising multimedia sensor nodes that are able to process real time multimedia content such as video and audio streams, still images, and scalar sensor data from the environment. We present the features of the environment in which the sensor networks may deploy. Node deployment in wireless multimedia sensor network is application dependent. It can be in deterministic or random fashion. In both the condition coverage of interested area is concerned.

Index Terms- Architecture, Coverage, Deployment, Wireless Multimedia Sensor Network

I. INTRODUCTION

Due to various challenging aspects of Wireless Multimedia Sensor Network ,it has drawn attention of research community in past few year. Further in due course various new application developed over large scale networks by small devices to gather and mine data after that transmit it to remote locations .These important outcomes in this field helped in various military and civil applications. Mostly deployed wireless sensor networks harvests information regarding scalar physical quantity like temperature, pressure, humidity, or location of objects. These applications has few limitations like delay, low bandwidth demands, expenses, network lifetime portability. So with enhanced interest Wireless Multimedia sensor network has been developed, comprising availability of inexpensive hardware such as CMOS cameras and microphones easily captures multimedia content from environment i.e., networks of wirelessly interconnected devices that allow retrieving video and audio streams, still images, and scalar sensor data. With rapid improvements and miniaturization in hardware, a single sensor device can be equipped with audio and visual information collection modules.

Wireless multimedia sensor networks improves existing sensor network applications with several new applications such as: Multimedia surveillance sensor networks, storage of potentially relevant activities, traffic avoidance, enforcement and control systems, advanced health care delivery, automated assistance for the elderly and family monitors, environmental monitoring, person locator services, industrial process control.

II. CHARACTERISTICS OF ENVIRONMENT

Dynamic environment where there maybe various types of sensor nodes in a single sensor network i.e. this type of environment is called heterogeneous environment in regard of software and hardware features of sensor nodes. Miscellany comprises of sensing various parameters and then comparative study by combining those parameters gives results i.e processing real time multimedia content such as video and audio streams. Multimedia senor nodes may be deployed in tough environment (in real world) which is dynamic and based over certain algorithm for multimedia sensor nodes execution. In network environment there is certain probability of failure at random times which causes to change network topology as well as range for transmission, reception, computation .So in due course continuous change in network topology causes computation and prediction complexity.

III. MULTIMEDIA SENSOR NETWORK ARCHITECTURES

In [5], the authors describes the biologically –inspired mechanism for sensor network architecture i.e. BiSNET which is based on the concept that bees act independently, influenced by local conditions and local interactions with other bees. A bee colony adapts to dynamic environmental conditions. The BiSNET run time operates a top of Tiny OS in each sensor node. It consists of a middleware platform and one or more agents. BiSNET models a platform as a hive and agents as bees.

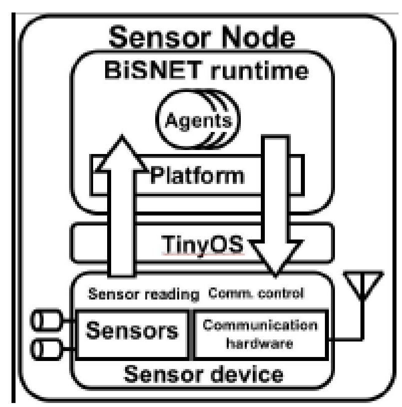

Fig. 1: BiSNET Architecture

Several biological principles named decentralization, autonomy, food gathering/storage and natural selection are used to design agents. Each agent reads sensor data, and discards or reports it to a base station. A platform runs on Tiny OS and hosts agents. Each platform manages the state of multimedia sensor node i.e. sleep, listen and broadcast and provides a set of runtime services that agents use to read sensor data and perform behaviors. The authors of [19] propose an architecture based on thefive OSI layers together with three management planes that go throughout the whole protocol stack (see Figure2).

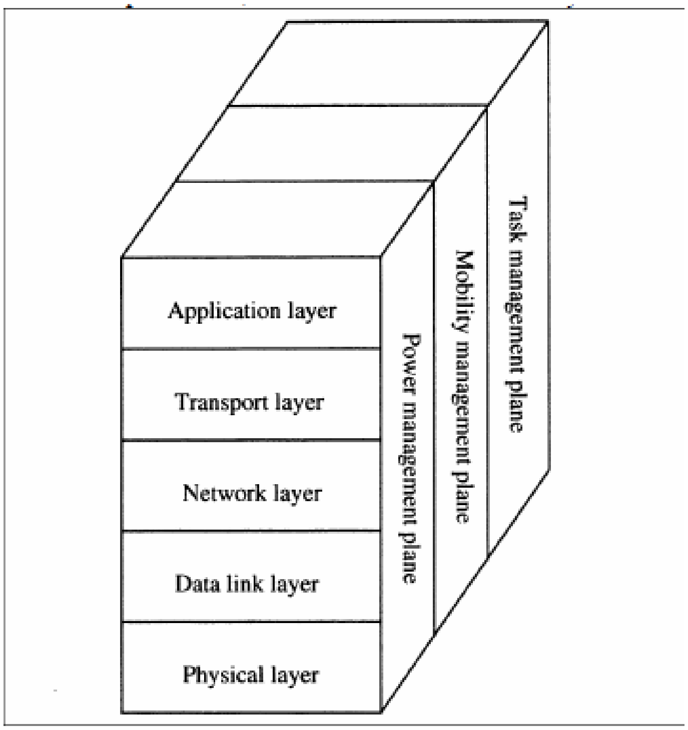

Fig.2: Protocol stack representation of the Architecture

IV. MULTIMEDIA SENSOR NODE DEPLOYMENT STRATEGIES

In a heterogeneous wireless multimedia sensor network, relay nodes(RN) are adopted to relay data packets from sensor nodes to the base station(BS).The deployment of the RNs can have a significant impact on connectivity and lifetime of a WMSN system. One strategy of uniform random deployment the biased energy consumption rate problem arises. This problem leads to insufficient energy utilization and shortened network lifetime. To overcome this problem two random deployment strategies has been studied such as, the lifetime oriented deployment and hybrid deployment. Potential-field-based approach for node deployment isdeeply discussed in [11], in which nodes are treated asvirtual particles, subject to virtual forces. These forcesrepel the nodes from each other and from obstacles, andensure that an initial, compact configuration of nodes willquickly spread out to maximize the coverage area of thenetwork. In addition to these repulsive forces, nodes arealso subject to a viscous friction force. This force is usedto ensure that the network will eventually reach the stateof static equilibrium, i.e. all nodes will ultimately come toa complete stop. The viscous force does not, however,prevent the network from reacting to changes in theenvironment; if something is changed, the network willautomatically reconfigure itself for the modifiedenvironment before return once again to a staticequilibrium. Thus, nodes move only when it is necessaryto do so, saving a great deal of energy. A hybrid approachbased on clustering in [13] is used for load balancing,where the 2-D mesh is partitioned into 1-D arrays by rowand by column. Two scans are used in sequence: one forall rows, followed by the other for all columns. Withineach row and columns, the scan operation is used tocalculate the average load and then to determine theamount of overload and under load in clusters. Load isshifted from overloaded clusters to under load clusters inan optimal way to achieve a balanced state. Each clustercovers a small square area and is controlled by clusterhead, knows the information about cluster's position inthe 2-D mesh and the number of sensors in the cluster.Limited motilities based approach is discussed in [14],where sensor can flip (or hop) only once to a newlocation and the flip distance is bounded. In thisframework, the problem is to determine the optimal wayfor flip based sensors to maximize the coverage in thenetwork. After detecting the coverage holes, the sensorsmove to new position to prevent coverage hole. Suchmovement can be realized in practice by propellers thatare powered by fuel, coiled springs that unwinds forflipping. In this model, sensors can flip only once to anew location. Sensor node deployment method based on acentralized virtual force [15], which combines the idea ofpotential field and disk packing. Clusterhead, communicate with all the other sensors,collect sensor information regarding position, calculate forces. The distance betweentwo neighboring nodes when all nodes are uniformly distributedis defined as a threshold to discriminate attractive orrepulsive force between two nodes. The force betweentwo nodes is zero if their distance is equal to thethreshold, attractive if less than and repulsive if greaterthan. The total force on a node is the sum of all the forcesgiven by other sensors together with obstacles andpreferential coverage in the area. In [16], three protocolsare evaluated for sensor network to maximize the sensorcoverage with less time, movement distance and messagecomplexity. These protocols first discover the existenceof coverage holes in the target area based on the sensingservice required by the application. After discovering acoverage hole, the protocols calculate the target positionsof these sensors, where they should move. Fewprotocols are based on the standard of movingsensors from densely deployed areas to sparsely deployedareas. In deterministic deploymentthe location of each sensor is determinedproperly which is used in static environment. The stochastic deployment sensors are deployed in such condition when information regarding sensing area is not known in advance or it changes with time, so its deployment positions cannot be determined.In [18], a centralized deterministic sensor deploymentmethod, DT-score is the basis. Given a fixed number ofdeployable sensors, DT-score aims to maximize the areacoverage of sensing area with obstacles. In the first phaseof DT-score, a contour-based deployment is used toeliminate the coverage holes near the boundary of sensingarea and obstacles. In the second phase, a deploymentmethod based on the Delaunay Triangulation is appliedfor uncovered regions. Before deploying a sensor, eachcandidate position generated from the current sensorconfiguration is scored by a probabilistic sensor detectionmodel.

V. CLUSTERING CAUSING ENERGY CONSERVATION

A node clustering algorithm based on overlapping camera FoVs. Firstly finding the intersection polygons of overlapping Field Of View(FOVs) and then calculating overlapped areas to establish clusters and determine cluster membership.Then coordination among cluster members conserve energy with respect to un-clustered solutions. At a time one node of every cluster carry out it process and rest other nodes where kept in sleep mode, so in due course for the particular time slot only energy related to thatworking node consumes. When its energy decreases to perform required task then it awakes other node and so on for every node of the cluster this process continue, which prolongs network lifetime and conserves energy.

The coordination among multimedia nodes can considerablyprevent wasting power avoiding redundant sensing, processingor sending similar multimedia data. Thus, it prolongs networklifetime particularly in dense networks that are usually deployed with a high number of low power, low resolution and inexpensive multimedia nodes in random manner. The proposed algorithm can work in both centralized anddistributed architectures and is only executed at node deployment. We select a centralized manner to perform it regarding power efficiency and enduring a negligibleoverhead for WMSNs.

VI. CONCLUSION

In this paper we Studied network architectures, deployment environment and existing node deployment strategies inwirelessmultimedia sensor network. We also surveyed over multiple perspective of its usage in various environment with different suitable deployment strategies. A clustering method for multimedia wireless sensor networks is studied. Cluster-membership is decided based on FoV overlapping areas. Themain objectives of this approach is to achieve capability ofcoordination among cluster nodes in sensing and processing tasks and also to develop energy conservation in the clustered multimedia nodes. There are still many challenges thatneed to be solved in multimedia sensor networks.

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AUTHORS

First Author – ShikhaSwaroop,M.TECH (Information Security and Management),Dehradun Institute of Technology, email-er.shikhaswaroop@gmail.com
.**Second Author** – PrashantKrishan, M.TECH(Information Security and Management), Dehradun Institute of Technology, email-kapilprashant10@gmail.com
Third Author – AyashaSiddiqua, M.TECH(Information Security and Management), Dehradun Institute of Technology, email-ayshasiddiquaster@gmail.com

Correspondence Author – ShikhaSwaroop, M.TECH (Information Security and Management), Dehradun Institute of Technology, email-er.shikhaswaroop@gmail.com ,
contact number- +91 9675128139