



Study on Communication Architectures in Sensor Network

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Abstract: To obtain the information security and information authentication one of effective approach is watermarking. In this approach, the data is hiding behind some multimedia objects. One of such effective watermarking concept is provided by Biometric Image watermarking. In this work, an analysis on DCT and DWT based watermarking approaches is defined to perform Biometric Image watermarking. In this paper, the issues and challenges associated with watermarking process are also discussed.

Keywords: Biometric Image Watermarking, DWT, DCT, Noisy, Compression

I. INTRODUCTION

A sensor network is restricted area network defined with tiny sensor nodes with energy specification and with sensing capability. These sensor networks are having its advantages in many environment specific applications, home applications, hospital application etc. The sensor node specification is defined with positional constraint and the nodes can be mobile or the fix position nodes. Each node is defined with fixed energy specification or with battery backup. The energy backup is defined to perform network communication with energy effective communication over the network. The network is having the capability to provide effective communication with energy restriction. As the communication is performed under the environmental, communication based restriction, sensor network is effective. Sensor network provides the communication in restricted scenario communication such as rescue area communication, class room based network etc. Sensor network architecture is defined with large number of sensor nodes with the specification in large communication area. This network type is defined with sensing network capability and with the energy node specification. The network is defined with the specification of receiver node at particular location. This kind of network is defined with the specification of the sensor nodes under the architectural restrictions. The architectural specification also includes the hardware specification, topological specification, operation system specification, communication parameter specification etc. The address of the network system is defined to perform reliable communication over the network. This architectural specification is shown in figure 1

A. Network Tracking

This scenario commonly discussed for sensor networks is the tracking of a tagged object through a region of space monitored by a sensor network. There are many situations where one would like to track the location of valuable assets or personnel. Current inventory control systems attempt to track objects by recording the last checkpoint that an object passed through. However, with these systems it is not possible to determine the current location of an object. For example, UPS tracks every shipment by scanning it with a barcode whenever it passes through routing centres. The system breaks down when objects do not flow from checkpoint to checkpoint.

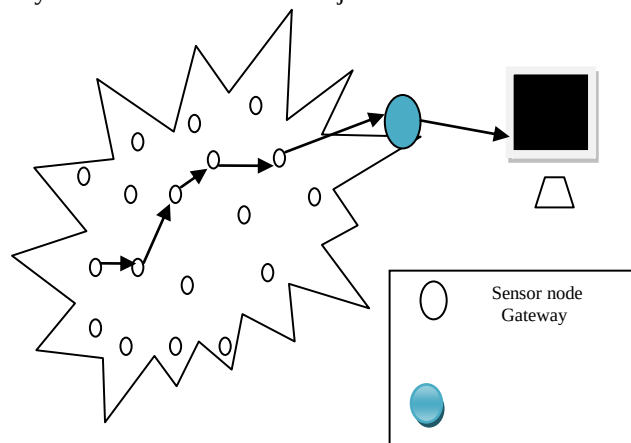


Figure 1: Architecture of Wireless Sensor Network

In typical work environments it is impractical to expect objects to be continually passed through checkpoints. With wireless sensor networks, objects can be tracked by simply tagging them with a small sensor node. The sensor node will be tracked as it moves through a field of sensor nodes that are deployed in the environment at known locations. Instead of sensing environmental data, these nodes will be deployed to sense the RF messages of the nodes attached to various objects. The nodes can be used as active tags that announce the presence of a device. A database can be used to record the location of tracked objects relative to the set of nodes at known locations. With this system, it becomes possible to ask where an object is currently, not simply where it was last scanned. Unlike sensing or security networks, node tracking applications will continually have topology changes as nodes move through the network. While the connectivity between the nodes at fixed locations will remain relatively stable, the connectivity to mobile nodes will be continually changing.

II. LITERATURE REVIEW

In the year 2001, Xu Lin carried out a task named "Location Based Localized Alternate, Disjoint, Multi-path and Component Routing Schemes for Wireless Networks". Within this article, Xu Lin suggested four proposals that can improve the performance of greedy routing method. In the other method, the i -th copy of the message m received is forwarded to i -th best neighbour, according to the selected criterion (if the number of copies exceeds the number of neighbours, the proposal fails). In the disjoint approach, each intermediate node, upon receiving m , will forward it to its best neighbour amongst those who have never received the message. If no neighbours as such exists, it fails.[1] In 2006, Shekhar H M P carried out a task called " Mobile Agents based Framework for Routing and Congestion Control in Mobile Ad Hoc Networks". In this paper, Shekhar presented a Mobile Agents based Framework for Routing and Congestion control in Mobile Ad Hoc Networks (MAFRC). The structure uses a cross-layer design tactic where numerous smart agents presented across the network protocol stack work together with each other and help in discovering cost-effective routes between the source and destination and also assist in controlling the amount of congestion in the network. The mobile agents moving across the network slowly gather the network connectivity information based on the congestion state given by the static agent at the link layer [2]. In 2009, Nacer Hamani carried out a task called the "An ACO/MAS joint approach to manage communications in wireless sensor networks". This article demonstrates the initial development of the MWAC model using an ant colony optimization. Hamani also brings up the use of ant colony optimization in the context of multi-agent systems and wireless sensor networks. Ants are not simply deployed on the multi-agent society [3]. In 2007, Vincent Borrel carried out a task called the " Understanding the Wireless and Mobile Network Space: A Routing-Centered Classification". Within this article, Borrel looked at the problem of classifying mobile and wireless networks with the aim of getting knowledge about what form of routing is the utmost suitable and that too for which network. The author next goes about developing a routing-awareness classification that understands that the limits between network classes are not that tough and are very much rely on the routing protocol parameters that are provided [4].

In 2008, Alfredo Garcia performed a work, " Rational Swarm Routing Protocol for Mobile Ad-hoc Wireless Networks". Wireless Mobile Ad-hoc networks (MANET) require dynamic routing schemes for adequate performance. In this paper, Author introduced a new dynamic routing scheme based upon energy. In a similar manner to ant-colony based dynamic routing protocols, Presented scheme is able to respond to link quality changes after a path is established [5]. In year 2011, Ashima Rout performed a work, " Optimized Ant Based Routing Protocol for MANET". In this paper, Author introduce a new ant based routing protocol to optimize the route discovery and maximize the efficiency of routing in terms of packet delivery ratio (PDR) using the blocking expanding ring search (Blocking-ERS), third party route reply, local route repair and n -hop local ring techniques. These techniques control the overhead and minimize the end-to end delay with improvement of PDR[6]. In year 2004, Xuefei Li performed a work, " Node-Disjointness-Based Multipath Routing for Mobile Ad Hoc Networks". AODV and DSR are the two most widely studied on-demand ad hoc routing protocols. Author modified and extended AODV to include the path accumulation feature of DSR in route request/reply packets so that lower route overhead is employed to discover multiple node-disjoint routing paths. The extended AODV is called Node-Disjointness-Based Multipath Routing Protocol (NDMR), which has two novel aspects compared to the other on-demand multipath protocols: it reduces routing overhead dramatically and achieves multiple node-disjoint routing paths [7]. In year 2010, Ying Lin performed a work, " An Ant-colony-system-based Activity Scheduling Method for the Lifetime Maximization of Heterogeneous Wireless Sensor Networks". This paper proposes an antcolony- system-based scheduling method (ACS-SM) for maximizing the lifetime of a typical type of heterogeneous WSNs. First, the lifetime maximization problem is formulated as finding the maximum number of disjoint sets of devices, with each set fulfilling sensing coverage and network connectivity simultaneously [8]. In year 2002, Fabian Kuhn performed a work, " Asymptotically Optimal Geometric Mobile Ad-Hoc Routing". In this paper Author present AFR, a new geometric mobile adhoc routing algorithm. The algorithm is completely distributed; nodes need to communicate only with direct neighbors in their transmission range. Author show that if a best route has cost c , AFR finds a route and terminates with cost

$O(c^2)$ in the worst case. Author gave a non-geometric algorithm that also matches the lower bound, but needs some memory at each node. This establishes an intriguing trade-off between geometry and memory [9]. In year 2011, Chen Yu performed a work, "A Behavior-Geography based Routing scheme in Mobile Ad hoc Networks". This paper devotes to adopt a behavior-geography based way to promote its performance. The core idea is to eschew the emergence of the redundant message duplicate which heads to errant directions of geography, when a message dispensed in the network, by the knowledge of the behavior type its terminus performing [10]. In year 2010, Wei-Jie Yu performed a work, "Pheromone-Distribution-Based Adaptive Ant Colony System". The proposed AACS algorithm is applied to solve a series of benchmark traveling salesman problems (TSPs). The resulting solution quality and the convergence rate of AACS are favorably compared with the results by the ACS using fixed parameters values and two existing adaptive parameters control methods [11]. In year 2012, Ana Cristina B. Kochem Vendramin performed a work, "CGrAnt: A Swarm Intelligence-based Routing Protocol for Delay Tolerant Networks". This paper presents a new routing protocol for Delay Tolerant Networks (DTNs), based on a distributed swarm intelligence approach. The protocol is called Cultural Greedy Ant (CGrAnt), as it uses a Cultural Algorithm (CA) and a greedy version of the Ant Colony Optimization (ACO) metaheuristic [12].

III. COMMUNICATION ARCHITECTURE

Data aggregation is one of the major communication approach in which multiple sources are sending data to single sink. This communication approach is applicable to most of the network scenarios as each network is controlled by some controller node or the base station and all other nodes are agreed to report them regularly for different purpose such as for permissions, authentications, to connect to outer interface etc. In all such case we need to transfer data from multiple sources to the single sink. But as such kind of communication is performed individually between the each source and the sink. There will be heavy traffic or the communication over the network that can result data and energy loss. Because of this there is the requirement of Data aggregation. The basic idea behind the aggregation is to avoid the one to one communication to the sink node and build an aggregative path over the network. The aggregative path is the path that selects a distance node as the source node and all the network nodes are intermediate nodes. The main objective of the data aggregation is to reduce the network traffic and to save the energy loss over the communication. While working with sensor network or any adhoc network, there are many dedicated applications that are suitable to the data aggregation. The aggregation also defined under some constraints and the components. One of the components is the aggregation operator called aggregator. The aggregator can be union operator that just combine the dataset taken from the previous node, add a delimiter and node message to it, and pass the message to next node. But such kind of aggregation is applicable only for the smaller network. As the network size grows, the union cannot be used. In such case, other aggregative operator called summation will be used. According to this operator the numerical values extracted from all nodes are added as the communication transferred to the next node. But these all kind of aggregation also suffer from the problem of inclusion of some false or the bad information. In such case, the false data detection approach is used. The basic process of aggregation is shown in figure 1.

In-network data aggregation reduces energy consumption in WSN. Specifically, the main problems to consider are how to create the converge cast tree, how to select the routes, and where to do the aggregation in this tree. There are number of different data aggregation processes in in-network data aggregation. For example:

- (a) *Tree based in – network data. Aggregation*
- (b) *Application specific data aggregation.*
- (c) *Structure free in – network data aggregation. But the most important one is*
- (d) *Cluster based in – network data aggregation [5].*

In cluster based in - network data aggregation partitioning the network into clusters and deploying cluster-heads to perform data aggregation. The job of these cluster-heads is specifically aggregating the data received from the sensors and transmitting them to the BS. In most scenarios, they do not perform any sensing.

Low-energy adaptive clustering hierarchy (LEACH), Energy-Efficient and Secure Pattern-based data aggregation (ESPD) and Power-Efficient Gathering in Sensor Information Systems (PEGASIS) are some of the example of Cluster based in – network data aggregation. They select a cluster-head among the sensor nodes that performs the data aggregation. Although LEACH considers clusters where each sensor can reach the cluster-head within one hop, PEGASIS creates chains of sensor nodes in which a leader is designated as the aggregator. ESPD, on the other hand, considers clusters with multi-hop routes. In all of these approaches, sensor nodes take turns to be elected as the cluster-head so that the load of being cluster-head is distributed evenly among the sensor nodes in the network [5].

PEGASIS is a chain based protocol that transfer data to its nearest node and form a chain and in case of some node failure chain is re constructed. The proposed work is the improvement in PEGASIS protocol in terms to decide the next node in the chain. It will check the ratio of residual energy along with distance to perform the initial decision it not eligible the second level decision is taken by checking the response time. The work proposed here is the try to increase the network life time as well to increase the throughput over the network.

The key features of PEGASIS are:

- *The BS is fixed at a far distance from the sensor nodes.*
- *The sensor nodes are homogeneous and energy constrained with uniform energy.*
- *No mobility of sensor nodes.*

PEGASIS is based on two ideas; Chaining, and Data Fusion. In PEGASIS, each node can take turn of being a leader of the chain, where the chain can be constructed using greedy algorithms that are deployed by the sensor nodes. PEGASIS assumes that sensor nodes have a global knowledge of the network, nodes are stationary (no movement of sensor nodes), and nodes have location information about all other nodes. PEGASIS performs data fusion except the end nodes in the chain. PEGASIS outperforms LEACH by eliminating the overhead of dynamic cluster formation, minimizing the sum of distances that non leader-nodes must transmit, limiting the number of transmissions and receives among all nodes, and using only one transmission to the BS per round. PEGASIS has the same problems that LEACH suffers from.

IV. CONCLUSION

In this paper, an effective communication architecture in sensor network is defined using clustering and aggregative communication capabilities. The work is defined using LEACH and PEGASIS protocol.

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