The Literature Review Analysis on Ad-Hoc Sensor Networks over Efficient Routing Algorithms in Transmitting the Data

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Abstract:
In the Ad-hoc sensor networks the selection of efficient rout to transmitt the packets is very important. Now a day's information transfer over ad hoc networks has been increasing in various froms. Especially Video transmission over ad hoc networks has attracted the attention of many ad hoc research groups. Performing illegal activities in the information transmission over ad hoc networks inflicts decrease in the quality of service parameters of the network in terms of throughput, delay, delivery ratio, bandwidth etc. The key features to improve the quality of transmission in ad hoc network affecting the efficiency of the network are listed below (L. Chen, W.B Heinzelman, 2007)

1. **Energy consumption of the node in a network:** When the energy consumption of a node in a network increases it changes the topology of the network causing depreciation in the quality of service.

2. **Rate Distortion of a node:** Packet loss is generated by three reasons: channel error, redundant path error and queuing loss which ultimately affect the throughput of the network. Channel error may cause congestion in the network which increases the delay and affects the quality of service.

3. **Outage Analysis of the signal:** Analysis of parameters such as interference, diffraction, fading and shadowing causing outage in the system i.e., a failure or interruption caused in the channel is called Outage Analysis. Outage analysis parameters listed above will result in decrease in signal to interference ratio which in turn affects the transmission power of the signal and the coverage area.

4. **Routing Path Selection:** Link failure and topology failure are the main problems that exist in a dynamic topology Ad hoc network. When a route breaks due to link failure, topological change in the network will affect the quality of service.

5. **Receiver synchronization:** Synchronization at the receiver is a crucial issue during multipath transmission. When the information such as video is split up into different parts and transmitted, the packets will arrive at the receiver in random order causing synchronization problem producing additional delay in retrieving the information.

6. **Path Synchronization:** All networking functions, such as determining the network topology, multiple accesses, and routing of data over the most appropriate multihop paths, must be performed in a distributed way particularly challenging in ad hoc networks due to the limited communication bandwidth available in the wireless channel.

The objective of designing routing algorithms is to reduce the above said limitations and to increase the quality of service during multipath multicast information in an ad hoc network. An effective solution to improve quality transmission in ad hoc networks includes energy efficiency, minimized distortion, and reduced interference with optimal multipath selected synchronized algorithm. Several solutions encompassing these elements individually are addressed to thwart the problems existing in ad hoc network affecting Quality of service.

2.1 ENERGY EFFICIENCY OF A NODE:

Transmitting information from source to destination in an ad hoc network takes place through multihop routing. If the energy gets depleted more it leads to instability in the network topology.

Energy of a node decides the optimal power in the transmission path. In order to work on the concept of multi-hop routing, the intermediate nodes play the role of the relay nodes. If the relay traffic is very high, it will leads to rapid depletion of a node power and if the traffic is negligible upon a node, it leads to the partitioning of a network (Thomas Kunz, Xiaoying Zhang 2008). If the battery size is very small, then it decreases the lifetime of a node and if battery size of a node is large, it increases the weight of the mobile node. So to keep the standard small size of a battery, energy management techniques are required to utilize it efficiently. Optimal value selection for transmitting a packet is difficult but as this transmission power increases, it increases the consumption of the battery but the connectivity increases.Reduction in transmission power increases frequency reuse, which leads to better channel reuse. Although developing battery efficient systems with low cost and complexity, remains a crucial issue, efficient battery aware protocol is the need of today's adhoc networks. Designing smart battery packs that can select appropriate battery discharge policies under different load conditions is a challenging problem.

The improvements in the energy consumption are obtained by both introducing an energy-based routing metric and by enhancing the physical layer performance using directional antennas by Cristina Comaniciu and Nie Nie (2006). In traditional AODV routing protocol, the route with fewer hops is selected without specifically accounting for the links' quality. Consequently, data packets may be transmitted over paths with poor links, which would require more energy consumption for correct end-to-end transmission. Connection (Set CONSET) is a cross-layer solution in which the MAC layer indirectly influences the selection of the next hop along the end-to-end path by manipulating the transmission power of the route request (RREQ) messages that has been proposed by Marwan Krunz (2004).

2.2 DISTORTION BASED ROUTING:

Video communication is different from data communication because interactive video applications are delay and loss sensitive. If the video packets are arriving late then it is useless to the video decoder. Thus, the retransmission techniques will not be applicable to video communication applications with low delay requirements, especially in multicast situation. There are additional challenges for supporting video communication over wireless ad hoc networks because of the mobility of wireless nodes. The topology of ad hoc networks may change frequently. Each packet of an interactive video application has a strict delay constraint. If a video packet arrives later than its deadline, it is useless to the decoder. As such it is desirable to drop late packets at the sender or in the middle nodes rather than attempting to transmit them after the decoding deadline has passed. In wireless ad hoc networks with low bandwidth, high bit error, and node mobility, the quality of streaming video is highly dependent on the quality of routing paths. Most of existing ad hoc routing algorithms selects the path according to network parameters (Arunabha Sen, 2007). However, the selected path may not be the best path for video applications.

The main challenges stem from mobility of nodes, time-varying nature of wireless channel, and error-prone communications. In order to ensure various multimedia applications with the necessary QoS, a qualified path has to be selected. The quality of a received video is highly dependent on the quality of the path in terms of loss, delay, and jitter. An efficient path selection algorithm should take account of the network status on the network layers and also video distortion on application layers. Prior routing researches mainly use network performance metrics. The metric most commonly being used by existing ad hoc routing protocols is hop counts. A typical routing algorithm, DSR (Dynamic Source Routing) protocol (Xiaoqing Zhu, Bernd Girod, Stanford University, 2005), selects the path according to pre-determined metrics, such as hop counts, delay, etc.

However, the shortest path may not be the best path for video applications. Minimizing the hop-count maximizes the distance travelled by each hop which results in minimizing the signal strength and maximizing the loss ratio in physical links. For bandwidth-consumed, delay sensitive video applications, a path selected with high loss ratio and narrow bandwidth will degrade the video quality in the receivers. metric(Xinggong Zhang, Yan Pang, Zongming Guo, 2009).

ISSN No: 2348-4845

On each link, the rate-distortion due to transmission error and congestion is estimated using queuing theory. In video communication for the successful reconstruction of the received video, the path used for the video session has to be stable for most of the video session period. Furthermore, packet losses due to transmission errors and overdue delivery caused by congestion should be kept low, such that they can be handled by error control and error concealment techniques. However, this situation does not hold true in ad hoc networks, where wireless links are frequently broken and new ones re-established due to mobility. Moreover, a wireless link has a high transmission error rate because of shadowing, fading, path loss, and interference from other transmitting users. The existing rate distortion algorithms do not consider the fading and interference problem and they also have to be modified for multipath multicast transmission.

2.3 OUTAGE ANALYSIS:

In recent years, routing of MANET has been inspirational for developing new communications and designing mathematical model for the ad hoc networks. Routing protocol with energy consumption improvement under mobility models in hybrid ad hoc networks have been proposed by Abdusy Syarif and Riri Fitri Sari (2011). They performed the simulation scenarios with three mobility model with different maximum speed and sources in hybrid network. The result shows that AODV-UI is more stable when it is used in random way point mobility model in any speed and number of sources. But the random way point mobility model is not suitable for analyzing fading and shadowing in the NLOS environment. Comparative study of radio propagation and mobility models in Vehicular Ad hoc Network has been proposed which gives sufficient information to choose the mathematical model for the system. Among the various radio propagation models, Nakagami is the best suited one because of its closer representation of the wireless communication channel. They proposed Bidirectional coupled simulation approach of mobility model which will help to form realistic scenario in VANET (Kapang Lego and Pranav Kumar Singh 2011). The statistical performances of the Nakagami fading channel in wireless communication emphasize on the importance of Nakagami fading model than the other fading model available (Li Tang and Zhu Hongbo 2003).

An outage analysis of wireless systems which operates in gamma-shadowed Nakagami-faded environments shows that the desired signal also suffers from co-channel interference (Alex Stephenne , Amine Laourine , Imene Trigui and Sofiene Affes 2009). The interfering signals are also subject to fading and shadowing. Thus the combined fading, shadowing and co-channel interference are analyzed in this work which concludes that probability of outage is predominantly affected by the fading parameters of the desired user, rather than by the fading parameters of the interferers. Mathematical modeling of fundamental properties of wireless ad-hoc networks is contributed. (R.Hekmat and P.Van Mieghem Stephen Mueller 2003). The results are useful in the study of connectivity and estimation of capacity in ad-hoc networks. They have suggested using Log-normal shadowing radio model rather than the path loss model to find the link probability between nodes in wireless ad-hoc networks. An on-demand, multipath distance vector protocol for mobile ad hoc networks have been developed (Mahesh K. Marina and Samir R. Das 2004).

Dipak Ghosal, Rose P. Tsang and Stephen Mueller (2003) contributed to mathematical modeling of fundamental properties of wireless ad-hoc networks. The results are useful in the study of connectivity and estimation of capacity in ad-hoc networks. They have suggested using Log-normal shadowing radio model rather than the path-loss model to find the link probability between nodes in wireless ad-hoc networks. Mahesh K.Marina and Samir R.Das(2004) developed an on-demand, multipath distance vector protocol for mobile ad hoc networks. The integration of both multipath and multicast routing have not been designed in the past for analyzing signal characteristics such as co-channel interference, diffraction and signal to noise ratio under the consideration of fading and shadowing. But the effect of fading and shadowing considerably decrease the system performance. Thus the fading and shadowing analysis in the ad-hoc network should be carried out which will enhance various parameters.

2.4 OPTIMAL PATH SELECTION:

The Link Redundancy based connected topology algorithm designed for a wireless network can have a significant impact on the connectivity, fault tolerance

and longevity of a network, Dan Jurca (April 2007). The optimised topology control algorithms including a Relative Neighbourhood Graph (RNG) and a Minimum Spanning Tree (MST) reduce the links in a network topology, while keeping a topology connected. Link redundancy may be critical to cope with faults such as node failures and link disruptions. In this work, tolerance of a number of topology control algorithms is a mechanism which can be used in the case of node failures, where extra link redundancy may be crucial to provide a connected topology. The aim of this algorithm, Link Redundancy (LR), is to add extra link/s to a power optimized topology in order to enhance its fault tolerance. The links are added on the basis of their 'redundancy' value, which is calculated in a distributed manner by examining the one hop connectivity of a probable redundant link and comparing it with the 1*st* and 2*nd* hop connectivity of a node executing the LR algorithm, allowing a node to evaluate a redundancy parameter for each link.

The Location-Aided Routing Algorithm makes use of physical location information of destination node to reduce the search space for route discovery only, and not for data delivery. It does not cover route maintenance in case of broken links (Kun Wang, Meng Wu, Weifeng Lu, Pengrui Xia, Subin Shen 2008). The Associativity-Based Routing Algorithm selects the route, based on node's associativity states. Therein, the search space used to determine the route to the destination node is equal to the entire network space and due to broadcast, the amount of routing related traffic increases, thereby consuming large portion of bandwidth

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2.5 SYNCHRONIZATION:

ShaHua, YangGuo, HangLio and Shivendra S.Panvar (2011) used Scalable video multicast in Hybrid 3G/Ad-Hoc networks. They proposed novel scalable video broadcast/multicast solution for hybrid 3G network. In this work video is encoded into one base layer and multiple enhancement layers using scalable video coding. Different layers are broadcast at different ways to cover viewers at different ranges. A packet to a client is first sent by the base station to its proxy node through a 3G channel. Proxy node then forwards the packet to the client through an ad-hoc network composed of other mobile clients.

For this work the distributed relay routing protocol is designed to locate the helping devices. They formulate the resource allocation problem for scalable video multicast in hybrid network whose optimal solution can be resolved by a dynamic programming algorithm. Efficient helper discovery and video forwarding schemes are to be designed for practical layered video/content dissemination through ad-hoc networks. From this a scalable video multipath multicast transmission has to be developed. This has the advantages of improvement in the video quality. Chengli Li, Hong kai Xiong (2010) used Distributed Robust Optimization for Scalable Video Multi-Rate Multicast over Wireless networks.They proposed a distributed robust optimization scheme to jointly optimize overall video quality and traffic performance for scalable video multi-rate multicast over practical wireless networks. In order to guarantee layered utility maximization, the initial nominal joint source and network optimization is defined, where each scalable layer is tailored in an incremental order and finds jointly optimal multicast paths and associated rates with network coding.

In order to enhance the robustness of the convex optimization formulation with nonlinear constraints, partial bandwidth is reserved for back up paths disjoint from the primal paths. It considers the path overlapping allocation of backup paths for different receivers to take advantage of network coding, and takes into account the robust multi-path rate control and bandwidth reservation problem for scalable video multicast streaming when possible link failures of primary paths exist. Specifically, an uncertainty set of the wireless medium capacity is introduced to represent the uncertain and time-varying property of parameters related to the wireless channel. The targeted uncertainty in the robust optimization problem is studied in a form of protection functions with nonlinear constraints, to analyze the trade-off between robustness and distributedness. Using the dual decomposition and primal-dual update approach, a fully decentralized algorithm has to be developed with regard to communication overhead.

2.6 SUMMARY:

The above literature review has presented an overview of the present techniques for addressing multipath multicast information in an ad hoc network.

We have discussed various routing techniques and theirs shortcomings. Each approach is mentioned along with its shortcomings and possible solutions to overcome those..so that finally the need for efficient routing algorithms has been justified.

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