ISSN (Print) : 2319-5940
ISSN (Online) : 2278-1021

International Journal of Advanced Research in Computer and Communication Engineering
Vol. 2, Issue 3, March 2013

Rate Distortion Based Path Selection for Video Streaming Over Wireless Adhoc Network

M. Saranya [1], S. Karpagam[2], N. Annitha[3]

PG Scholar, Dept of ECE, Bannari Amman Institute of Technology, Sathyamangalam, India[1]

PG Scholar, Bannari Amman Institute of Technology, Sathyamangalam, Tamilnadu, India[2]

PG Scholar, Bannari Amman Institute of Technology, Sathyamangalam, Tamilnadu, India[3]

Abstract: A Mobile Ad-Hoc Network (MANET) is a self-configuring infrastructureless network of mobile devices connected by wireless. Most of the existing ad-hoc routing algorithms select the shortest path using various resources. However the selected path may not be the best path for video applications. The problems with existing methods are frequent route change with respect to change in topology, congestion as result of traffic and battery limitations since it's an infrastructure less network. The set of rules were evaluated with proactive and reactive protocols namely DSDV, AODV and DSR in the NS-2 simulation environment based on metrics such as total energy consumed, throughput, packet delivery ratio and average end-to-end delay.

To overcome this problem, a rate-distortion based (RD) path selection algorithm is developed for video streaming over wireless networks. The algorithm selects a path with the minimum expected rate distortion as a routing path. RD routing algorithm can improve the quality of video streaming significantly as compared to the conventional shortest-path routing algorithm

Keywords: Mobile Ad Hoc Network, DSDV, AODV, DSR, Rate Distortion based path selection algorithm

I.INTRODUCTION

Wireless networks are the networks that use radio frequency channels as their physical medium for communication. It operates on a special band of radio frequencies around 2.4 GHz that have been reserved in most parts of the world for unlicensed point to point spread spectrum radio devices. Each node in the network broadcasts information which can be received by all the nodes within its direct transmission range. Nodes that transmit and receive over the air, need to be physically connected to any network, such networks offer data connectivity along with user mobility.

Multipath routing is advantageous over a single path routing for video transmission. If we assume that only two layers are streamed to the destination (one base layer plus an enhancement layer) and two disjoint paths are used for streaming these two layers, one need to make sure that the base layer takes the path that has the smaller packet drop probability i.e. the path with the minimum rate distortion. However, generating more than two descriptors may only result in marginal improvement in the video quality over using two descriptors. Hence, we primarily focus our discussion on computing the distortion in the node-disjoint paths available.

II.EXISTING SYSTEM

A rate-distortion based (RD) path selection for video streaming over wireless networks uses the video distortion on application layer as path metric [1]. The research community has even proposed many ways to improve performance of TCP in MANETs. Among them ADTCP [4] uses an end-to-end approach which is easy to implement and deploy since it requires minimal changes at the sender and receiver, provides the flexibility for backward compatibility, maintains end-to-end TCP semantics and is TCP-friendly.
In video communications for the successful reconstruction of received video, the path used for the video session should 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.A novel schema for multipath video transport over wireless ad hoc networks' main idea is based on transferring video through two disjoint paths using AOMDV. In each of these paths we use video proxy [6] nodes as video caches. The duty of these nodes is

ISSN (Print) : 2319-5940
ISSN (Online) : 2278-1021

International Journal of Advanced Research in Computer and Communication Engineering
Vol. 2, Issue 3, March 2013

to receiving and recognizing video streams, buffering of favourite streams and if possible managing errors locally.

III.DISTORTION ESTIMATE

The two major points in the proposed work is:
1. It proposes a new metric, *rate-distortion*, instead of conventional network performance metrics (i.e. hop-count, loss probability, and delay) for video routing.
2. The rate distortion is estimated by using the network prediction models, and not the network measurements.

In this model, packet loss is generated by two reasons: channel error and queuing loss. There are three steps to estimate the video distortion introduced by a node:
1. Packet error probability in the MAC layer is estimated
2. Packet loss probability due to congestion is estimated
3. Rate distortion model is used to calculate the rate-distortion of a node

IV. MULTIPATH ROUTING

Multipath routing enables multiple alternative paths through a network, which can yield a variety of benefits such as fault tolerance, increased bandwidth, improved delay, increased throughput or improved security. The ability of creating multiple routes from the source to a destination is used to provide backup route.

V. SIMULATION SCENARIO

The proposed method addresses the congestion issues considering delay and packet loss. In order to evaluate the performance of multipath video transmission and to compare it with single path video transmission, the below parameters are configured in the network simulator:

TABLE I
PARAMETERS CONFIGURED IN THE SIMULATION

PARAMETERS	RESULT
Input	.dat file
Packet Size	100-3000 bytes (variable)
Data Rate	Variable Bit Rate
No. of Nodes	100
Protocol Used	RDAODV
Dimension	1000*1000
Channel Type	Wireless channel IEEE 802.11
Queue Type	Drop Tail/PriQueue
Antenna	Omni Antenna
Protocol	TCP
Mobility	10 m/s
Transmission Range	150m

In this proposed method the video is transmitted in multipath from a source to a receiver. The initial positions of the nodes are visible in the below Fig. 6.

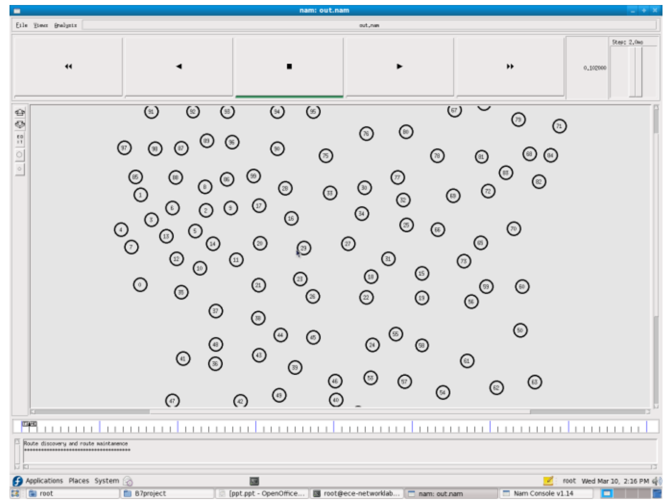

Fig .1 Initial positions of nodes

In fig.2 the sender senses two paths for transmission using the modified routing protocol. The multiple paths are indicated by various colors. The paths are SRC-P1-P2-P6-P3-P4-P5-P8-DST AND SRC-P7-P8-P9-P12-P10-P13-P14-DST.

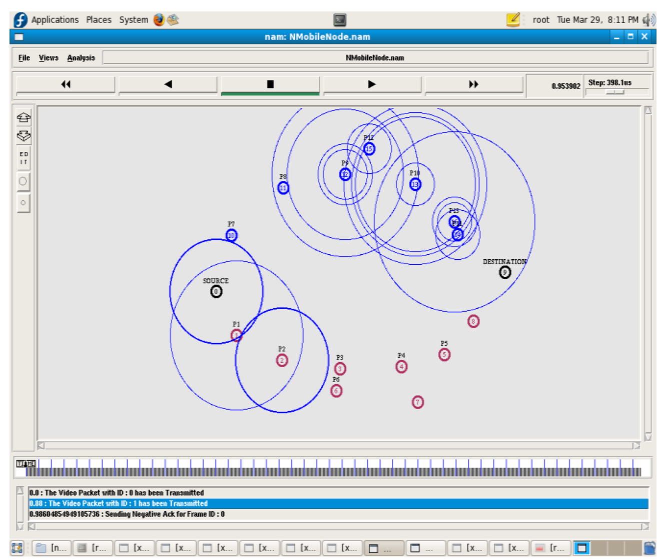

Fig.2 Range detection for the transfer of packets

Each node detects its range of transmission, to check the presence of nodes in the path for transmission.

Path 1: SRC-P7-P8-P9-P12-P10-P13-P14-DST

Path 2: SRC-P1-P2-P6-P3-P4-P5-P8-DST

ISSN (Print) : 2319-5940
ISSN (Online) : 2278-1021

International Journal of Advanced Research in Computer and Communication Engineering
Vol. 2, Issue 3, March 2013

VI.PERFORMANCE EVALUATION

Delay

Delay is defined as the average time taken by the packet to reach the server node from the client node.

$$\text{Delay} = \frac{Total\_packets\_sent}{simulation\_time}$$

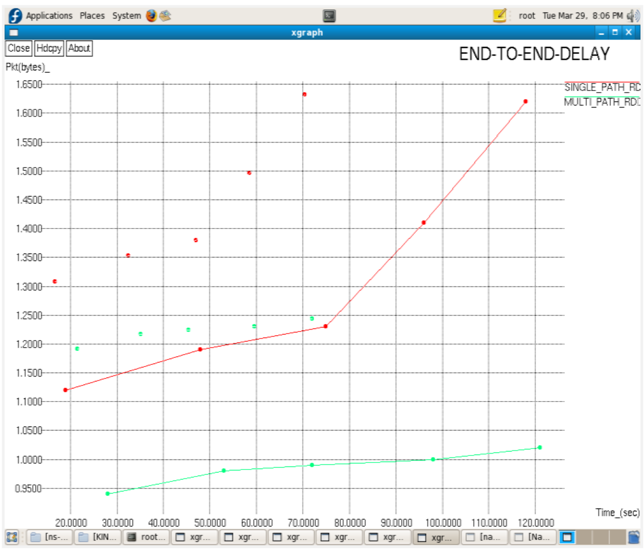

Fig.3 Packet Vs Time (end-to-end delay)

TABLE .II
Time Vs End-to-End Delay

END-TO-END DELAY (sec)		
TIME (sec)	**SINGLE PATH**	**MULTIPATH**
20	1.12	0.94
50	1.19	0.98
70	1.23	0.99
95	1.41	1.00
120	1.62	1.02

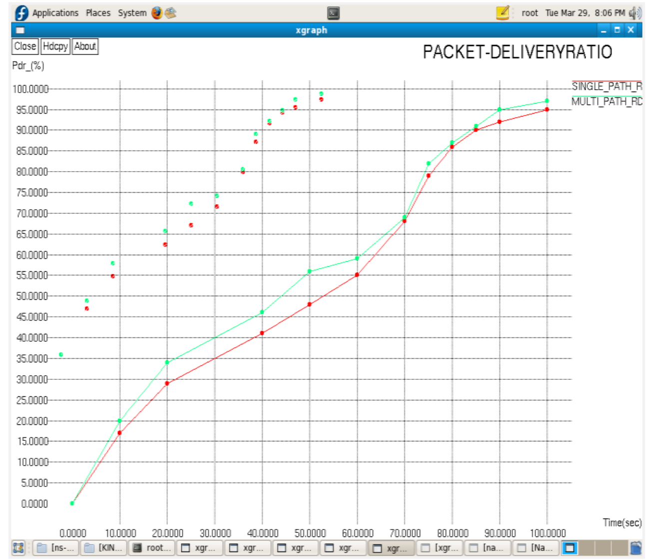

Fig .4 PDR (%) Vs Time

TABLE .III

Time Vs Packet Delivery Ratio

PACKET DELIVERY RATIO (%)		
TIME (sec)	**SINGLE PATH**	**MULTIPATH**
0	0	0
10	17	20
20	29	34
40	41	46
50	48	56
60	55	59
70	68	69
75	79	82
80	86	87
85	90	91
90	92	95
100	95	97

The graph compares the end-to-end delay for both single path transmission and multipath transmission. It is observed that, the end-to-end delay is reduced when transmitted in multipath rather than single path

Packet delivery ratio

Packet Delivery Ratio is defined as the average of the ratio of the number of packets received by the receiver over the number of packets sent by the source.

$$\text{Delivery Ratio} = \frac{Total\_packets\_receeived}{Total\_packets\_sent}$$

Fig.4 depicts the packet delivery ration (%) Vs time graph. The graph compares the packet delivery ratio (pdr) for both single path transmission and multipath transmission. It is observed that, the packet delivery ratio is improved when transmitted via multipath rather than single path.

Dropped packets

Dropped packet is the number of packets dropped due to the effect of link breaks. The dropped packets may be a control packets or data packets

ISSN (Print) : 2319-5940
ISSN (Online) : 2278-1021

International Journal of Advanced Research in Computer and Communication Engineering
Vol. 2, Issue 3, March 2013

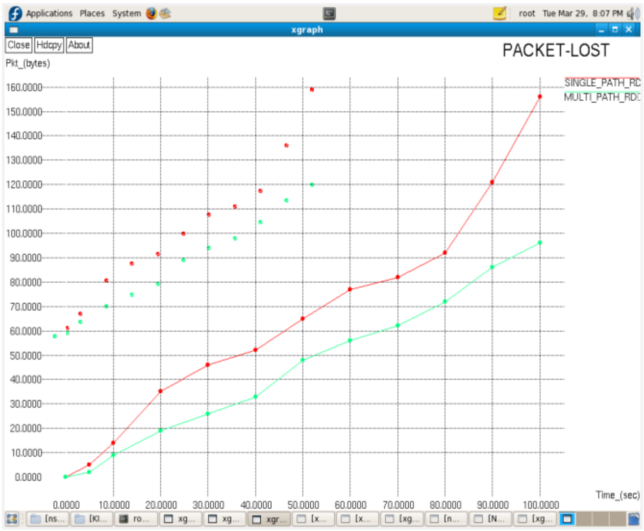

Fig.5 Packets lost Vs Time

TABLE .IV
Time Vs no. of Packets Lost

PACKETS LOST (bytes)		
TIME (sec)	**SINGLE PATH**	**MULTIPATH**
10	14	9
30	46	26
50	65	48
70	82	62
90	121	86
100	156	96

Fig.5 depicts the packets lost Vs time graph. The graph compares the no. of packets lost in both single path transmission and multipath transmission. It is observed that, the no. of packets lost is reduced multipath transmission than in single path transmission.

VI.CONCLUSION

In this project, the problem of congestion in the transmission of video over wireless ad-hoc networks has been analyzed. The proposed rate-distortion based routing algorithm provides the best path for video transmission over wireless ad-hoc networks.The new simulated path selection technique proves that it is much better that the existing technique and by adopting the modified AODV protocol, the QoS parameters, such as delay and packet delivery ratio has been significantly improved. Multipath transmission is required for efficient transmission of video over wireless ad-hoc networks. The delay for the proposed method is reduced to 3% and the packet delivery ratio is increased by 0.5% by varying the number of paths for transmission. Therefore the overall transmission efficiency is improved when compared to that of the existing case.

REFERENCES

[1] Xinggong Zhang, Yan Pang, Zongming Guo, Institute of Computer Science & Technology Peking University, "Rate-Distortion Based Path Selection For Video Streaming Over Wireless Ad-Hoc Networks", IEEE International Conference, 2009

[2] O.S Badarnes, M Kadoch, A.A Elhakeem, "Video Multicast based Multiple Description Coding and Multi-paths in Wireless Ad-hoc Netwroks", Canadian Conference, 2009

[3] O Alay, T Karakis, S Yao Wang Panwar, Institute of NYU, Brooklyn, "An Experimental Study of Packet Loss and Forward Error Correction in Video Multicast over IEEE 802.11b Network", Consumer Communications and Networking Conference, CCNC, 2009

[4] Gajjar S. Gupta, H.M. Dept. of Electrical Engg. Nirma University, Ahmadabad, "Improving performance of adhoc TCP in Mobile Adhoc Networks", India Conference, INDICON 2008. Annual IEEE, 2008

[5] Pejman Panahi, Haamed Khataiee Maragheh, Masound Abdolzadeh, Mirali Sharifi, "A Novel Schema for Multipath Video Transferring Over Ad Hoc Networks", Second International Conference on Mobile Ubiquitous Computing, Systems, Services and Technologies, UBICOMM '08, 2008

[6] Ramin Khalili, Member, Jim Kurose, "A Distributed Minimum-Distortion Routing Algorithm with In-Network Data Processing", 27th Conference on Computer Communications, INFOCOM, 2008

[7] Parvathinathan Venkitasubramaniam, Lang Tong, Cornell University, Ithaca, "A Rate-Distortion Approach to Anonymous Networking", 45th Annual Allerton Conference, 2007

[8] Sudheendra Murthy, Prasad Hegde, Viswesh Parameswaran, Baoxin Li, Arunabha Sen, Arizona State University, "Improved Path Selection Algorithms For Multipath Video Streaming In Wireless Ad-Hoc Networks", Military Communications Conference, MILCOM, 2007

BIOGRAPHY

SARANYA M is a PG scholar doing her M.E communication systems in Bannari Amman Institute of Technology and she received B.E degree in Electronics and Communication Engineering from Anna University, Coimbatore. Her area of interest includes mobile adhoc networks, mobile computing and wireless sensor networks.

KARPAGAM S is a PG scholar doing her M.E communication systems in Bannari Amman Institute of Technology and she received B.E degree in Electronics and Communication Engineering from Anna University, Chennai. Her area of interest includes wireless adhoc networks, high speed networks and mobile communication.

ANNITHA N is a PG scholar doing her M.E communication systems in Bannari Amman Institute of Technology and she received B.E degree in Electronics and Communication Engineering from Anna University, Chennai. Her area of interest includes wireless adhoc networks, computer networks and wireless communication.