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A Mathematical Model for Quality Video Packet Streaming with Minimum Jitter Rate

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Abstract

Most video parcel transmission rate assurance and pad headway counts are made for wired frameworks and can perform insufficiently over remote frameworks. Remote MAC layer direct, for instance, rate change, retransmissions, and medium sharing, can inside and out degenerate the ampleness of current spouting computations. This paper demonstrates the Buffer and Rate Optimization for Streaming count to upgrade spouting execution. An exchange speed estimation gadget arranged especially for remote frameworks and models the association between pad measure, spouting data rate, and available transmission limit scattering. It enhances the spouting data rate and beginning pad measure, realizing a high data rate yet with few edge disasters and support undercurrent events, while up 'til now keeping a little initial bolster delay. It is executed in the Emulated Streaming client server system and surveyed by remote demonstrating ground with various remote conditions. The evaluation demonstrates that BROS can effectively improve the streaming rate and early on support gauge in perspective of remote framework information exchange limit conditions, in this way achieving favored execution over static rate or pad decision and jitter clearing underpins.

Keywords:[video streaming, parabolic fit time delay, interpolation method, jitter rate.]

1. INTRODUCTION

Video streaming is an asking for application in the remote framework by impacting the video quality through the concede consider. While video streaming incorporates a constant flow of information and convey of groups by a dead time, remote radio frameworks have issues to offer such an organization reliably. The inconvenience is troublesome due to wrangle from other framework center points, and also sporadic check from outside radio sources, for instance, remote phones. Along these lines, remote framework requires a quality video transmission. Show day media transmission frameworks takes their definition has the ability to manage the way of different applications with different Quality of Service (QoS) parameters. Nature of Service (QoS) parameters is viewed as and separated in light of the direct of video quality. Package with the video diagrams does not keep up the amazing rate deliverance.[1] The loss of astounding video stream trading from sender to recipient end with variable piece rate due to the concede ascertain happened higher extent. The extent of video data packs moved in the put off time, where the more error occurred in the remote framework. The higher slip-up rate on end to end video package trade prompts the higher bundle missing probability on remote framework action.

The essential focus of the video stream is to assess video nature of organizations with jitter (i.e., delay) parameter estimation on the remote framework level. A framework named Inner State Packet Time based Classification (ISPTC) is proposed in this segment. At in the first place, illustrative fit time defer expansion strategy is exhibited for development inclination compensation, surmised remote framework video streaming. The bury landing bundle time between the midway centers is enrolled in this part. Additionally, Margin Infused Relaxed Classification Algorithm is made in ISPTC method to bunch the outer state packages (i.e., burst in) from the inner ones to upgrade the Quality of organizations.[2]The mixed up minor packages in the remote framework are discarded to upgrade the swapping scale. Finally, Correlation based Reliable Video Data divide approach is finished. In this part, ISPTC strategy fulfills trustworthy transport of video packs from sender to authority end with insignificant jitter rate. Investigation is driven on the execution estimations, for instance, mean package drop extent level, jitter rate estimation and general video move execution level in remote system.

2. VIDEO STREAMING

The extending thought of intelligent media applications asks for the escort requirement for enhancing the transmission of telecom framework information exchange limit. In particular cases, the nature of video stream relies on upon application sort. For instance, in the video stream of significantly component exercises like amusements and motion pictures, it is basic to manage a high video

quality, while for unassumingly predictable exercises, for instance, news revive and videoconference the inflection would be more on the substance. Current media transmission frameworks need to give quality video transmission of different applications with moving QoS levels.[3-6]The necessities on QoS are as an essential dependent on framework and application layer parameters. At the application level, QoS rely on upon quality viewpoints, for instance, bit rate, diagram speed, sorts of video-and sound codecs, et cetera. Nevertheless, turns, for instance, delay, jitter, divide, et cetera for the most part rises at the framework level.

The standard purpose of video streaming is to demonstrate a structure to beneficially transmit stunning video over the remote framework when managing dark and component, for instance, transmission limit delay, jitter segment and Loss rate. The transmission limit gave between two concentrations in the remote framework is ordinarily unidentified and time-advancing. If the sender impart snappier than the available information exchange limit then blockage happens, packs are missing, and there is an authentic impact to video quality.

2.1. Real-Time Video Traffic

Video applications generally use customer datagram tradition at the vehicle layer, and persistent applications likewise use traditions, for instance, RTP and RTCP for spouting organizations. Thusly, the result from late work don't bolster direct while looking at video spouting execution. Video movement examination is the most comprehensively asked about range over remote LANs and over the Internet. These explores concentrate on the execution of video spouting applications that can manage a broad assortment of beginning delay in light of buffering, jitter and setbacks. Regardless, there are no aggregate reports that component the execution of keen video development over remote affiliations. Video spouting in remote frameworks faces from jitter hardships and delays at the remote association, the get to interface, and also the ISP sort out.[7,8] Generally, a high thought is paid on to deal with the execution of video movement, jitter segment and stops up at the remote and get to joins. The consistent assention among customers is that high piece rate video quality defies issues in remote frameworks. Assorted perspectives provide for the wreck in video quality, for instance, remote setbacks, stop up, poor principal affiliation quality, lining, considerable delays and nerves. All things considered, these perspectives are most basic to see what traits impact the video quality, and to what keep running, to create lively video spouting strategies.

2.2. Video Quality Focussed Recent Models

Giving bewildering video over remote convenient frameworks is a trying issue, due to the fanciful and time fluctuating nature of a remote channel. The media development prompts the low deliverance of the bundles to the beneficiary end. While video streaming requires a continuing stream of information (i.e., data, sound, video, pictures) and movement of groups however remote radio frameworks encounter issues to give such an organization constantly. Martin Ellis., et al., (2014) Two-level Markov show in User Datagram Protocol (UDP)/Internet Programming (IP)- based persistent video applications was bankrupt down the package mishap in perspective of the private framework takes after. Two level models with longer term, changes the framework direct through the outside states of the Morkov fasten provoking the time delay on trading the data bundles.[9] Natalia M. Markovich., (2013) Dealing with nature of video package transport on conveyed fast frameworks, using Buffer less fluid line as fundamental Tele movement demonstrate. Pad appear on the vehicle channel diminish the incident rate yet crash occurs with a high package missing probability.[10] The missed package assembles the time ascertain (i.e., delay) while playing out the looking method.

The pervasiveness of the video applications in the remote compact framework predicts the higher development advancement on transmitting the video packages. Video movement examination is gotten out the present works through different arrangements. Regardless, there are no aggregate surveys to arrange the canny video action states over private framework affiliations

Keeping at the top of the priority list the ultimate objective to convey the issues related to pile up, stop up rate, and jitter consider stood up to existing models, video stream concentrate on Inner State Packet Time based Classification (ISPTC) in the remote framework to diminish the jitter figure when the line length augmentations and besides to reduce the missing probability rate of packages. The standard responsibility of video stream, isTo repay the activity inclination, an interpolation method is incorporated into ISPTC in light of the parabolic fit time. [11-13]To arrange the external state bundles from the inward ones, Margin Infused Relaxed Classification Algorithm is created with ISPTC technique.To dispose of the interlopers and enhance the information move rate in remote medium, mistaken edges are identified.To viably exchange the video of any length from the source to goal by diminishing the parcel holding up line length.To limit the jitter calculate by solid transport of video parcels utilizing Correlation based Reliable Video Data bundle Transportation approach.

2.3. Inner State Packet Time Based Classification of Video Streams In Wireless Network

Video stream measures the jitter calculate on Video Frame exchange over the remote

system is a key concern. The variable piece rate based video outline exchanged is accomplished on the beneficiary end utilizing the Inner State Packet Time based Classification system. The fundamental procedure connected in the ISPTC measured the jitter calculate utilizing the entry time of the video outline bundles from the one end to another. The activity happens in the remote system when the clock synchronization is not appropriately completed. Nature of administration is kept up in the remote system through the jitter figure metric measure. Video transmission on factor VBR from source to the goal end is obviously spoken to in Figure 4.1.

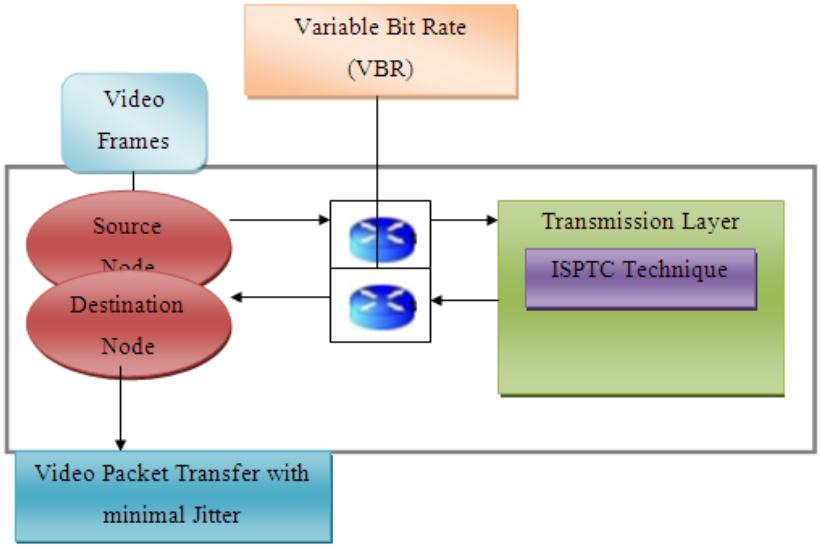

Figure 2.1 Video transmission with VBR in Wireless Network

Figure 2.1 Video transmission with VBR in Wireless Network

QoS observing assumes a fundamental part in ISPTC Technique for planning, introducing and keeping up video parcel exchange administrations. ISPTC Technique contains all the imperative parameters that required in the setup of a QoS estimation from the source end hub to the goal end.[14] The remote channel based video outline parcel exchanging occur to anticipate the top notch administrations with variable piece rates. An adaptable QoS evaluation structure is created in ISPTC for video broadcasting from the sender to collector end with remote channel. The remote channel covers the entire framework dependability by sending the bundle from the source to the goal end with the negligible jitter rate.

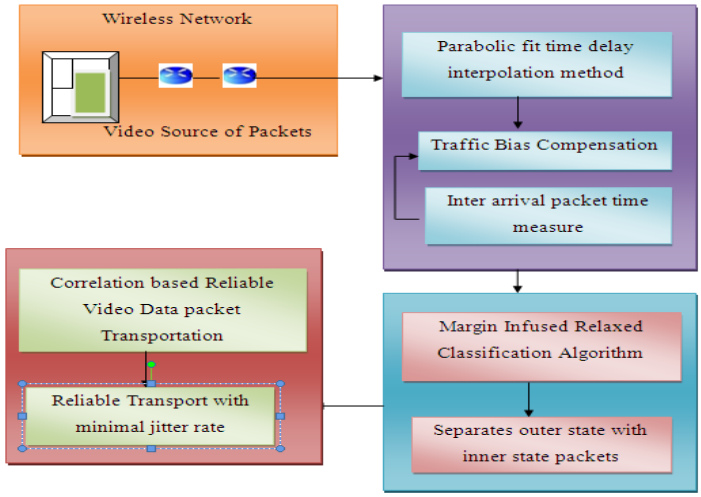

Figure 2.2 Overall Structural Diagram of ISPTC technique

A proposed show chooses the way of video streams move in remote framework using the ISPTC method as depicted in Figure 4.2. The remote framework contains the couple of center points with different transmission capacity. At to begin with, the time delay is enrolled in perspective of the arrival rate of the video plot bundles. The section rate is measured using the illustrative fit time concede expansion strategy. The action inclination pay is finished and after that the Margin Infused Relaxed Classification Algorithm is executed. The Infused Relaxed computation is planned to take in the course of action of parameters to deal with and perform portrayal.[15] The arrangement structure ousts the undesirable space bundles from the inside space in remote framework.

Edge Infused Relaxed Classification Algorithm in ISPTC framework ousts the space for diminishing the delay time. ISPTC strategy can sufficiently trade the video of any length from the source to objective. ISPTC strategy third bit of the work is to play out the transmission using Correlation based Reliable Video Data distribute approach. Association based Reliable Video Data distribute out the intense connection between the transitional centers of the video diagram package trade.

3. PARABOLIC FIT TIME DELAY INTERPOLATION METHOD

ISPTC strategy embraces the interpolation method with parabolic fit rate to assess the time delay on the video outline bundle exchange. The interpolation method plays out a parabolic fitting with pinnacle values in the shape, for example,

$$\textbf{Video exchange rate (S to D)} = \sum_{i=1}^{n} [(T_{ri} \times d_i)] \quad \textbf{... (1)}$$

i - Intermediate hubs

T_ri - Transfer rate of middle of the road hub i

d_i - Data measure on middle hub i

The source hub "S" with video outline parcel exchange to the goal "D" conveys the many middle of the road hubs i. The transitional hub i exchange rate is measure in light of the time figure. The time consider shifts for every hub exchange because of the variable piece rate of bundles. [16]The restriction of the most extreme coefficient by remunerating the movement in remote system and it is formularized as,

Most extreme Coefficient Rate = (Packet Receivable)/(Packet Send) × 100 ... (2)

The most extreme coefficient rate utilizing parcel receivable separated by bundles send to complete one transmission amongst source and goal. The time delay estimation is performed through the interpolation method in the ISPTC procedure. The parabolic fit based interpolation coefficients measure serves to effortlessly distinguish the delay happened position in remote system.

ISPTC strategy utilizes the parabolic fit structure for measuring the time delay. The Figure 4.3 serves to effortlessly repay the activity predisposition by recognizing the entry rate. The landing time rate of the parcels is recognized in area 4.3.2. The learning through the interpolation method repays the movement event in the remote system while exchanging the video outline parcel exchange.

3.1. INTER ARRIVAL PACKET TIME MEASURE

At the underlying phase of the jitter estimation in ISPTC procedure, the parcel landing time is measured. The entry rate is measured as,

Entry Time Rate(ATM)= R_(T(i))- S_(T(i)) ... (3)

The recipient time "R_T" of the "i" hub is subtracted from the sender hub time S_(T(i)) to distinguish the entry rate. For repaying the movement rate, ISPTC procedure measure the landing rate with the distinctive between the sender and recipient hubs.The calculation work is done for all the in the middle of hubs utilizing a similar methodology in ISPTC procedure on remote system.

3.2. CORRELATION BASED RELIABLE PACKET TRANSPORTATION

The guideline focus of the ISPTC strategy is diminishing the jitter figure while transmitting the video plot distribute the vehicle layer. The remote framework achieves the high bore of Service (QoS) by giving the tried and true alliance (i.e., relationship) between the centers. ISPTC strategy prompts avoid missing probability of packs and farthest point the jitter rate.

The jitter rate measured by using the bury passage distribute which are pondered. The error rate is constrained by clearing the outside states infringed in the remote framework. The association based steadfastness is used as a piece of ISPTC method to work with the total information gave by the source center point to playing out the jitter measure. The connections accumulate every one of the information and play out the adequate cycles to measure the steadfastness. The constancy rate measure is formularized as,

Unwavering quality R(δ(t))= ⟦Source⟧_nt^n+⟦Source⟧_(n+1) t^(n-1)+⟦Source⟧_(n+2) t^(n-2)+⋯..+D_n t

… (4)

Eqn (4) utilizes the past processed qualities to recognize the unwavering quality rate on video outline bundle exchange from the source to the goal. Source hub plays out the video stream parcel exchange from "n" area to "n+1" area to achieve the goal end. The measure of the "n" guides helps toward enhance the dependability rate of the bundles.[17]Connection work can distinguish the blunder event hub by utilizing the ATM esteem rate in ISPTC procedure. The expanded length of the video stream and furthermore after the development of the remote system structure, ISPTC procedure functions admirably to quantify the jitter rate. Relationship based dependable parcel transportation in the remote system enhances the Quality of administrations with insignificant jitter rate.

4. EXPERIMENTAL EVALUATION

Interior State Packet Time based Classification (ISPTC) strategy is immediately illuminated in Ns2 test framework. The reenactment is finished over the 1100m x 1100m remote framework field. Ns2 generation takes the 40 centers for the exploratory work. The center points are used on the video transmission from the source to objective with high gauge of Services (QoS). The convenient centers move at the unpredictable speed of 30 m/s and an ordinary break of 0.01s. The video plots (i.e.,) video data groups are diligently transmitted in the remote framework on element bit (i.e., speed) rate.

The framework uses the DSR guiding tradition to play out the trial on the indiscriminately moving housings to the objective side. Discretionary Way Point (RWM) model is decided to simply move the video streams in a discretionarily favored zone. A discretionarily picked territory with an other speed offers a predefined speed. The discretionary development is variable in the midst of the reenactment time casing to gage the jitter rate. The RWM uses standard number of center points for data transmission work with bewildering rate.

ISPTC methodology is considered against the present work Two-level Markov

demonstrate based progressing video applications and Buffer less fluid line as crucial Tele Video Traffic show. Examination is driven on components, for instance, mean bundle drop extent level, jitter rate estimation, and general video move execution level in remote structure.

4.1. RESULT ANALYSIS

Remembering the true objective to better observe the sufficiency of the proposed ISPTC strategy liberal test outcomes are sorted out in table 1. The examination work takes the video housings of different sizes to perceive the feasibility of the proposed work. For instance, the total coding edge is set to 100 and each packaging is send by methods for groups. The bundles transmitted through the remote framework course way and full coding modes are used at the recipient end to ensure visual quality.

Inside packaging groups are more secured using ISPTC method, and outer bundles are discarded. ISPTC technique differentiates the work and other w structures, specifically, Two-level Markov (TM) demonstrate based continuous video applications and Buffer Less Fluid Queue as basic Tele Video Traffic (BLFQ) show in remote framework.[20] The DSR controlling tradition is chosen for executing the ISPTC strategy.

4.2. MEASURE OF MEAN PACKET DROP RATIO LEVEL

The no. of edge parcels does not achieved the recipient end, then proportion level is dropped. The disappointment of the casings landing to the goal end delivers the mistake.

The mean drop of the bundles in the remote portable system is figured as,

Mean Packet Drop Ratio= (No.of Packet Send Count)/(No. of Packet Drop)

For approximating the edge divide extent on transmitting the video packaging of different sizes, the transmission range is thought to be 700m. The information exchange limit with regards to quantify the package drop is moreover thought to be 5 Mbps bit rate video using the setup. The field extend on which the propagation is to be done is taken as 1100m * 1100 m gauge. The center points are self-assertively put and edge packs are sent through the DSR based coordinating tradition. The typical delay time for trading the packages between the transitional centers is thought to be 0.01 seconds. The appraisal result for the above characterized qualities is showed up in Figure 4. This figure doubtlessly connotes the bundle drop extent level for the different measured video streams.[18] The estimation setup through graph is showed up as,

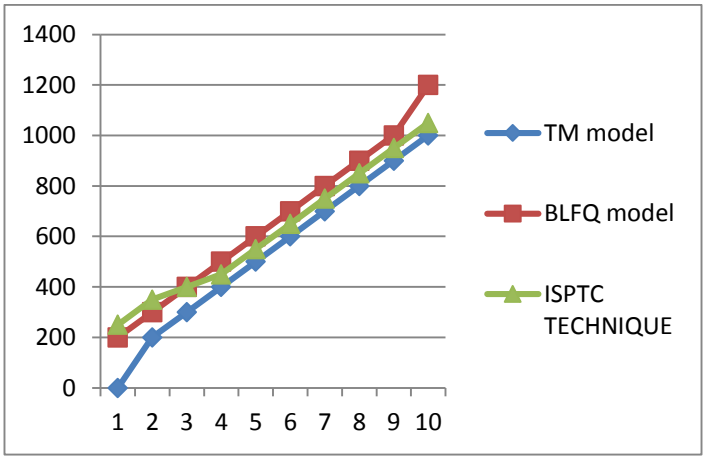

Figure 4.1 Mean Packet Drop Ratio Measure

Figure 4.1 depicts the casing parcel drop proportion level on the distinctive video stream stack. The Video floods of 100 to 7000 Kbps with the interim of 1000 kbps based video streams are taken for the assessment. The diagram focuses are assessed and plotted for the each occasions. The parcel drop proportion is sensible clarified, on the grounds that the hubs in the remote portable system are moved arbitrarily. The development of hubs is asked for the casing parcel sending from the source to goal end, it causes the bundle drop in the remote system.

The bundle dropping proportion is lessened in ISPTC system by playing out the activity remuneration in the remote hub condition. The activity free framework with no interruptions serves to effortlessly enhance the outcome rate of the framework by decreasing the bundle dropping rate. The parcel dropping is decreased to 11-17 % when contrasted and the TM Model by Martin Ellis., et al., (2014), since the use of the movement pay strategy. Then again, the ISPTC method lessens the bundle drop proportion by 3 – 9 % when contrasted and the BLFQ Model by Natalia M. Markovich., (2013). The decrease in the parcel drop level enhances the framework execution rate and covers the entire framework unwavering quality by sending the bundle from the source to the goal.

4.3. MEASUREMENT OF JITTER RATE

Jitter rate increments when the edge bundle sits tight in a line for the more drawn out time. In system, the time between the consummation of the undertaking (i.e., bundle exchanged to goal end) from the begin hub. The line holding up causes when the asked for hubs are not out of gear state to exchange the video outlines.

Jitter Rate=Destination Reach Time-Arrival Time

The holding up time of the packaging groups in the line measures the jitter figure. The jitter variable is measured in perspective of the ricochet check. Ricochet is the transmission of the package in the single path from the source end to the objective. Ricochet check based jitter figure is measured TM Model by Martin Ellis., et al., (2014) and BLFQ Model by Natalia M. Markovich., (2013) and in proposed ISPTC method.[19] Each event, the edge distribute into the line and place the request to the center points for the transmission. The hop takes the course way using the DSR based take after course charges under Ns2 test framework.

The hop check go from 1 to 7 in out exploratory work. The bounce number 1 show the package trade through the pick course route with one transitional device. For instance, the skip count 4 implies the package trade through the four widely appealing devices (i.e.,) center points to accomplish the objective end. The course route with various ricochet implies divide from the source to objective, the jitter (i.e., delay) part is measured. The outcome of the measure is clearly shown in underneath graph. As the picked way length extends, the time taken for the packaging group trading is moreover extended a tiny bit at a time.

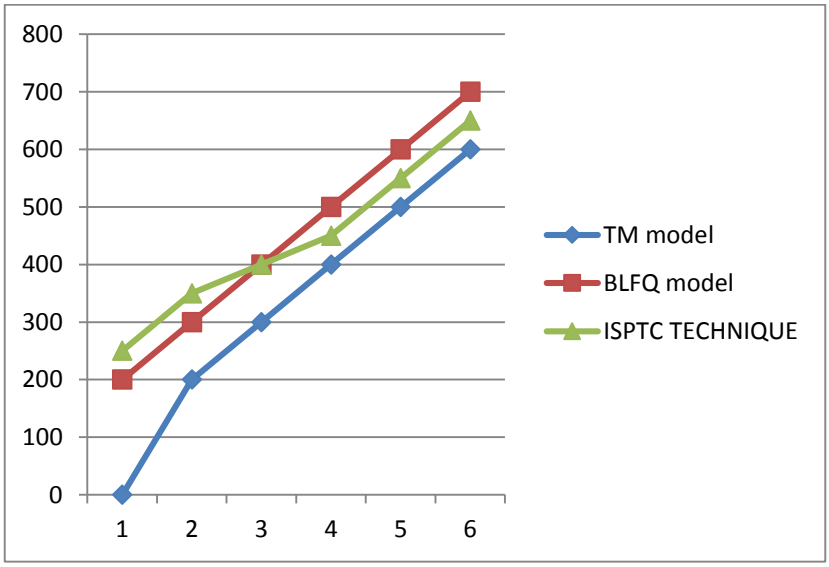

Figure 4.2. Jitter Rate Measure

With the assistance of the expansion based time figure measure, measures the time gone up against transmitting the packages from source to objective end in ISPTC strategy. "D" is means as the widely appealing contraptions (i.e.,) center points taken for the trial work.[19] The remote flexible framework is extensively conveying the higher jitter measure regard, since the center points move indiscriminately. The time consider varies for each center point trade in view of the variable piece rate of edge packages and besides on different bounce checks between the sources to objective

end. With a particular ultimate objective to depict the level of route in which the put off happened is measured using landing time rate (ATM) in ISPTC strategy.

4.4. OVERALL VIDEO TRANSFER EFFICIENCY

The general packages met up to the objective center point with no outer state of groups, improves the general structure video trade capability. The video trade capability uses the internal state distribute to well keep up the quality rate of video. The video trade efficiency using video diagram viably got confined by general video plot trade to complete source to objective deal with.

General Video Transfer Efficiency= (Video outline effectively got)/(Overall Video outline exchange) ×100

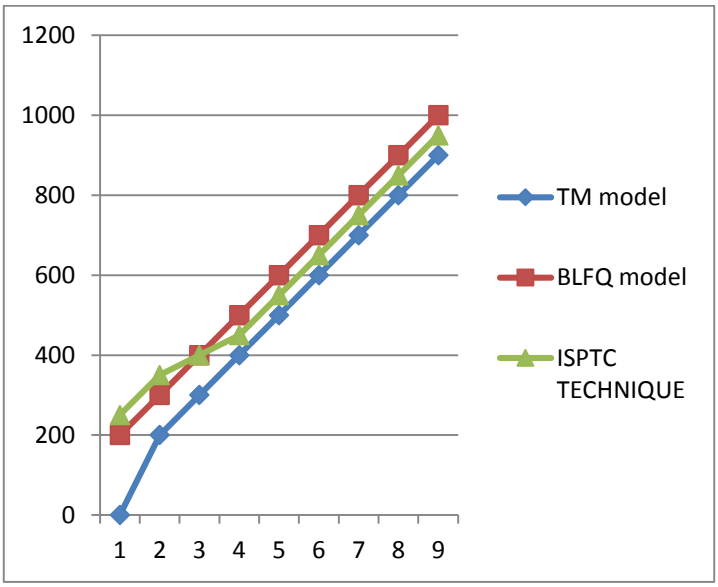

Figure 4.3. Overall Video Transfer Efficiency Measure

Figure 4.3 depicts about the general video exchange proficiency on utilizing the interpolation parabolic fit. Size of various range are taken and assessed. Result demonstrates that the ISPTC system beats the other two works by ordering out the internal and external state hubs in remote system.[20]The internal state ordered in view of edge mixed loose arrangement strategy. For example, on assessing the 50 Kb video streams, ISPTC system accomplishes the 93 % aftereffect of video exchange quality while, TM Model achieves just 79 % and BLFQ Model is just around 88 percent. Additionally, the ISPTC system accomplishes the better condition of craftsmanship results with bigger negligible focuses.

The space guide's evacuation helps toward enhance the framework execution rate. The casing send from the source are altogether assembled at the collector end with higher execution rate. The general execution rate is enhanced by 6-9 % when contrasted and the TM Model by Martin Ellis., et al., (2014) and furthermore enhanced by 7-9 % in ISPTC method when contrasted and the BLFQ Model by Natalia M. Markovich., (2013). The directing in light of the DSR in remote versatile system beats the general execution rate.

At last, Inner State Packet Time based Classification remunerates the movement predisposition and furthermore lessens the jitter consider esteem. The line length holding up time is limited to diminish the delay rate on remote system. The off base edges are distinguished while exchanging the bundle outlines from source to goal.

CONCLUSION

Jitter component is reduced while transmitting the video packages from source to objective end in the flexible remote framework using ISPTC technique. At in any case, Inner State Packet Time based Classification answers extraordinarily well to keep up the quality over the video streams. The properties of remote and end to end associates over the video spouting are masterminded using Margin Infused Relaxed Classification. Finally, Correlation based Reliable Video Data allocate approach is valuable on trustworthy transport of video groups from sender to recipient end. Attempt evaluation is performed on parametric segments, for instance, jitter rate estimation, general video trade remote system execution level, missing probability rate, and mean package drop extent level. The test estimations presented in video stream fill in as a guide on keep up the way of the video packs of different assurance and pad size of the line is furthermore seen in the persistent applications. In addition, Jitter segment is decreased to 11.161% averagely. The tradeoffs between the video groups movements in remote framework ensure that the proposed work basically improves the structure wide video quality with diminished jitter figure.

REFERENCES

[1] Hsien-Po Shiang., and Mihaela van der Schaar., “Informationally Decentralized Video Streaming over Multihop Wireless Networks”, IEEE Transactions on Multimedia, Volume:9, No:6, 2007.

[2] Anandan.K., and Ram Kumar.R., “Energy Efficient Algorithms in WSNs: A Review”, International Journal of Advanced Research in Computer Science and Software Engineering, Volume 4, Issue 9, September 2014.

[3] AviRapaport, Weimin Liu., Liangping Ma., Gregory S. Sternberg.,

ArielaZiera., and AnantharamanBalasubramanian., "Adaptive HARQ and Scheduling for Video over LTE," Asilomar Conference on Signals, Systems and Computers, 2013, Page(s): 1584-1588.

[4] Avinash Kumar Chaurasia., Aditya K. Jagannatham., "Dynamic Parallel TCP for Scalable Video Streaming Over MIMO Wireless Networks," Wireless and Mobile Networking Conference (WMNC), 2013, Page(s): 1-6.

[5] C. Sengul, M. J. Miller, and I. Gupta, "Adaptive probability-based broadcast forwarding in energy-saving sensor networks", ACM Transaction Sensor Network, Vol. 4, pp. 6:1-6, 32, April 2008.

[6] Cheng Huang, Philip A. Chou, Anders Klemets, "Optimal Coding Rate Control for Scalable Streaming Media", In Proceedings of International Packet Video Workshop, Dec 2004.

[7] Cheng-Hsin Hsu, and Mohamed M. Hefeeda, "Broadcasting Video Streams Encoded With Arbitrary Bit Rates in Energy-Constrained Mobile TV Networks," IEEE/ACM TRANSACTIONS ON NETWORKING, VOL. 18, NO. 3, JUNE 2010.

[8] Cheng-HsinHsu., and Mohamed Hefeeda., "Flexible Broadcasting of Scalable Video Streams to Heterogeneous Mobile Devices," IEEE TRANSACTIONS ON MOBILE COMPUTING, VOL. 10, NO. 3, MARCH 2011.

[9] Claudio Greco., Marco Cagnazzo., and B´eatricePesquet-Popescu., "Low-Latency Video Streaming with Congestion Control in Mobile Ad-Hoc Networks," IEEE Transactions on Multimedia, (Volume: 14, Issue: 4), 2012.

[10] D. Bethanabhotla, G. Caire and M. J. Neely, "Adaptive Video Streaming for Wireless Networks with Multiple Users and Helpers", IEEE Transactions on Computers, Networking and Internet Architecture, arXiv: 1304.8083 Apr 2014.

[11] D. Bethanabhotla, G. Caire and M. J. Neely, "Adaptive Video Streaming in MU-MIMO Networks", Networking and Internet Architecture, arXiv: 1401.6467, Jan 2014.

[12] Dapeng Wu., Hou, Y.T., Zhu, Wenwu.,Ya-Qin Zhang., Peha, J.M"Streaming video over the Internet: approaches and directions", IEEE Transactions on Circuits and Systems for Video Technology, Volume: 11, No: 3, 2002.

[13] Eden Ricardo Dosciatti., Walter Godoy Junior., Augusto Foronda., "Capacity Evaluation of a New Scheduler with Call Admission Control to Fixed WiMAX Networks with Delay Bound Guarantee.," International Journal on Advances in Networks and Services, vol 5 no 3 & 4, year 2012

[14] Egilmez, H.E., and Tekalp, A.M., "Distributed QoS Architectures for

Multimedia Streaming Over Software Defined Networks", IEEE Transactions on Multimedia, Volume: 16, No: 6, 2014.

[15] Egilmez, H.E., Civanlar, S., Tekalp, A.M., "An Optimization Framework for QoS-Enabled Adaptive Video Streaming over Open-Flow Networks," IEEE TRANSACTIONS ON MULTIMEDIA, VOL. 15, NO. 3, 2013.

[16] EsaPiri., MikkoUitto., JanneVehkapera., and TiiaSutinen., "Dynamic Cross-layer Adaptation of Scalable Video in Wireless Networking," IEEE Global Telecommunications Conference (GLOBECOM 2010), 2010, Page(s): 1-5.

[17] Gregory J. Conklin., Gary S. Greenbaum., Karl O. Lillevold., Alan F. Lippman., and Yuriy A. Reznik., "Video Coding for Streaming Media Delivery on the Internet" IEEE Transaction on Circuits and Systems for Video Technology, VOL. 11, NO. 3, MARCH 2001.

[18] H.B. Kazemian n, K. Ouazzane., "Neuro-Fuzzy approach to video transmission over ZigBee," Neurocomputing, Elsevier, Vol. 104, March 2013, Pages 127-137.

[19] Hang Shen, GuangweiBai, Lu Zhao, and Zhenmin Tang, "An Adaptive Opportunistic Network Coding Mechanism in Wireless Multimedia Sensor Networks", Hindawi Publishing CorporationInternational Journal of Distributed Sensor NetworksVolume 2012, 13 pages.

[20] HatemAbou-zeid, Hossam S. Hassanein, and Stefan Valentin, "Energy-Efficient Adaptive Video Transmission:Exploiting Rate Predictions in Wireless Networks", IEEE Transactions on Vehicular Technology, Volume 63, Issue 5, Pages 2013-2026, Jun 2014.