Program Guide Book

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Jan. 31 - Feb. 2, 2018

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IEEE SEOUL SECTION

Chiang Mai Rajabhat University

มหาวิทยาลัยราชภัฏเชียงใหม่

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Program Schedule

Time	*Room: Nanta III*	*Room: Nanta IV*	*Room: Mengrai II*
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11:40 am - 12:30 pm	Plenary Talk I *(Tharathong II)* : Mobile Biometrics – Trands and Issues Prof. Jaihie Kim (Yonsei University, Korea)		
12:30 pm - 01:40 pm	Lunch *(River Terrace)*		
01:40 pm - 02:30 pm	Plenary Talk II *(Nanta III & IV)* : Fuzzy Set Theory in Data Analysis Prof. Sansanee Auephanwiriyakul (Chiang Mai University, Thailand)		
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04:20 pm - 05:30 pm	Welcome Reception *(Nanta III & IV)* (including Recruitment Meeting, Young Researchers' Networking)		
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Wednesday, January 31, 13:40 – 14:30

Plenary Talk II

Fuzzy Set Theory in Data Analysis

Prof. Sansanee Auephanwiriyakul (Chiang Mai University, Thailand)

Rooms: Nanta III & Nanta IV

Chair: Seong Oun Hwang (Hongik University, Korea)

Wednesday, January 31, 14:50 – 16:20

Session II-1: Security

Oral

Room: Nanta III

Chair: Wai Kong Lee (Universiti Tunku Abdul Rahman, Malaysia)

Session II-1.1 Energy Efficient Fog-based File Sharing Scheme for Personal Area Networks

Jung-Eun Park and Young-Hoon Park (Sookmyung Women's University, Korea)

As the wearable device emerges and develops, and the consumption of such devices increases, a personal area network (PAN), which is a personal network of wearers, is formed. Devices connected to the PAN generate, store, and communicate important information about the wearer. However, these devices requires appropriate security measures due to the risk of theft, loss or hacking, these devices in order to protect critical information, suggest measures to adopt combinatorial-based file sharing scheme for these problems. However, wearable devices are to be able to efficiently utilize resources because resources are limited, however, existing schemes have efficiency problems. So, we propose algorithms for solving these problems. Then, through the simulations, we prove that the algorithms can solve the problems pointed out.

Session II-1.2 Decorrelation of Wireless Channel Coefficients for Secret Key Generation

Xiaofu Wu, Dongming Dai, Xunjian Yu and Jun Yan (Nanjing University of Posts and Telecommunications, P.R. China)

When Alice and Bob can observe a common wireless radio channel, it is possible to extract secrets between them. As the wireless channel coefficients over time are generally correlated, it is a common challenge to perform decorrelation efficiently for various secret key generation schemes. In the literature, it was reported that the Karhunen-Lo$\grave{\text{e}}$ve (K-L) transform for decorrelation is very sensitive in implementation and often the channel covariance at the side of Alice should be finely transferred to Bob, which is very expensive. In this paper, we provide some insights on the sensitivity of K-L transform, which can be well exploited to develop an improved version of K-L transform for removing this sensitivity. Since the K-L transform is very expensive in complexity, we further propose a linear prediction self-filtering approach at both sides for decorrelation. The theoretical analysis show that its performance is insensitive to the impairment of the wireless channel coefficients observed at different sides, which is further validated by simulations.

Session II-1.3 An Intrusion Detection System Based on N-gram Pattern Analysis for the Wireless IoT Systems

Yoonkyung Jang (University of KyungHee, Korea); Myeongseung Han and Hojin Lee (KyungHee University, Korea); In Tae Ryoo (Kyung Hee University, Korea)

In this paper, we propose an intrusion detection system(IDS) capable of detecting potential normal traffic by improving existing system that detects only abnormal traffic in wireless IoT systems. In order to determine the normal traffic, N-gram model used for speech and language processing was applied by assigning probability to a pattern composed of sequence of IEEE 802.11 wireless LAN. The main purpose of the proposed IDS is to decrease the false positive rate than the existing anomaly detection system. The proposed system determines whether a normal pattern or an anomaly pattern by calculating probability of a pattern using the N-gram Smoothing algorithm. In this paper, we implement and experiment the proposed IDS.

Session II-1.4 SDN-Based DDoS Attacks Security: Popular Detection and Mitigation Techniques

Misenga Joëlle Mumpela and Young-Hoon Park (Sookmyung Women's University, Korea)

Software Defined Network (SDN) is an emerging paradigm that brings the network innovation and attracts both the industry and researchers. By separating the control plane and the forwarding plane, SDN controller become the most attractive target for attackers due to the openness of programmability and complexity of its functionality. One of the most known threat is DDoS attack with the goal to exhausting network resources by sending heavy traffic to them, causing network congestion. Since SDN was proposed, DDoS attack has become a popular research field in SDN security and many researchers have been presented different detection, prevention and mitigation solution of DDoS attack in SDN environment using different techniques. This paper survey the existing popular detection and mitigation techniques that are available to prevent DDoS attacks in SDN environment.

Session II-1.5 A Reliable and Scalable GroupCast Block Acknowledgement Scheme for Video Multicast over IEEE 802.11aa Standard

Muhammad Khalil Afzal (COMSATS Institute of Information Technology, Wah, Pakistan); Rehmat Ullah (Hongik University Sejong Campus, Korea); Byung-Seo Kim (Hongik University, Korea); Sung Won Kim (Yeungnam University, Korea)

Reliable video delivery is one of the most important requirements to satisfy end user needs. With the proliferation of multimedia technologies there is a growing demand for video multicast, particularly in challenging wireless environments. Effective video multicast services need to meet the conflicting goals of assured data rate, scalability and reliability. The most used IEEE standards do not ensure reliable multicast. The 802.11aa remains the only standard that attempts to handle the unreliability issue with multicasting. However, the block acknowledgement scheme of the IEEE 802.11aa standard suffers from scalability issue. This paper proposes a modified block acknowledgment scheme for video multicast. Our scheme considers the impact of the loss of different frames on video quality under Moving Picture Expert Group 4 (MPEG-4) and H.264 video coding. Simulation results indicate that proposed scheme performs well in terms of PSNR.

Session II-2: Control & Intelligence System I

Poster

Room: Nanta IV

Chair: Seon Wook Kim (Korea University, Korea)

Session II-2.1 Performance Optimization of Training Inception-V3 on Multi-GPUs with XLA JIT Compilation

Jeongeun Ha, Kyu Hyun Choi and Minseong Kim (Korea University, Korea); Hongchan Roh (SK Telecom, Korea); Seon Wook Kim (Korea University, Korea)

TensorFlow is an open-source software library for machine learning developed by Google that supports numerical computation using data flow graphs. The software provides an application that trains the Convolutional Neural Network (CNN) image classification model, called as Inception-V3. The training application is a computationally intensive process that takes days or even weeks because it repeats training of huge datasets to improve image classification accuracy. Thus, in general, multi-GPUs platforms are used for reducing the training time. However, TensorFlow/XLA JIT compilation fails to improve the performance due to GPU-to-GPU data dependencies on the platforms. In this paper, we present how to remove the dependence and optimize the performance in detail. As a result, we achieved 1.46x speedup on 4 GPUs and 1.62x speedup on 8 GPUs without any accuracy loss.

Session II-2.2 3D Object Recognition Using Deep Learning for Cognitive Robot

Hyunsik Ahn and Beom-Chang Kim (Tongmyong University, Korea)

In this paper, a methodology of 3D object recognition using Yolo (you only look once) for cognitive robot is proposed. Yolo is using CNN and can detect spatially separated bounding boxes and associated class probabilities with high speed. In a sentential cognitive system, Yolo detects bounding boxes and labels of objects from color image of RGB-D data acquired from a vision module. By applying 3D median filtering and 3D normal vector region growing to the region of bounding boxes, the 3D data of the objects are acquired more conveniently as well as labeling.

Session II-2.3 Detection of GUI Elements on Sketch Images Using Object Detector based on Deep Neural Networks

Young-Sun Yun, Jinman Jung and Seongbae Eun (Hannam University, Korea); Sun So (Kongju National University, Korea); Junyoung Heo (Hansung University, Korea)

Graphical user interface (GUI) is very important to interact with software users. In many studies, therefore, they are trying to convert GUI elements (or widgets) to code or to describe formally its structure by help of domain knowledge or machine learning based algorithms. In this paper, we adopted object detection based on deep neural networks that finds GUI elements by integration of localization and classification. After the successfully detection of GUI components, we will describe the objects as the hierarchical structure and transform those to appropriate codes by synthetic or machine learning algorithms.

Session II-2.4 A Study on Evaluation Index and Standard Surgical Method for Bankart Surgery for Simulator Development

Min Jae Lee (Myungji - Hospital, Korea); Ein-Jeong Hwang (Myongji Hospital, Korea)

We have studied about the surgery of arthroscopic surgery such as bankart and rotator cuff to develop medical simulator for resident education. Because this surgery is difficult and complex, residents who want to be a professional doctor can't do better than using medical simulator During the surgery, there are various method of the surgery so we researched a lot of evaluation index in the medical surgery by referencing professional doctors's surgery. This paper's purpose is to analyzing the process of bankart. So residents can learn feeling and sense about the arthroscopy surgery such as bankart by using this simulator. Before completing the simulator, We classified the process of bankart and sorted evaluation index in this paper

A Reliable and Scalable GroupCast Block Acknowledgement Scheme for Video Multicast over IEEE 802.11aa Standard

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***Abstract*—Reliable video delivery is one of the most important requirements to satisfy end user needs. With the proliferation of multimedia technologies there is a growing demand for video multicast, particularly in challenging wireless environments. Effective video multicast services need to meet the conflicting goals of assured data rate, scalability and reliability. The most used IEEE standards do not ensure reliable multicast. The 802.11aa remains the only standard that attempts to handle the unreliability issue with multicasting. However, the block acknowledgement scheme of the IEEE 802.11aa standard suffers from scalability issue. This paper proposes a modified block acknowledgment scheme for video multicast. Our scheme considers the impact of the loss of different frames on video quality under Moving Picture Expert Group 4 (MPEG-4) and H.264 video coding. Simulation results indicate that proposed scheme performs well in terms of PSNR.**

***Index Terms*—IEEE 802.11aa, MPEG-4, Multicast, PSNR, Reliability, Scalability.**

I. Introduction

Multicasting is the method used to deliver the same data to multiple group members at once. The use of multicast services in various applications over wireless local area networks (WLANs) include video streaming to group of students, streaming of sport events in smart stadium, video gaming, video on demand, and file sharing etc. [1]. Multicast of video streaming services is both promising and growing technology for multimedia services over WLANs [2].

Historically, throughput had been regarded as the primary demand of multimedia applications. However, video streaming has placed new demands upon the underlying WLANs. Video quality relies on the reliable delivery of video traffic. Therefore, video multicast frames need to be reliably delivered to all stations in the multicast group. Legacy IEEE 802.11 standard [4] supports only unreliable multicast service since it does not support retransmission of lost packets. Under the IEEE 802.11e standard [4], differentiation and prioritization among four different types of traffic classes is supported through enhanced distributed coordination access (EDCA). However, even EDCA does not consider multicast transmission despite support for multiple traffic classes since it does not provide multiple classes for video. IEEE 802.11aa standard [5] extended the existing EDCA prioritized mechanism of the IEEE 802.11e to provide differentiation among different video flows. IEEE 802.11aa standard added two additional queues within the existing EDCA access categories [5] to provide prioritization for both audio and video streaming. The main features of medium access control (MAC) under the IEEE 802.11aa standard are stream classification service (SCS) and groupcast with retries (GCR). GCR Block Acknowledgement (GCR-BA) is considered as an extension of the BA scheme defined in IEEE 802.11v and IEEE 802.11n standards. In this scheme, sender transmits a block ACK request (BAR) packet to all multicast members. The receiver station sends an ACK packet only when it is requested by a BAR packet. Therefore, this mechanism offers better reliability than other ACK policies. Fig. 1 shows an example scenario of the GCR-BA operation.

Carrier sense multiple access with collision avoidance (CSMA/CA)-based scheme suffers from various kinds of overheads at MAC and physical (PHY) layers hampering the efficiency of schemes [6]. In the GCR-BA scheme, a group of packets destined for the same receivers is allowed to be transmitted to reducing per packet distributed inter-frame space (DIFS) to a single DIFS without being acknowledged (significantly decreasing the short inter-frame space (SIFS's)). After the transmission of a block, the sender initiates a block BAR packet to confirm the number of packets that were successfully received. Receivers then respond with a BA packet. The efficiency of the BA scheme comes from the fact that the overhead is greatly reduced, because DIFS and backoff times only occur before the first packet of the block, and only one ACK packet is used for all the packets in the block.

Many codecs, such as Moving Picture Expert Group 2 (MPEG-2), MPEG-4, and MPEG-4 advanced video coding (AVC) do not provide equal frames even though some of them are more significant than others. Therefore, this paper proposes a modified GCR-BA scheme by considering the importance of

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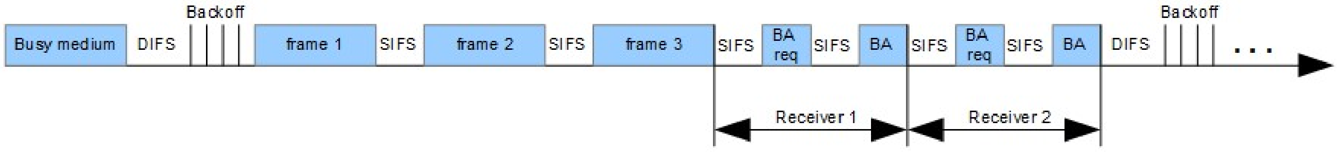

Fig. 1: Example Scenario of Block ACK Scheme.

different frames for multimedia traffic. The main contribution of this paper is to overcome the scalability limitations of GCR-BA scheme of IEEE 802.11aa standard. The reminder of the paper is structured as follows. Section 2 provides the related work in detail. Section 3 presents the proposed protocol. Section 4 discusses the performance evaluation, and finally, Section 5 concludes the paper.

II. Related Work

Authors in [1] presented an analytical model for delay estimation directed multicast service (DMS), GCR unsolicited retry (GCR-UR) and GCR-BA of IEEE 802.11aa standard. The delay of the Block ACK protocol is inversely proportional to the transmission opportunity (TXOP) limit. In [7], authors proposed a protocol which is capable of Block Negative Acknowledgment (BNACK) in wireless networks based on IEEE 802.11. The proposed protocol addresses reliable multicast and address retransmission of missing packets. The protocol is able to outperform the ideas of IEEE 802.11v and IEEE 802.11aa. The receiving nodes are assumed to be in the coverage are of the sender nodes and that transmission takes place at a specific rate with no collision. Using the BNACK policy, packets are transmitted in blocks followed by a Block NAK Request (BNR) and only member with lost packets provide the feedback. In this way, if all packets are transmitted correctly no BNAK is transmitted which saves the bandwidth. However, the reliability of the proposed protocol depends on the reception of BNR.

High bandwidth application like video streaming requires high bandwidth and reliability. In 802.11p the link is degraded due to mobile and static link in vehicular network. This paper [8] proposed hybrid architecture based on fourth generation long term evolution (4G/LTE) and IEEE802.11p to support vehicle to everything (V2X) video streaming. The proposed protocol works on the principle of always best in best possible way. In the proposed network architecture, vehicles can communicate using ad hoc link or using cellular network infrastructure such as 4G/LTE. The proposed protocol focusses on packet loss rate and tries to keep it minimum which is not addressed before. The results show feasibility of the proposed approach and significant improvements on link reliability.

Ivanov et al. [9] studied the amendment provided in IEEE 802.11aa standard and provided an analytical model of GCR retransmission method. Daldoul et al. [10] evaluated the throughput and reliability of DMS, GCR-BA and GCR-UR with different group sizes. They stem the analytical with simulation results and conclude that GCR-UR is the most appropriate scheme for bigger group sizes. However, DMS does not scale very well. GCR-BACK is also not found suitable for large number of receivers. For providing service differentiation between real-time and non-real-time video queues Lai and Liou [11] presented an efficient scheduler between the primary and alternative queues of SCS in IEEE 802.11aa. Their proposed scheme maintains priority and fairness between primary and alternative queue of SCS.

The work in [12] proposed a quality of experience (QoE) based link adaptation (QLA) mechanism for H.264 AVC streaming through IEEE 802.11a/g LANs. QoE is becoming very important in IEEE 802.11 LANs. It used the metrics such as resolution buffering time and smoothness to assess the user experience. The legacy IEEE 802.11a/g broadcast mechanism lacks link adaptation and retransmission mechanisms. This work also discussed a link adaption mechanism to optimize video streaming for users QoE. Previous MAC layer link adaptation work didn't optimize it for video transmission. On the contrary, this work has focus on link adaption for H264/AVC video streaming through IEEE 802.11. The proposed scheme used regression method to define utility function. A higher average playback video stream indicates a higher video stream thus a user is more. The purpose of QLA is to select a set of multiple coding schemes and retries limits which maximize the utility. The legacy IEEE 802.11 lacks ACK for multicasting. This work also proposed a scheme to use block ACK for multicast to achieve reliability. QLA is evaluated for different channel conditions. The results showed that utility of proposed scheme is higher than other schemes.

III. PROPOSED GROUPCAST BLOCK ACKNOWLEDGEMENT SCHEME

With growing multimedia traffic video compression is of utmost importance. MPEG4 and H.264 are among the most popular standards for this purpose and include three types of frames: intra-coded (I-frames), P-frames and B-frames [13].

Reconstruction of a video frames is exclusive to I-frames. Since, I-frames are self-contained, they prevent inter-frame error propagation. Being self-contained in nature, I-frames result in best quality video, however, are not compression friendly. I-frames are inevitable for interactive video playback since a new Group of Pictures (GOP) cannot start without these. A typical GOP order is *IBBPBBPBBPBB* . If an I-frame is lost, all P- and B-frames up to the next I-frame are of no use. Therefore, the reliability of the I-frame is very important. The impact of loss of I-frame is presented in Fig. 2. In Fig. 2, frame index 287 (an I-frame) is not decoded since some packets belonging to the I-frame are lost, so the following P- and B-frames also show lower PSNR values. The same effect

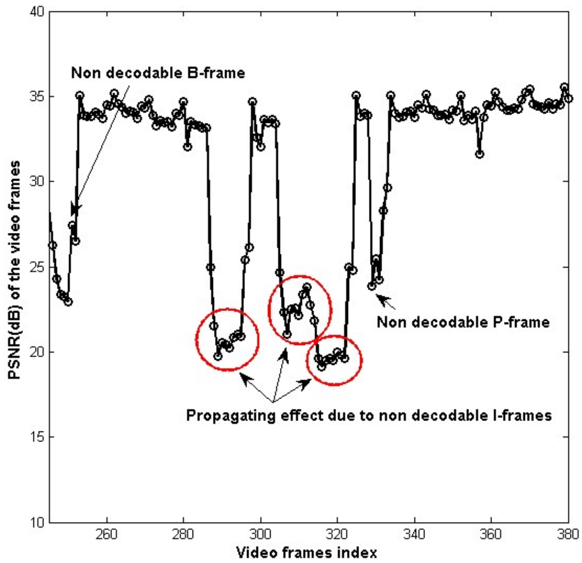

Fig. 2: Impact of I-, P- and B-frames losses on PSNR.

can also be observed for frame index 305 (an I-frame) and 314 (an I-frame) [14]. Fig. 2 also highlights the effect of the loss of P- and B- frames on PSNR. Loss of a packet of P-frame index 329 shows a lower PSNR value, however, there is no propagating effect. On the other hand, with B-frame index 250, the PSNR value is acceptable.

Algorithm 1 Proposed GCR Block ACK Scheme

```
procedure
    type ←getTypeof Frame();
    Mm ← getMulticastMembers();
    loop
    if (node==sender) then
        transmitframe(Mm);
    end if
    if (type==I and (!Block ACKrecieved())) then
        retransmit I-frame();
    end if
    if (node == reciever) then
        if (type == I) then
            transmit BlockACKRequest();
            transmitBlock ACK();
        end if
        if (type==P or type == B) then
            break;
        end if
    end if
    end loop
end procedure
```

Fig. 3 highlights a system model. The system consists of *N* nodes, including a multicast source and *N-1* multicast members. We assume that each node always has a packet

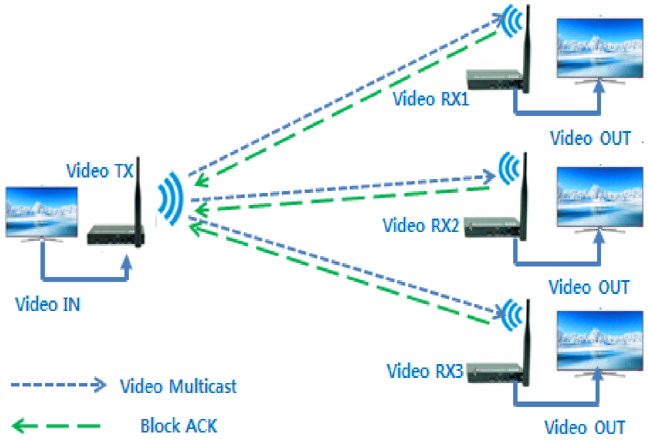

Fig. 3: Proposed System Model.

Algorithm 2 GCR Block ACK Scheme

```
procedure
    type ←getTypeof Frame();
    Mm ← getMulticastMembers();
    loop
    if (node==sender) then
        transmitframe(Mm);
    end if
    if (type==I or type==P or type== B and ( !Block-
  ACKrecieved())) then
        retransmit I-frame();
        retransmit P-frame();
        retransmit B-frame();
    end if
    if (node == reciever) then
        if (type==I or type==P or type==B ) then
            transmit BlockACKRequest();
            transmitBlock ACK();
        end if
    end if
    end loop
end procedure
```

available for transmission. Proposed GCR Block ACK and GCR Block ACK algorithms are presented in algorithm1 and algorithm 2, respectively. The proposed solution does not use BA or BAR or any other control packets for both P and B-frames. BA is transmitted by each receiver if they correctly received the packet belonging to an I-frame. This reduction in control overhead leads to increasing scalability of GCR-BA protocol.

IV. PERFORMANCE EVALUATIONS

A simulation study is performed to compare the performance of reliable multicast schemes using NS-2 (Network Simulator 2.35) [15], and Evalvid (a video evaluation framework) [16]. Protocols evaluated include the proposed modified GCR-BA scheme and a comparison is drawn with legacy

802.11 multicast, and GCR-BA. Peak signal-to-noise ratio (PSNR) is calculated as a primary source of video quality measurement on receivers.

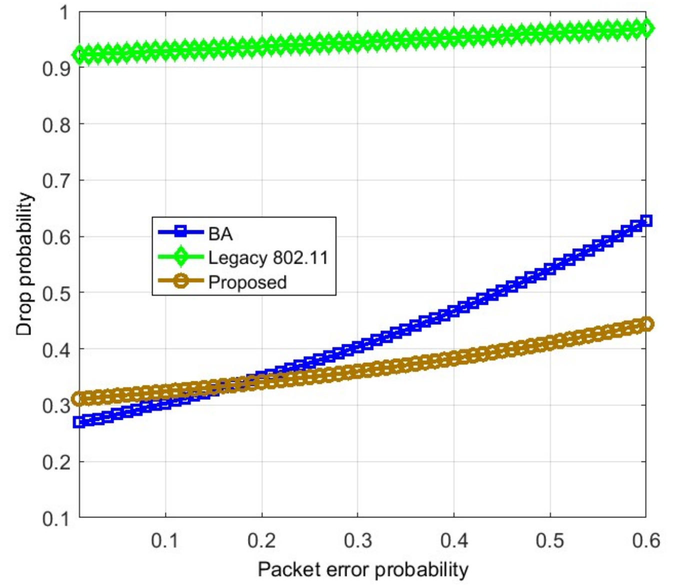

Fig. 4: Average drop probability as a function of channel error probability when the number of nodes is 20.

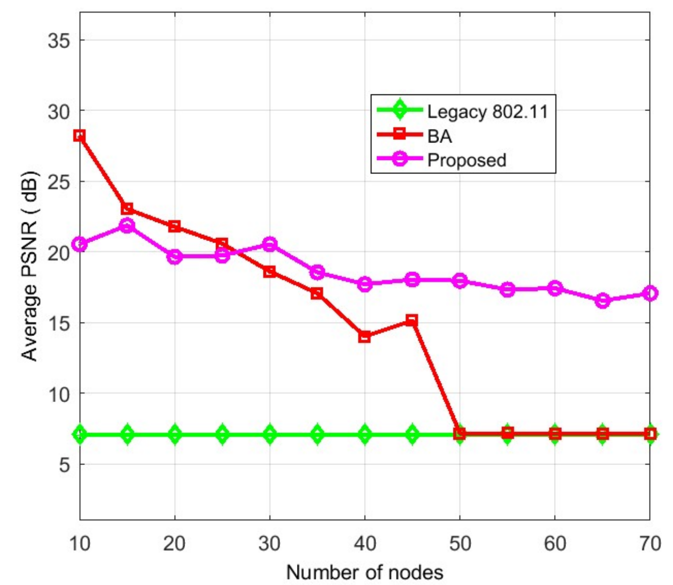

Fig. 5: Average PSNR as a function of the number of nodes (channel error probability = 0.1).

Fig. 4 shows the packet drop probability with different channel error probabilities when the number of nodes is 20. It is clear that our proposed protocol is more effective when there is a higher channel error probability. This is because there are more retransmissions with a higher channel error probability and the proposed method reduces the overhead of retransmissions.

In Fig. 5, PSNR is plotted against the number of nodes in multicast group. Average PNSR decreases with increasing number of nodes for all the protocols evaluated. However, the legacy 802.11 multicast suffers severe performance degradation due to lack of support for retransmissions. The proposed protocol shows higher average PSNR compared GCR-BA scheme due to its lower drop probability. However, it is evident from Fig. 5 that the proposed scheme achieves lesser PSNR with lesser number of nodes since P- and B-frames are not retransmitted in our proposed protocol, causing higher drop rate and hence effecting PSNR.

V. Conclusion

Reliable delivery of video multicast is important. Therefore, the 802.11aa standard specifies a different scheme for reliable multicast transmission. In this paper, we propose a modified groupcast with retries block acknowledgement (GCR-BA) scheme for multimedia applications to address the scalability problem with the GCR-BA scheme. The proposed protocol performs well than Legacy IEEE 802.11 and GCR-BA schemes in terms of peak signal-to-noise ratio when there is large number of nodes, as compared to the GCR-BA scheme.

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