Digested suicide vector PK18mobSacB	100ng
Digested Target fragment	20 ng
10x T4 ligase buffer	1 ul
T4 ligase	1 ul
H_2O	Up to 10 ul
Total volume	**10 ul**

Ligate overnight at 16 ℃.

1.1.9),transformation to E.coli Dh5

1.1.10)selection and validation

I.Medium: X-g-Gal(blue-white)

Kar

II.double digestion:EcoRI,HIdIII

III. perform PCR to identify the positive clones(primer:down Ldh1 and up ldh2)

УДК 338

DELAY ANALYSIS OF A MODIFIED CUMULATIVE ARQ

Liu Mei
Belarusian State University
E-mail: liumei19910101@126.com

Abstract. *For the wireless channel characteristics, this paper modifies the cumulative ARQ in order to improve the performance of the traditional cumulative ARQ. We put in sequence confirmed feedback to satisfy the demands of the new generation cellular mobile communication. An analysis model is developed for parameter manipulation in the proposed framework. Finally, the simulation results show that the performance of modified cumulative ARQ is better than the traditional mechanism.*

1. Introduction

With the continuous growing of communication, the broadband wireless access technology which is based on a series of the IEEE802.16 standard becomes a hot spot of broadband metropolitan area network wireless access technology gradually. As one of the most mainstream mobile communication standards, the IEEE802.16m has more superior performance. At present, a frequently used error control technology is ARQ, which play an important role in broadband wireless communication such as 4G, WiFi and UWB. It has been catching many researchers' attention over the years.

Reviewing the previous researches, we find that there is still plenty of room for improving to the transmission mechanism of cumulative ARQ, especially the feedback mechanism. Overall, in this paper, we modify the transmission mechanism of cumulative ARQ in IEEE 802.16m networks and study its performance. An absorbing Markov chain and a three-queue model are developed for providing a simple and efficient approach to investigate the important performance metrics, such as goodput, PDU delivery delay, and SDU delivery delay.

2. Modified cumulative ARQ

In the process of the traditional cumulative ARQ mechanism transmission, when the first lost PDU appears, the successful received PDU before the first lost PDU will be fed back. This PDU and the PDUs after it will wait to the next transmission opportunity to retransmit. In this way, the transmission causes large delivery delay and channel waste. So on the basis of the discussion, we propose a modified scheme which adds to the sequence ACK in the traditional cumulative ARQ.

For simplicity, a queue under consideration is referred to as the tagged queue. The modified mechanism is described as follows. For example, in the first frame, since the PDU with sequence number 3 has been lost and identified by the receiver, the largest sequence number among all successfully received PDUs is 2. The received PDUs with continuous lost state or continuous successful state are divided into a sequence and we need contain the number of PDUs in each sequence. In this way, we just need to know the information of sequence feedback and retransmit the lost sequence.

3. Analysis of delivery delay of PDU

The delivery delay of PDU in unit of frame is defined as the total number of frames lasting from the first transmission of a PDU to the frame during which this PDU is successfully received.

Firstly we need to calculate the $E[N_P]$ in this section, where N_P is the number of transmission attempts experienced by the tagged queue to successfully transmit a PDU. Here, we only consider the condition that once the PDU lost at the second lost sequence, the second lost PDU and the PDU after it will be retransmitted. We refer to L PDUs that are launched at each DL sub-frame as a transmission burst. According to the regulation of the modified mechanism, the delivery delay of a PDU is relative to its position at the transmission burst where its first transmission occurs. Whether a PDU is successfully transmitted or not depends not only on the successful transmission of itself but also on the successful transmission of all the previous PDUs in the transmission burst where its first transmission occurs. Thus the transmission can be modeled by an absorbing Markov chain as shown in Fig. 4, where the state 'i' denotes that this PDU is at the ith position in a transmission burst, and the state '0' is the absorbing state representing that a PDU is transmitted successfully.

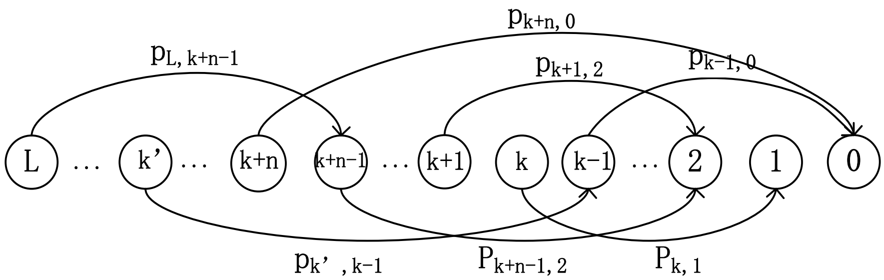

Fig.1 – The transition diagram of a PDU

Because p_{ij} is related to parameters k, n, k', we denoted p_{ij} is $p_{ij}^{(k,n,k')}$, then the transition probability is

$$p_{ij}^{(k,n,k')} = \begin{cases} (1-p)^i & j = 0, i < k \\ (1-p)^{k-1} p^{i-k} & k \le i \le k+n-1 \\ (1-p)^{i-n} p^n & j = 0, k+n-1 < i < k' \\ (1-p)^{i-j+n} p^{n+1} & i \ge k' \\ 0 & \text{Otherwise} \end{cases} \tag{1}$$

Hence, let Π_0 denotes the initial state vector, I is an $L \times L$ identity matrix, R is the matrix derived from the one-step transition probability P by deleting the row and column corresponding to the absorbing state (0), and e is an identity vector with $L \times 1$ dimensional. The expected number of transmission opportunities for successfully transmitting a PDU is equivalent to the average number of steps experienced by the PDU until to be absorbed, which is given by

$$E[N_P] = \Pi_0 (I-R)^{-1} e. \tag{2}$$

Let ξ denote the probability that a PDU is located at the ith position in second transmission burst when it is first transmitted. The initial state vector, $\Pi_0 = [\pi_1, \pi_2, \cdots, \pi_i, \cdots, \pi_L]$, is derived as follows:

$$\pi_i = pr(\xi = i) = \sum_{j=1}^{L} pr(\xi = i, \mu = j) = \sum_{j=1}^{L} pr(\mu = j) pr(\xi = i \mid \mu = j); \tag{3}$$

$$pr(\xi = i \mid \mu = j) = \begin{cases} \dfrac{1}{j-n} & i = L - j + n + 1, \cdots, L \\ 0 & \text{Otherwise} \end{cases} \tag{4}$$

where μ denotes the number of PDUs successfully transmitted during each time the tagged queue obtains the chance of transmission, n denotes the number of PDUs unsuccessfully transmitted in the first lost queue and its probability density function has been given.

Then we can calculate the delivery delay of PDU which is given by

$$D_P = \sum_{i=1}^{N_P - 1} (m_i + 1), \tag{5}$$

where N_P is given in (9), m_i is the ith inter-service time. Thus the average delivery delay is given by

$$E[D_P] = E\left[\sum_{i=1}^{N_P - 1} (m_i + 1)\right] = (E[N_P] - 1)(E[m] + 1). \tag{6}$$

4. Conclusion

A modified cumulative ARQ is surveyed in this paper. On the basis of the traditional cumulative ARQ, we put in the sequence ACK feedback in the transmission. We have studied the PDU delay of the modified mechanism by building the Markov model. The improvement is important to adapt to the environment with wireless channel. Our further research on the cumulative with several sequences feedback is under way.

УДК 622.69

DYNAMIC RELIABILITY ANALYSIS ON TRANSMISSION SYSTEM OF SHEARER

*Di Zhou , Xufang Zhang, Yimin Zhang**
School of mechanical engineering and automation
Northeastern University, Shenyang, China
E-mail: zhoudiNEU@126.com

Abstract*: Mining industry plays an increasingly important role in industrial development of China. The transmission system of shearer loader can be considered as a dynamic model with variable motion, time-varied mesh stiffness and nonlinear backlash. The vibration responses or contact stress should be investigated for safety production in the condition of variable speed and heavy load. An efficient method is proposed to conduct dynamic reliability analysis of the system. Reliability analysis aims at guaranteeing safety in production and improving work efficiency of transmission system in shearer. Reliability sensitivity method is proposed to analyze characteristic and optimize the structure of transmission system in shearer.*

1. **Introduction**

The transmission system in shearer loader undertakes the essential task of movement and support in the mining machinery. The performance has great impact on the reliability of the whole shearer loader. There are multiple failure modes such as fatigue, wear and fracture of