Feedback Collision Detection By Multiuser Diversity In Wireless Network Using Recurrent Cluster Rifting (RCR) Algorithm

C.Chitra[#1], Mr.S.Venkateswaran, K.M.Fathima Jahanas*****

[#1]M.E., Computer Science and Engineering Student, Arasu Engineering College, Kumbakonam,
[#2]Assistant Professor, Department of CS, Arasu Engineering College, Kumbakonam,
[#3]M.E., Computer Science and Engineering Student, Arasu Engineering College, Kumbakonam
[1]chitraamri@gmail.com
[2]venkates@gmail.com
[3]jahanas22@gmail.com

Abstract─ An ultimate goal in wireless network is to detect the feedback collision occurred in the multiuser environment. Though it is difficult to detect the feedback collision,we proposed an algorithm called *Recurrent Cluster Rifting* (RCR).In this we fix a threshold value (constant value) based on the number of users in the multiuser environment.This value is otherwise known as feedback threshold.If nouser in the multiuser environment send the feedback,there will be some adjustment in the threshold value(i.e.)this algorithm will lower the value.Therefore if there is any feedback collision occurs in the multiuser environment there will be no change in this value but this algorithm will rift the users recurrently to detect the collision and find the certified user involved in this collision.After detecting the collision we use two schemes namely Bandwidth Efficient Scheme(BES) and Switching Efficient Scheme (SES) to avoid the collision occurred during retransmission of data with lower bandwidth in this environment.

***Keywords*─Feedback collision, Multiuser environment,Recurrent cluster rifting, TDMA.**

I. INTRODUCTION

Mobile computing is a technology that allows the transmission of data over the computer, without connecting to the fixedlink.Multiuser diversity is a way to define the fading characteristics of the channel by selecting one user from an array of connected users. The channel will be faded due to signal fluctuation occurred in wireless communication network.Signal fluctuations caused by multipath propagation and shadowing effects.Because of the signal fluctuation in the network, the user gets affected by the channel fading. Thus the user sends the feedback to the scheduler.Scheduler will serve the users who have the high channel quality, so the scheduler collects the channel quality information from the users.Channel quality information is obtained at the transmitter by the messagesend by the user (i.e.) feedback message, is an important message for communications systems. Even though control information is necessary,a huge amount of control information may lead to protocol overheads and excessive processing to the system.

To overcome this issue in this system,we proposed an algorithm Recurrent Cluster Rifting,this allows the group of users transmit at one subgroup and other group of users at another subgroup, thus it will reduce the protocol overhead in the system. However,this paper is similar to opportunistic splitting algorithm,this also rift the usersinto cluster but it require many number of mini-slots to detect the feedback collision.This algorithm will focus on the uplink context only.The process of scheduling in the wireless network defines the procedure of selecting which of the mobile users having the high channel quality going to transmit or receive information on the wireless channel to increase the throughput and quality of service(Qos).Quality of service can be specified in terms of power consumption, buffer overflow or delay.

1.1 Related works

Let us discuss some of the previous work done in this area. There are many feedback scheduling algorithm are proposed to reduce the collision occurred in the wireless network.One of the feedback scheduling algorithms is opportunistic splitting algorithm. The idea was to allow a user whose current channel quality exceeds a threshold value to send the feedback. This algorithm focused only on the uplink context.This scheduling algorithm increases the system spectral efficiency by selecting the users with favourable channel conditions to transmit and receive data.

It maximizes the system spectral efficiencyamong all TDM (Time division multiplexing) basedalgorithms where the user with highest carrier to noise ratio(CNR)is served first at all times.In opportunistic splitting,a pair of thresholds is set based on the number of users in multiuser environment. In first mini-slot,the user whose current channel quality is between the thresholdsistransmitted to base station.The base station will broadcast it to the users in the multiuser environment.Depending on the broadcast message received,each user modifies their threshold according to binary search algorithm.This process continues until each and every user satisfies.This scheduler often implemented centrally at the base station in the cellular network and multiuser diversity exits between the users.Opportunistic splitting requires two way communication and coordination between the base station and users every mini slot, and a variable number of mini slots can be used in a time unit.If one user satisfies,then that user identity is stored at the base station.

For instance, two threshold are T_l andT_h for each mini slot,such that at each time only users whose channelgains, t, that satisfy $T_l < t < T_h$ are allowed to transmit. At the end of each mini-slot each users receives a (0,1,e) feedback, indicating if the mini-slot was idle(0),successful transmission indicates as (1) and the collision indicates as (e).we denote the received feedback by f. If f=1 it determines the user with the best channel quality transmitted in each mini slots. If f=0 or f=e, the users will adjust their threshold and repeat this algorithm until either success occurs or the time slot ends.

To know the current channel quality of all the users, the users need to transmit their channel condition to the base station; this will increase the bandwidth and energy. If the collision occurred it will split the users into group, only the user in one of the subset will transmit at the next time slot so the probability of collision is reduced. This goal of this algorithm is not only to resolve the collision but to find the user with best channel gain out of all backlogged users. Thus it will increase the throughput and coherence time.It also will improve the delay and stability over the channel aware aloha approach.

1.2Contributions

In this paper we introduce an algorithm called Recurrent Cluster Rifting (RCR) to limit the number of mini slots and number of bits for a threshold value in signaling message required to detect the feedback collision occurred in the multiuser environment. This algorithm lowers the threshold value if no user send the feedback and if the feedback collision occurred this algorithm no longer update the threshold but it will rift the users into certain cluster. It allows the first cluster to send the feedback .If no feedback received from the cluster it give chance to second cluster. But if collision exists in the first cluster it will again rift the users into sub- cluster. By rifting the user recurrently whenever the collision occur, the algorithm narrows down a search space until a single feedback is receive. Our main goal to reduce the number of mini slots required for user selection without losing spectral efficiency performance and this is robust, practical and scalable.

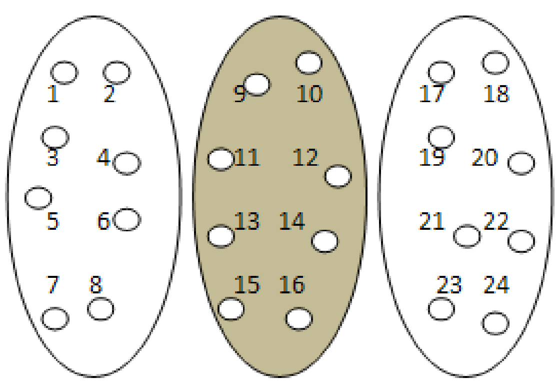

Figure 1(a).This diagram describes 24 users rifted into 3 clusters and feedback collision occurred at the second cluster.

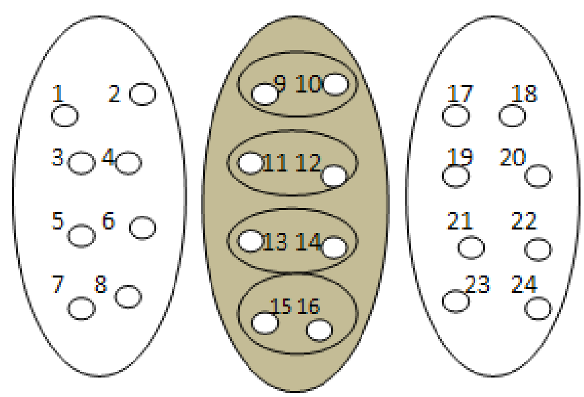

Figure 1(b). Second cluster again rift the users recurrently into 4 cluster in order to detect the feedback

II. SYSTEM MODEL

In this paper we proposed to find a user in each time-slot. The time slot is defined by TDMA (Time Division Multiple Access).TDMA is a technique in which a wireless transmitter channel transmits a modulated signal and accesses in a time-slice and another modulated signal accesses in another time slice such that the signal from two sources or two data services can propagate in the mediumwithoutaffecting each other and it uses same frequency slice or band and the same channel. The available time slice is divided for use by multi sources. Like this we want to detect the feedback collision occurred and serves a qualified user in time slot. The users can affect by the fading channel from the base station. In figure 2the users receiving fading channel and it will lead to signal fluctuation in this network. This is considered as an important issue to be reduced in wireless communication and the efficient scheduler is used to achieve multiuser diversity in multiuser environment. And each user receives independent fading channel from the base station. So the users send feedback to the base station.

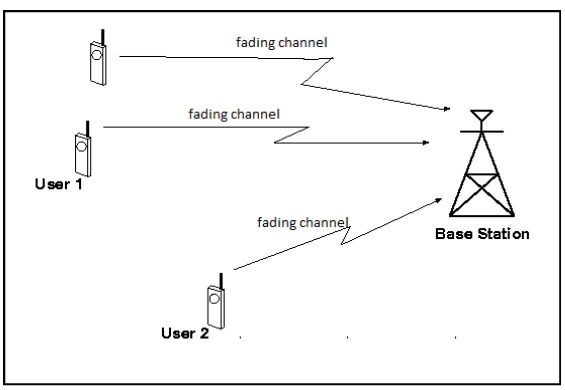

Figure 2.Users receive fading signal from the base station

For exampleconsiderthe mobile tower, the users receiving signal from the tower. Suppose the tower gets affected by some natural disaster or by external, the users receives fading channel from the tower so the users will send the feedback. Thus feedback collision occurred because many users sending feedback at the same time .Here to detect the feedback collision we propose an algorithm called Recurrent cluster rifting (RCR).

Switching Efficient Scheme: By using this technique, we can avoid collision occurred during retransmission of data with the help of one controller node (switching node) in a network.

Bandwidth Efficient Scheme: By using this technique, we can avoid collision by sending the information with lower bandwidth around the network.

2.1 RECURRENT CLUSTER RIFTING:

In recurrent cluster rifting algorithm there are 3 phases, namely

1. Feedback process
2. Threshold scrutiny phase
3. Cluster rifting phase

This algorithm initiate at the first phase, If feedback collision occurs at any point of mini slot it will move to next stage (i.e.) cluster rifting phase. Each mobile user has distinctive identification number, which is assigned by the scheduler during registration to the network. A feedback message from the user contains user identification number so the scheduler makes user selection in case of feedback. This identification number is used to cluster the users where each user knows their cluster automatically without the knowledge of scheduler in base station. In the figure 4 the entire system architecture of recurrent cluster rifting is represented. Here the multiuser environment sends feedback to server, the iterative (recurrent) scheduler set value and gets the user CQI and broadcast it to all users in multiuser environment. If feedback collision again occurred, the scheduler again rift (split) the user into sub group (cluster).By rifting the users into sub cluster we can detect feedback collision by using less number of mini slots. Cluster rifting phase is otherwise known as group splitting stage.

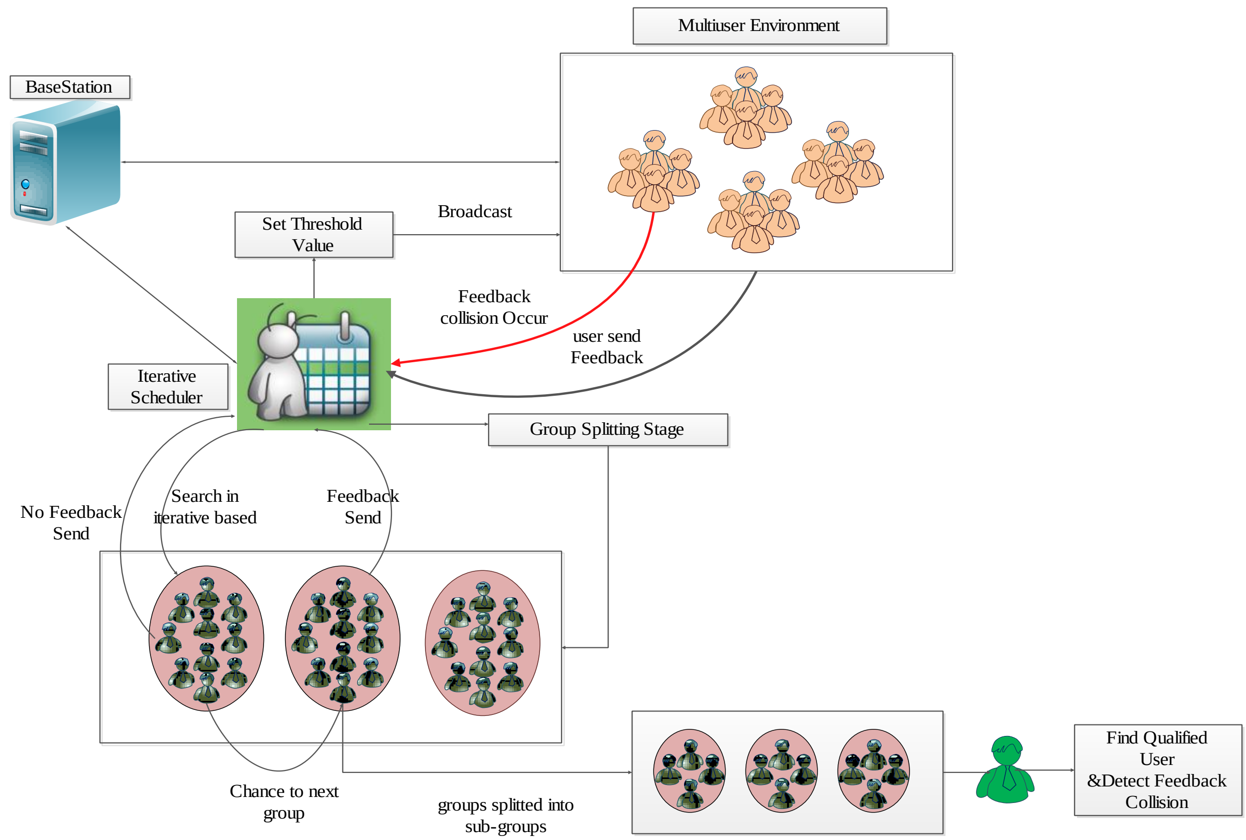

Figure 3.Architecture of recurrent cluster rifting

2.1.1 Feedback process

Our first phase is feedback process. Users receiving signal fluctuation due to weather condition, so the users allowed to sends feedback to the scheduler in base station.

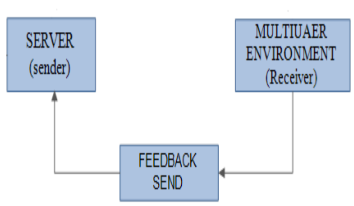

Figure4.This figure depicts that the users sending feedback to server

2.1.2 Threshold scrutiny phase:

Our objective in this phase is to discover a user with high channel quality than other users by using less number of mini slots. Two schemes introduced in this paper are

- Linear scrutiny
- Binary scrutiny

In linear scrutiny scheme, the scheduler scrutiny from first mini slot to last mini slot. If no feedback is observed, the scheduler will lower the threshold value. But if collision occurred then the user who sent a feedback will proceed to next mini slot, whereas the users who did not send a feedback do not compete anymore and go sleep (idle).

In binary scrutiny scheme, the middle threshold value is used in first mini slot. If collision occurred then the threshold is increased but if no collision occurred then the threshold decreased. Figure 5 defines the threshold phase and threshold value generated by the scheduler and broadcasting to the user

.

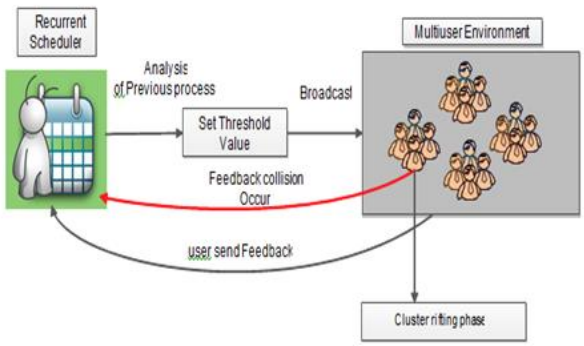

Figure 5.This figure depicts the model of threshold scrutiny phase

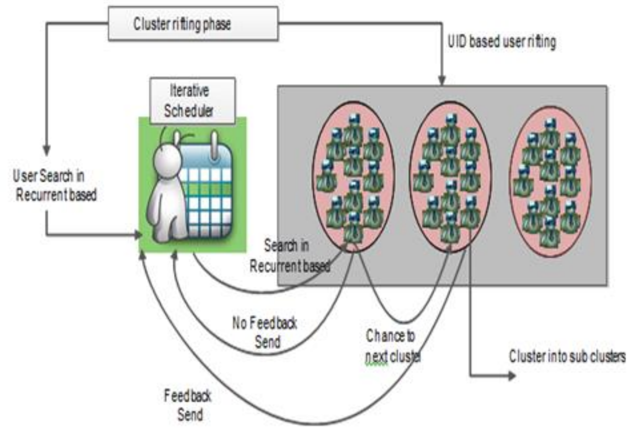

Figure 6.This figure describes the cluster rifting phase

2.1.3 Cluster rifting phase:

In this paper we propose cluster rifting phase, once feedback collision occurred in threshold scrutiny phase it will comes to cluster rifting phase. This phase rift the users randomly into cluster until collision detected. In the beginning of the phase, starting from the first group, a group is selected one after another until a collision occurred. In each mini slots the users in the selected group allowed to send a feedback if their channel quality is higher than the threshold value determined by the scheduler. If no user sends feedback the next group take an opportunity on next mini slot. But if collision occurred then the users in cluster are again rifted into sub-cluster to narrow down the scrutiny space. Our objective in this phase to discover any one of those qualified users from the multiuser environment.

III. CONCLUSION AND FUTURE WORK:

Multiuser environment is an environment in which different kind of users accessing resources from user. In this paper we propose an algorithm to detect the feedback collision occurred in the multiuser environment and to retransmit it to the user without any delay and collision occurred in the retransmission. By using this algorithm we can detect the feedback collision occurred in multiuser environment with less number of mini slots compare to the previous algorithm designed for collision detection. Thus we can improve performance in wireless network. Our main goal in this paper is to detect the feedback collision by using threshold value, so our future work focused on the collision detection without using threshold value in the recurrent scheduler.

REFERANCES:

1. G. L. Stüber, *Principles of Mobile Communications*. Boston, MA, USA: Kluwer Academic, 1996.
2. D. Gesbert and M.-S. Alouini, "How much feedback is multi-user diversity really worth?" in *Proc. IEEE Int. Conf. Communication*, Paris, France, Jun. 2004.
3. X. Qin and R. Berry, "Opportunistic splitting algorithms for wire-less networks," in *Proc. IEEE Conf. INFOCOM*, vol. 3. Mar. 2004, pages 1662-1672
4. T. Tang and R. W. Heath, Jr., "Opportunistic feedback for down-link multiuser diversity," *IEEE Commun. Lett.*, vol. 9, no. 10, pages 948-950
5. Deepak G and Dr. Pradeep B S," Challenging Issues and Limitations of Mobile Computing" in ,Int.J.ComputerTechology&Applications,Vol 3 (1),177-181
6. Y. Liu and E. Knightly, "Opportunistic fair scheduling over multiple wireless channels," in *Proc. IEEE Joint Conference of the Computerand Communications Societies (INFOCOM'03)*, vol. 2, (San Francisco,CA, USA), pp. 1106–1115, Mar. 2003

7. H. J. Bang, “Advanced scheduling techniques for wireless data networks.” Master Thesis, Department of Physics, University of Oslo, Feb. 2005.
8. Vegard Hassel,” Design Issues and Performance Analysis for OpportunisticScheduling Algorithms in Wireless Networks” Thesis for the degree of philosophiae doctor Trondheim, January 2007 Norwegian University of Science and Technology, Faculty of Information Technology, Mathematics and Electrical Engineering , Department of Electronics and Telecommunications.
9. P. Viswanath, D. Tse, and R. Laroia, “Opportunistic beamforming using dumb antennas,” *IEEE Trans. Inform. Theory*, vol. 48, no. 6, Pp 1277–1294, Jun. 2002.
10. X. Qin. and R. Berry, “Opportunistic splitting algorithms for wireless networks,” in *Proc. IEEE International Conference on Computer Communications(INFOCOM’04)*, (Hong Kong, PR China), pp. 1662 –1672, Mar. 2004.

