ABSTRACT

Multi antenna relays are used to combating fading, enhancing throughput, and extending coverage in emerging wireless broadband networks. In multi user multi relay cooperative wireless uplink with multi antenna nodes using amplify and forward relays propose a low complexity joint scheme joint user relay selection and association, which simultaneously selects multiple relays and users cooperation as well as assigns the selected users to different selected relays for service. That is, three different tasks relay selection, user selection/scheduling, user relay selection are performed concurrently. It reduces the amount of delay and collision is avoided. Better time management provides the efficient performance.

Key Words: MIMO relaying, relay selection, user scheduling, user relay selection and association.

1. INTRODUCTION

The use of multi antenna relays has emerged as a very promising technique for combating fading, enhancing throughput and extending coverage in emerging wireless broadband networks (e.g., LTE Advanced). However, practical wireless relay networks are delay sensitive due to two or more hops required to convey information from the source to the destination. Relaying schemes intention is to reduce the transmitter to receiver distance, thereby allowing for higher data rates. Depending on the scheme applied, different types of relaying solutions can be envisioned. The three most common relaying protocols are the Amplify and Forward (AF), in which a relaying scheme only linearly processes its received signal before retransmission. The Decode and Forward (DF), in which a relaying scheme decodes its received signal, then re-encodes it before transmission. The Compress and Forward (CF), in which a relaying scheme quantizes the received signal and transmits the encoded version of the quantized received signal.

In order to have any practical relevance, user relay selection and/or association schemes must be of acceptable complexity and fit within a small fraction of the coherence time of the channel.

Relay selection and user scheduling have been separately performed. In order to enhance the system performance, both relay selection and user scheduling performed.

2. PROJECT DESCRIPTION

As mentioned earlier, Multi antenna relays are used to combating fading, enhancing throughput, and extending coverage in emerging wireless broadband networks. In order to perform this function in efficient way Amplify and Forward relays are used. Here in my project, three tasks performed: neither user-relay selection nor user-relay association, user-relay association but no user-relay selection, user-relay selection and user-relay association and finally compare the performance of these three tasks.

3. SYSTEM DESIGN

It consist of one base station, K-relays and K-users (K=1, 2, 3,…). Base station serving K scheduled user equipments with the aid of K fixed in band half duplex Amplitude and Forward relay nodes as depicted in figure. That is, there is no direct link between the user equipments and the base station. With the half duplex relay nodes, the transmission of a symbol block takes place in two hops. In the first hop, each user equipment transmits to its associated relay node while causing interference at other relay nodes. The relay nodes simultaneously forward amplified version of their received signal to the base station in the second hop. The proposed user relay selection and association scheme, simultaneously selects multiple relays and
users for cooperation, as well as assigns selected users to selected relays for service. That is, three tasks performed concurrently. Relay Selection, User selection/Scheduling and User-Relay Selection and Association.

4. RELAY SELECTION SCHEMES

The simplest routing scheme for selecting a cooperation partner corresponds to mobile stations choosing their relays randomly. The major advantage of this random selection scheme is a very low scheme complexity, resulting in low selection time and signaling overhead. However choosing the relays randomly might not be very efficient in terms of gain. For frequency flat fading channels, diversity gain can be obtained if the random selection scheme is used, whereas for frequency selective channels, only in some cases the random selection can achieve the same diversity as the best relay selection.

The best relay selection, the simplest method which is based on the instantaneous end to end signal to noise ratio or partial relay selection algorithms, i.e., methods in which the relay choice only takes into account the source-relay or the relay-destination SNR. However, when addressing the spatial multiplexing case, both the best relay selection and partial relay selection approaches are ineffective, and the resulting loss in capacity can be significant, in which capacity based selection was also considered.

There are two types of relay selections are single user relay selection and multi user relay selection. Single user relay selection based on best relay selection, nearest neighbour selection, best worse channel selection, best harmonic mean selection. Relay ordering schemes such as worse channel ordering, harmonic mean ordering and SNR ordering are used in multi user relay selection.

4.1. No user relay selection, no user relay association

There is no selection and association between user and relays. Randomly user and relay selected and transmits the data to the destination. This performance is mainly degraded by the collision. Delays also affect the performance.

4.2. No user relay selection, yes user relay association

There is no election between user and relays, but there is association between user and relays. User and relay randomly selected and scheduling is performed to transmit the data to the desired destination. Compared to no selection and no association scheme it provides the better results in collision and delay.

5. JOINT USER RELAY SELECTION AND ASSOCIATION

It is a sub optimal scheme, which simultaneously selects multiple relays and users for cooperation as well as assigns the selected users to selected relays for service. That is, three different tasks relay selection, user selection/scheduling, user relay selection are performed concurrently. It reduces the amount of delay and collision is avoided. Better time management provides the efficient performance.

Joint selection and association is a suboptimal scheme. An optimization problem based on a utility matrix \(U\) and association matrix \(\bar{I}\). The row index and column index of \(U\) and \(\bar{I}\) correspond to the UE and RN ID respectively.
U is a predefined utility matrix whose (i, r)th entry \( U_{(i,r)} \geq 0 \) is the system utility achieved, when the ith UE is served by the rth RN. The association matrix \( T \) is a binary matrix (with only 0s and 1s), where an (i, r)th entry of 1 implies that the ith UE and the rth RN are selected and associated with each other. Thus the number of 1s in the rth column gives the number of UEs associated with the rth RN while the number of 1s in the ith row gives the number of RNs the ith UE is associated with.

6. RESULTS
Figure 9: BER vs SNR performance comparison graph

Figure 10: Cumulative distribution function comparison graph

Table 1 Performance comparison

<table>
<thead>
<tr>
<th>Scheme</th>
<th>BER vs SNR</th>
</tr>
</thead>
<tbody>
<tr>
<td>No UE-RN selection and association</td>
<td>Above 0.78</td>
</tr>
<tr>
<td>No UE-RN selection and Yes association</td>
<td>0.76-0.78</td>
</tr>
<tr>
<td>Joint UE-RN selection and association</td>
<td>Below 0.75</td>
</tr>
</tbody>
</table>

7. CONCLUSION

The joint user relay selection and association used to extend the coverage between selected user equipments (UEs) and an evolved node B (eNB). A practical low complexity CSI based joint UE-RN selection and association scheme is proposed for the delay sensitivity of half duplex multi-hop communication networks, which simultaneously selects the RNs and UEs, as well as assigns the selected UEs to different selected RNs for service. Simulation results demonstrate the superiority of the proposed joint scheme compared to a scheme with neither user-relay selection nor user-relay association, and another scheme with user relay association but no user-relay selection. Performance of proposed scheme very attractive for implementation in emerging broadband wireless relay networks.

8. REFERENCES


