IJARCCE

ISSN (Online) 2278-1021
ISSN (Print) 2319 5940

International Journal of Advanced Research in Computer and Communication Engineering
Vol. 5, Issue 1, January 2016

PDF Based Relay In Reactive Dual-Hop Wireless Networks

Thara Elizaba Thomas

M.Tech scholar, Department of ECE, MZCE, Kadammanitta, Pathanamthitta, Kerala

Abstract: Relay transmission plays an important role in future cellular communication system as well as wireless ad hoc and sensor networks ,this is because of its several benefits, such as it increase the system capacity, it extend the radio range and to reduce network infrastructure. In this paper we propose a PDF based relay selection method for dual hop networks. Here the relay selection on the basis of PDF, check each signal and select the best one so it increases the system capacity, reduce interferences and increase diversity. Interferences can be avoided with the help of adaptive filters .Here use only the reactive approach that means, concentrate only the relay to destination section, so it reduces the complexity of the system, and it also decreases the error rate.

Keywords: Average Fairness, Cooperative Diversity, Cumulative Distribution Function (CDF), Outage Probability, Relay Selection.

I. INTRODUCTION

Cooperative diversity is an efficient way to avoid wireless impairments and obtain spatial diversity by using relays. In a cooperative wireless network with multiple relays, one of the most useful techniques for cooperative diversity is relay selection. Relay transmission plays an important role in future cellular network because of the benefits of its low cost and hardware impairments since relay selection schemes are simple to implement practically. Future wireless networks will support relay-based communication, where well-placed relay nodes receive a message from a source node, process it, and forward it to its intended destination node. This will result in performance gains for end-users in systems. Relaying will be especially beneficial when there is no line-of-sight path between the source and the destination. In dense wireless networks, there are typically several fixed relay nodes in the region between the source and the destination. Determining which of these potential relays should be selected is a difficult cross-layer problem. There are different relay selection methods one of the method is CDF based relay selection, here use both the proactive and reactive methods are used .that means the relay selected in the proactive section ie the source to relay section and the best signal select at the reactive section i.e the relay to destination section here we will get only the combined effect and it converts the system more complex. It increases the error rate, selection probability will be low and one of the most important disadvantages is mismatching. The CDF based relay selection increases system capacity, reduces error rate and increase diversity.

The other methods are channel gain based relay selection (CGRS) and cumulative relay selection (CRS) method. the statistics of the channel such as mean and variance are location depending, it leads to reduction in life time of CGRS method, the next method is the CRS method, CRS is more accurate than CGRS and it achieve same diversity as the CGRS method., the concept of physical-layer fairness is dealt with in AF cooperative diversity systems by attributing a weight coefficient to each relay depending on its average channel state. Power reward is used to select the relay and improve the fairness for energy constrained ad hoc networks reactive proportional fair relay selection is proposed. Previous works (CGRS, CRS) focus on strict fairness among relays. However, in a real situation, since relays should have different priority on utilization considering factors such as residual energy, it is needed to control fairness of utilizing relays. .In this paper we propose a PDF based relay selection method for dual hop networks. Here the relay selection on the basis of PDF, check each signal and select the best one so it increases the system capacity, reduce interferences and increase diversity. Interferences can be avoided with the help of adaptive filters .Here use only the reactive approach that means, concentrate only the relay to destination section, so it reduces the complexity of the system, and it also decreases the error rate.

II .EXISTING SYSTEM

CGRS methoduse only the reactive approach and CRS use both the reactive and proactive approach. Compare the average fairness of various relays and outage probabilities.

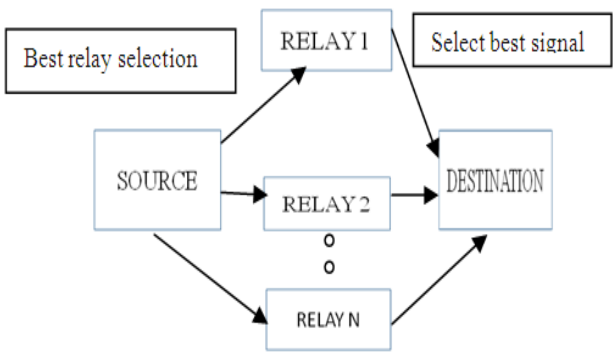


Fig 1: Blockdiagram of existing system

Fig 1 explains the block diagram of existing system. It contains mainly three blocks namely the source, relay and destination

III. SYSTEM MODEL

Consider a cooperative wireless network with a single source S, a single destination D, and the set of K potential relays, i.e., R = {r_1,r_2,...,r_K}. Assume that each node has a single antenna and that all nodes do not transmit and receive signals simultaneously. Moreover, assume that there is no direct path between S and D, and decode-and-forward relaying is adopted.

The received signal at node j from node i is given by yj = hi,jxi + nj

where $h_{i,j}$ is the fading channel coefficient between node i and node j, x_i is a transmitted signal from node i with transmit power P_i, and $n_j \sim CN(0,N_0)$ is the additive white Gaussian noise at node j. Assume that coefficient $h_{i,j}$ is a circularly symmetric complex Gaussian random variable with zero mean and variance $\sigma_{i,j}^2 = \mu(d_{i,j})^{-\alpha}$, where μ is a propagation constant, α is the path-loss exponent, and $d_{i,j} = \bar{d}_{i,j}/d_0$ is a normalized distance between node i and node j in which $\bar{d}_{i,j}$ is the actual distance between them, and d_0 is the reference distance.. consider both proactive and reactive relay selection depending on whether the relay is selected before or after S broadcasts.

1) Proactive CRS Scheme: When the received SNRs at r_k and at D have the values of $\gamma_{S,rk}$ and γ_{rk},D, respectively, a relay is selected such that

$$r^* = \arg\max_{r_k \in \mathcal{R}} \left\{ \min \left\{ (F_{\Gamma_{S,r_k}}(\gamma_{S,r_k}))^{\frac{1}{w_k}}, (F_{\Gamma_{r_k,D}}(\gamma_{r_k,D}))^{\frac{1}{w_k}} \right\} \right\} \quad (2)$$

where $F_{\Gamma S,r}k(\cdot)$ and $F_{\Gamma r}k,D(\cdot)$ are cdfs of $\Gamma_{S,rk}$ and Γ_{rk},D, respectively, and w_k is a nonnegative CP for relay r_k with $\sum_{i=1}^{K} w_k = 1$. After a relay is selected, a signal is transmitted to D in two phases. In the first phase, S broadcasts a signal to all potential relays. The selected relay decodes the received signal and reencodes it. In the second phase, the selected relay transmits the reencoded signal to D.

2) Reactive CRS Scheme: Unlike the proactive CRS scheme, a relay is selected after S broadcasts. Source S transmits a signal to D in two phases. In the first phase, S broadcasts a signal to all potential relays. All relays try to decode the received signal. Let C denote the set of relays that decode the received signal successfully. When the received SNR at D has the value of γ_{rk}, D, a relay is selected such that

$$r^* = \arg\max_{r_k \in \mathcal{C}} \left\{ \left(F_{\Gamma_{r_k,D}}(\gamma_{r_k,D}) \right)^{\frac{1}{w_k}} \right\}—$$

where $\sum_{r_k \in \mathcal{C}} w_k = 1$. The selected relay reencodes the received signal. In the second phase, the selected relay transmits the reencoded signal to D.

IV. PERFORMANCE ANALYSIS OF PROACTIVE CRS SCHEME

A. Average Fairness

We analyze the average fairness among all potential relays. Let ζ_{rk} denote the ratio of the probability of selecting r_k to the sum of probabilities of selecting r_l, l = 1,2,...,K, that is

$$\zeta_{r_k} = \frac{\Pr(r^* = r_k)}{\sum_{l=1}^{K} \Pr(r^* = r_l)}. \quad (4)$$

Then, the average fairness of the network with K relays is given

$$\mathcal{F} = -\sum_{k=1}^{K} \zeta_{r_k} \frac{\log_2(\zeta_{r_k})}{\log_2(K)}$$

B. Outage Probability

An outage occurs when the end-to-end SNR at D via the selected relay is smaller than the SNR threshold γ_{th}. The outage probability is given by

$$P_{\text{out}} = \sum_{k=1}^{K} \int_0^{\gamma th}$$

where $f_{\Gamma r}k(\cdot)$ is the pdf of Γ_{rk}. Let the random variable $U_{S,rk}$ be defined as $U_{S,rk} = F_{\Gamma S,r}k(\Gamma_{S,rk})$. Then, $U_{S,rk}$'s are i.i.d. uniform random variables in the interval [0, 1] [14].

V. PERFORMANCE ANALYSIS OF REACTIVE CRS SCHEME

A. Average Fairness

There are $\binom{K-1}{m-1}$ subsets that have cardinality m and contain r_k among all subsets of R. Let $R^k_{m,n}$ denote the nth subset among them for $n = 1, 2, \ldots, \binom{K-1}{m-1}$. Then, the probability of selecting r_k is given by

$$\Pr(r^* = \sum_{m=1}^{K} \sum_{n=1}^{\binom{K-1}{m-1}} \Pr\left(r^* = r_k | \mathcal{C} = \mathcal{R}^k_{m,n}\right) \Pr\left(\mathcal{C} = \mathcal{R}^k_{m,n}\right). \quad (16)$$

The probability that C is equal to $R^k_{m,n}$ is given by

$$\mathbf{Pr}\left(\mathcal{C} = \mathcal{R}^k_{m,n}\right) = \Pr(r_k \in \mathcal{C})_\times \prod_{r_i \in \mathcal{R}^k \setminus \{r_k\}} \Pr(r_i \in \mathcal{C}) \prod_{r_j \notin \mathcal{R}^k_{m,n}} \mathbf{Pr}(r_j \notin \mathcal{C}). \quad (17)$$

The probability that r_i belongs to C is given by $\Pr(r_i \in C) = \exp(-\gamma_{th}/\lambda_{S,ri})$. Let the random variable U_{rk},D be defined as $U_{rk},D = F_{\Gamma r}k,D(\Gamma_{rk},D)$. Then, U_{rk},D's are i.i.d. uniform random variables in the interval [0, 1] [14].

B. Outage Probability

An outage occurs when the received SNR at D from the selected relay is smaller than the SNR threshold γ_{th} or the decoding set is empty. The outage probability is given by

ISSN (Online) 2278-1021
ISSN (Print) 2319 5940

International Journal of Advanced Research in Computer and Communication Engineering
Vol. 5, Issue 1, January 2016

$$P_{out} = \sum_{k=1} \int_{0}^{\gamma th} KPr(r^{*}= r_k|\Gamma_{rk},D = \gamma)f_{\Gamma r}k,D\ (\gamma)d\gamma$$

where P_e is the probability that all potential relays do not decode the received signal successfully, which is given by $P_e = \prod_{i=1}^{K}\{1 - \exp(-\gamma_{th}/\lambda_{S,ri})\}$. The probability of selecting r_k given that the received SNR of r_k is γ and the decoding set C is equal to $R_{m,n}^{k}$

VI. PROPOSED SYSTEM

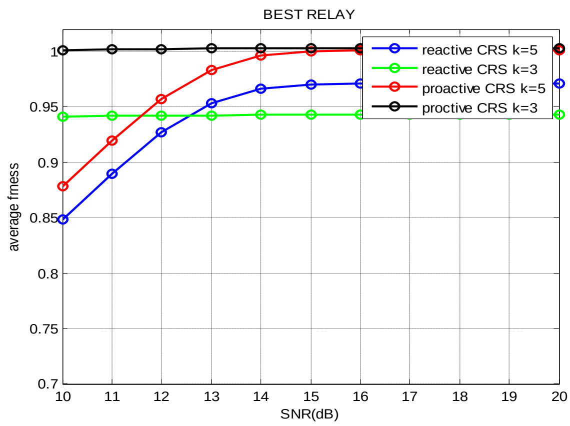
The proposed system relay selection is on the basis of PDF, here check each signal and select the best signal with the help of control parameter. It increases system capacity so here plot SNR verses Capacity., as SNR increases system capacity also increases and also plot outage probabilities of relays and compare it with the existing system,it shows that the outage probabilities is lower than existing that means better error rate.

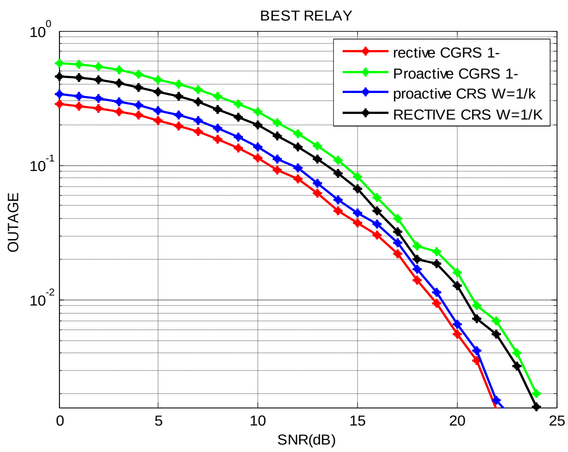
VII. PERFORMANCE EVALUATION

By using matlab compare the performances of the average fairness among relays ,outage probabilities of existing and proposed system

A. SNR vs AVERAGE FAIRNESS

As SNR increases average fairness increases For W= 1/K and K=1



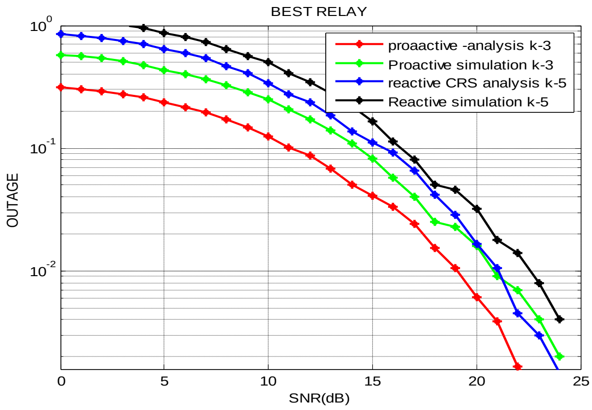


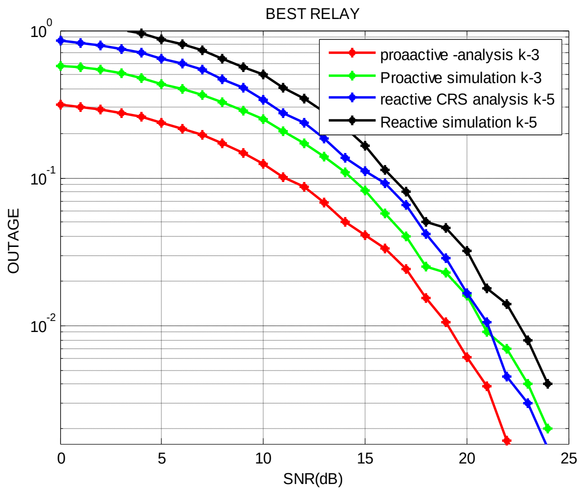
B. SNR vs VARIOUS OUTAGE PROBABILITIES

It shows that as the SNR increases the outage also decreases and it is lower than existing system. so better error rate. For K=5 for reactive

For K=3, 5

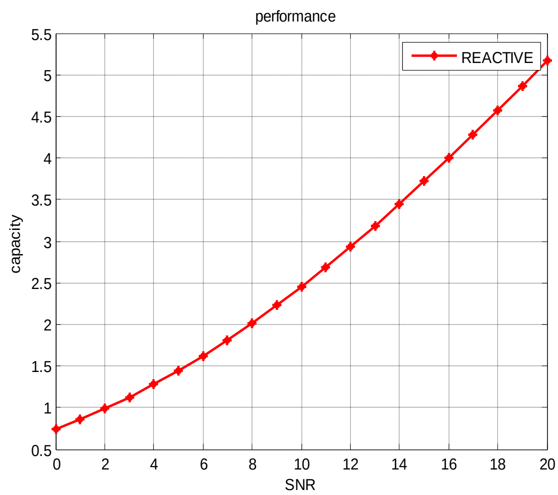
K is the number of relays; it shows that probability decreases downwards





A. SNR vs CAPACITY

As SNR increases Capacity increases, if capacity increases the system has better error rate.



DOI 10.17148/IJARCCE.2016.51106

VIII. CONCLUSION

Here analyze the average fairness among relays and shows that as SNR as average fairness increases, here use adaptive filters so it help to reduce interference in dual hop networks and shows that outage probability decreases as SNR increases, so will get better error rate, and also shows the SNR verses capacity curve it results that SNR increases capacity also increases and achieve full diversity.

ACKNOWLEDGMENT

I sincerely thank to all those who helped me in completing this task.

REFERENCES

[1] A.lkhlef, D.S. Michalopoulos, H. A. Suraweera. G. K. Karagiannidis, and R. Schober. "Amplify-and-forward relay selection with outdated channel estimates," IEEE Trans. Commun., vol. 60, no. 5,pp.1278-1290,May 2012.

[2] A.Bletsas, A.Khisti, D.P.Reed. and A.Lippman," A simple cooperative diversity method based on network path selection," IEEE J.Sel. Areas Commun.,vol.24, no.3, pp.659-672, Mar.2006.[2] A.Nostratina, T.E.Hunter, an A. Hedayat."Co-operative communication wireless networks," IEEE Commun.Mag, vol.42, no.10, pp.74-80,Oct.2012

[3] A. Bletsas, A. Khisti,D .P. Reed.and A. Lippman," A simple cooperative diversity method based on network path selection,"I EEE J.Sel.Areas Commun.,vol.24,no.3,pp.659-672,Mar.2006.[2] A. Nostratina, T.E. Hunter ,and A. Hedayat."Co-operative communication wireless networks," IEEE Commun.Mag, vol.42, no.10, pp.74-80, Oct.2012

[4] D.S. Michalopoulos and G.K Karagiannidis, ''PHY-layer fairness in amplify and forward cooperative diversity systems," IEEE Trans. Wireless Commun.,vol. 7,no.3,pp.1073-1083,Mar.2010.

[5] A. Nostratina, T.E. Hunter, and A. Hedayat. "Co-operative communication wireless networks," IEEE Commun. Mag, vol.42, no.10, pp.74-80, Oct.2009