Power Allocation and Relay Selection in Amplify-and-Forward Relaying

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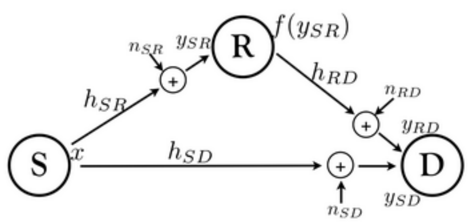

Fig. 1. Two slots in AF

***Abstract*—Multihop communication is considered to be a standard in next generation cellular networks. There are several relaying schemes, Decode-and-forward(DF) and Amplify-and-Forward(AF) being the popular ones. In DF scheme, the relay decodes the message from the source, re- encodes and transmits it to the destination node whereas in AF the relay amplifies the received signal and transmits to the destination node. Relay selection and optimal power allocation are the two important aspects in either scheme. In this work, we look at these two problems in 2- hop communication network in which relays employ AF scheme. To make the power allocation problem well-defined we prove that rate/capacity is a concave function of both source and relay powers. Once concavity is established, we can find the optimal relay and source powers. However, when there are multiple relays the power allocation might interfere with relay selection. We show that this is indeed the case and discuss the conditions under which a relay switch over can take place.**

I. Introduction

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A. Subsection Heading Here

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II. Amplify-and-Forward Relaying

Consider 2-hop relaying; we have a source node, the destination, and a relay node. In amplify-and-forward(AF) relaying scheme, the total transmission period is divided in to two slots. In the first slot, source node broadcasts the message to relay and destination nodes and in the second the relay amplifies the received signal and retransmits it to the destination node. This is illustrated in Fig 1.

A. Received Signals

The signals received at relay and destination nodes in the two slots are as follows:

First Slot:

$$Y_{sd} = \sqrt{P_s G_{sd}} X_s + n_{sd}$$
$$Y_{sr} = \sqrt{P_s G_{sr}} X_s + n_{sr}$$

Second Slot:

$$Y_{rd} = \sqrt{P_r G_{rd}} X_{rd} + n_{rd} \tag{1}$$

$$Y_{rd} = \frac{\sqrt{P_r G_{rd} P_s G_{sr}}}{\sqrt{P_s G_{rd} + \sigma^2}} X_s + \frac{\sqrt{P_r G_{rd}}}{\sqrt{P_s G_{rd} + \sigma^2}} n_{sr} + n_{rd} \tag{2}$$

The final expression for Y_{rd}(eq. 2) is obtained by substituting $X_{rd} = \frac{Y_{sr}}{|Y_{sr}|}$ in eq. 1. All symbols have usual meanings; s denotes source, P denotes power etc

B. Rate

The rate/capacity of AF relaying scheme is given by

$$R = \frac{1}{2} w \log_2(1 + \Gamma_{sd} + \Gamma_{srd})$$

where Γ represents SNR

$$R = \frac{1}{2} w \log_2 \left(1 + \frac{P_s g_{sd}}{\sigma^2} + \frac{P_s g_{sr} P_r g_{rd}}{\sigma^2(\sigma^2 + P_s g_{sr} + P_r g_{rd})}\right)$$

III. Source power and Relay selection

IV. Future Work

V. Conclusion

The conclusion goes here.

References

[1] H. Kopka and P. W. Daly, *A Guide to LaTeX*, 3rd ed. Harlow, England: Addison-Wesley, 1999.