# Interference Mitigating in Wireless Networks Using Prior Knowledge

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***Abstract*— We propose a framework to mitigate the interference in high data rate mobile wireless networking. Interference is a fundamental obstacle to achieve high data rates in wireless networking. However, a systematic approach to deal with this problem has not yet been addressed in the context of routing in multi-hop networks. In traditional decoding schemes, interference is assumed as additive white Gaussian noise (AWGN), even though in many occasions it is in fact correlated with previous available data. Thus, in order to optimize performance, it is necessary to exploit such correlation in the decoding process. This is done by interpreting the problem as one of transmission over multiple access channels with *a priori* information.**

***Index Terms*— Multi-hop wireless networks, interference mitigating decoding, interference aware decoding.**

## I. Introduction

The development of high data rate mobile wireless networking is essential in many environments, including military applications. However, interference is a fundamental obstacle to high throughput and has not yet been systematically addressed in the context of routing in multi-hop networks. In traditional decoding schemes, interference is assumed as additive white Gaussian noise (AWGN), even though in many occasions interference is in fact correlated with previous available data. Thus, in order to optimize performance, it is necessary to exploit such correlation in the decoding process.

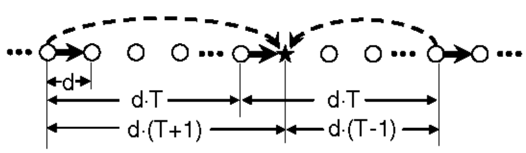


Fig. 1. The string topology. Each node transmits once every T time-slots. Nodes are uniformly spaced d meters apart. The direct transmission is shown with a solid line and interference is shown with a dashed line.

In order to understand the impact of interference and motivate the proposed work, consider the simple string topology shown in Figure 1. Let us temporarily assume that the bit-rate of links is given by

$$BR = BW \log_2(1 + SNIR), \qquad (1)$$

where $BW$ is the bandwidth, and $SNIR$ is the ratio of the signal to inference and noise. We further assume that a single channel is used, nodes are synchronized and nodes follow a common TDM schedule. Specifically, we assume that each node transmits once per $T$ time-slots and that when a node receives a packet in one time-slot, it transmits it in the next time-slot. The result of this scheme is that transmitting nodes upstream and downstream of a receiving node will interfere with the reception. For ease of discussion, assume that the nodes are uniformly spaced $d$ meters apart, and that the propagation environment is such that the received signal power strength is $KP_T/d^\alpha$, where $K$ is a constant, $\alpha$ is the attenuation exponent and $P_T$ is the transmission power, which, we assume, is common to all transmitters.

Under these assumptions, the average received bit-rate by any node is

$$BR(T) = \frac{BW}{T} log_2 \left(1 + \frac{KP_T/d^\alpha}{N + \sum_{j=1}^{\infty} KP_T/(d(jT-1)^\alpha) + \sum_{j=1}^{\infty} KP_T/(d(jT+1)^\alpha)}\right), \qquad (2)$$

where $N$ is the variance of noise and the $\sum_{j=1}^{\infty} KP_T/(d(jT-1)^\alpha)$ and $\sum_{j=1}^{\infty} KP_T/(d(jT+1)^\alpha)$ terms account for interference from the downstream and upstream transmission, respectively. Furthermore, since the node only transmits once out of every $T$ time-slots, the average bit-rate is the bit-rate achieved during reception divided by $T$. For ease of presentation, we focus only on the most significant source of interference, which is from the node that is $T-1$ hops upstream. If we assume that the transmission power is large enough so that the noise is substantially smaller than the interference, and can be neglected, we obtain

$$\begin{aligned} BR(T) &\leq \frac{BW}{T} \log_2 \left(1 + \frac{KP_T/d^\alpha}{KP_T/(d(T-1))^\alpha}\right) \\ &= \frac{BW}{T} \log_2 \left(1 + (T-1)^\alpha\right). \end{aligned} \qquad (3)$$

Several comments are in order. First, note that internode distance and transmission power play no role in the bit-rate (assuming the transmission power is large enough so that the noise can be neglected). Second, $BR(T)$ reaches a maximum for small $T$. For example, if $\alpha = 2$, then the maximum is achieved with $T = 4$ and is $0.8 \times BW$, for $\alpha = 3$, the maximum occurs at $T = 5$ and is $1.2 \times BW$, and for $\alpha = 4$, the maximum occurs at $T = 5$ and is $1.6 \times BW$. Hence, if $\alpha = 2$ and if $BW = 20$ MHz (as in the case of 802.11b/g), then the maximum achievable bit-rate over a string topology is a mere 16 Mbps. Today's physical layers such as 802.11g boast bit-rates of 54 Mbps and even 104 Mbps if the inter-node distance is small (i.e., if the SNR is high). However, without new approaches, such as the ones proposed here, such bit-rates are not possible when applied to multi-hop wireless networks.

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In summary, there is no way to reduce the impact of interference by traditional means. Thus, we propose to develop decoding methods that can eliminate interference by exploiting prior knowledge. The use of these techniques will provide data rates above the limit defined in (2). Specifically, we present two novel decoding schemes aimed at improving performance in this context. The first approach is referred to as *interference aware decoding*, and takes into account the fact that the statistics of the interference are different from those of noise. The second, more powerful one, is called *interference mitigating decoding*, and makes use of the correlation existing between the interference and previously received data to achieve an improved performance. Both schemes treat transmission as a multiple access channels, and thus they can be interpreted as a problem of multiple access with several users and *a priori* information.

During the last years, there has been a substantial amount of work in multi-hop networks and the special case of relay channels. Much of this work has focused on the case where the interference is assumed as AWGN and traditional decoding is performed [1], which is "order" optimal when the number of nodes increases. From a networking perspective, an approach aiming at cancelling interference when channel coding is not considered has appeared in [2]. From an information theoretical perspective, interference cancellation utilizing backward decoding [3], [4], which leads to substantial delays that grow exponentially with the number of nodes, has been discussed in [5]. These delays can be eliminated with the use of sliding-window decoding [6], utilized in [1], [7], [8], [9] to study theoretical limits of relay channels. As indicated in [9], the design of practical codes aiming at achieving the theoretical performance is an open research problem. Indeed, the proposed *interference mitigating decoding scheme* can be seen as a practical (and simplified, thus not necessarily optimal) implementation of sliding-window decoding. For the case of a simple relay system, an approach related to our proposed techniques has been presented in [10], where instead of the block-by-block decoding utilized here and in [7], [9], joint decoding over all blocks is performed. Although this technique approaches capacity in the relay channel, it suffers from substantial delays and is unpractical in multi-hop systems. Therefore, the development of practical coding schemes aimed at mitigating the interference in multi-hop networks, such as the ones proposed here, is an open problem of great interest.

The proposed techniques have their roots in previous work from our group on transmission of correlated senders over multiple access channels (MAC). In fact, the interference existing at each node can be considered as a linear combination of multiple users, with each user corresponding to a node in the network. However, the work in this paper presents several differences with respect to standard multiuser schemes. First, we have *a priori* information about several of the users, which in the *interference mitigating decoding* scheme will be used in the decoding process to improve performance. Second, the final objective is not to jointly decode all the users as in standard multiuser systems, but to i) recover the user of interest, ii) provide estimates about the other users that will be employed as *a priori* information in later decoding stages.

Notice that we are substituting the spreading and channel encoding in standard CDMA systems by direct encoding with lower rate channel codes (as first proposed using orthogonal very low-rate convolutional codes in [11]), which theoretically is a capacity achieving approach [11], [12]. In the application at hand, the advantage of the proposed system is that it can easily deal with the *a priori* information. Previous work utilizing this approach in the field of multiuser decoding (which is related, but not equivalent to the proposed schemes for interference cancellation, see the caveats mentioned in the previous paragraph) has appeared in [13-22]. Decoding is performed by applying message passing or belief propagation [23], [24] over the decoding graph representing all users.

## II. Techniques to Decode Transmissions in the Presence of Interference

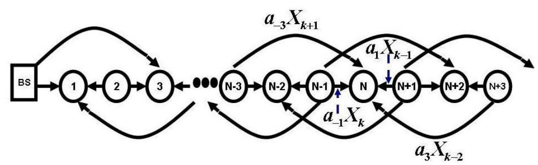


Fig. 2. An even time-slot is shown where all odds numbered nodes transmit and even numbered nodes receive the sum of all transmissions.

In order to illustrate the proposed interference mitigation schemes, we consider two simple topologies, the string topology and star topology.

### A. String Topology

In the string topology shown in Figure 2, a given node transmits and receives information at consecutive times (i.e., it receives information at odd (even) times, and it transmits information at even (odd) times). As described before, in traditional schemes $T$ must be 3 or more. Here, we examine the possibility of using $T = 2$. The packet propagates from left to right. Consider the time-slot where each odd numbered node transmits. These nodes take data packet $U_k$, encode it with a channel code of rate $R$ into a frame $X_k$, and then transmit the frame through the channel. Node $N-1$ transmits $X_k$, node $N+1$ transmits $X_{k-1}$, etc. Each even numbered node is not transmitting and hence receives attenuated transmissions from odd numbered nodes. That is, node $N$ receives $Y = X_k + a_{-3}X_{k+1} + a_{-5}X_{k+2} + \cdots + a_1X_{k-1} + a_3X_{k-2} + \cdots + Z$, where $Z$ is additive white Gaussian noise, $a_{-m}$ denotes the attenuation between node $N$ and the node that is $m$ hops upstream and $a_m$ is the attenuation between node and the node $m$ hops downstream. In a simple propagation environment, $a_k = K/\left(|k|d\right)^{\alpha/2}$. Note that the received signal strength is normalized so that $X_k$ is not attenuated. In order to illustrate the proposed method (and to simplify the analysis), we assume that interference at a node $N$ is limited to that proceeding from nodes $N-3$ and $N+1$ (as we will see later, interference from the nodes downstream has no degrading effect, since it can be completely eliminated) and that all nodes are equally spaced. Thus, the signal received by node $N$ is given by $Y = a_{-3}X_{k+1} + X_k + a_1X_{k-1} + Z$.

Consider the behavior of node 3, the node three hops from the base station. And consider the first few time-slots when transmissions begin. Specifically

- time-slot 1: $Y_1 = a_{-3}X_1 + Z_1$
- time-slot 3: $Y_3 = a_{-3}X_2 + X_1 + Z_3$
- time-slot 5: $Y_5 = a_{-3}X_3 + X_2 + a_1X_1 + Z_5$
- time-slot 7: $Y_7 = a_{-3}X_4 + X_3 + a_1X_2 + Z_7$.

Note that we ignore the even time-slots when node 3 is transmitting, and hence, unable to receive. The objective of node 3 is to obtain $U_k$ during the $2k+1$ time-slot. We examine two approaches to achieve this objective. The first approach is referred to as *interference aware decoding* and uses the fact that during time-slot 3, the interference $a_{-3}X_2$ is not random noise, but a data transmission. Thus, multiple access decoding with two users allows $U_1$ to be decoded in the presence of $a_{-3}X_2$.

The second method is called *interference mitigating decoding*. This approach takes two steps and at each step produces an estimate of the packet. First, during time-slot 1, node 3's estimate of $U_1$ is denoted $\hat{U}_1$. This estimate is based on the perhaps weak signal $a_{-3}X_1$. Next, during time-slot 3, node 3 makes a second estimate of $U_1$, we denote this estimate as $\hat{\hat{U}}_1$. This reestimation is performed by applying message passing (belief propagation) in the graph relating equations for time-slot 1 and 3 with the information packets $U_1$ and $U_2$. Figure 3 shows the block diagram of the decoding process. Notice that the first stage is performed via standard decoding, while the second stage represents a multiple access channel, $Y_3 = a_{-3}X_2 + X_1 + Z_3$, which has been analyzed under many conditions by our research group. Similarly, interference aware decoding also treats the transmission as a multiple access channel. In the case of interference aware decoding, the distribution of the interference is known, while the interference mitigating approach not only uses this distribution, but also makes use of a prior estimate of $U_1$ that was found in the first stage. Several important points have to be remarked:

- Assuming that $U_1$ is perfectly recovered by node 3 in time-slot 3 (i.e., $\hat{\hat{U}}_1 = U_1$), and since the corresponding equations in node 4 are equivalent, we can also assume that node 4 successfully recovers $U_1$ in time-slot 4.
- Assuming that $U_1$ is perfectly recovered by node 3 in time-slot 3, the statistics of $\hat{U}_2$ are equivalent to the statistics of $\hat{U}_1$. This occurs because $X_1$ is then known, and hence can be "subtracted"[1] from $Y_3$. Thus, in essence, $Y_3' = a_{-3}X_2 + Z_3$, which is of the same form as time-slot 1, where $\hat{U}_1$ is obtained.
- If we look at the equation corresponding to time-slot 5, we observe the term $a_1X_1$, which is interference proceeding from node 4. Notice, however, that as indicated in the previous bullets $U_1$ is perfectly known in nodes 3 and 4. Thus, as indicated at the beginning of the section, such interference (and in general, all interference proceeding from the right nodes) can be eliminated and does not have any effect in the system performance (notice that after this step, and since the statistics of $U_1$ and $U_2$ are equivalent, the equation in time-slot 5 is equivalent to the equation in time-slot 3).

By repeating these arguments (with the assumption that $\hat{\hat{U}}_1$ is perfectly recovered by node 3 in time-slot 3), all the messages $U_k$ will be perfectly recovered in every node. Therefore, in order to assess the network performance, we just need to determine under what conditions $\hat{\hat{U}}_1$ is perfectly recovered. Thus, in the sequel we only simulate the system described in Figure 3.

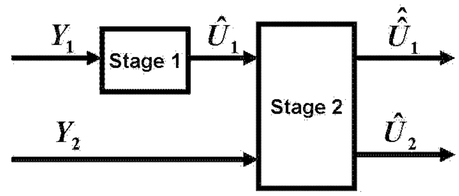


Fig. 3. Interference mitigating decoding in string topology decodes packet in two stages.

## B. Star Topology

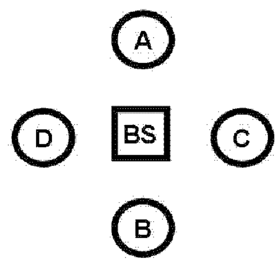


Fig. 4. Star topology with 4 nodes around base station.

In the star topology shown in Figure 4, four nodes are at the vertices of a square, and the center of this square is the base station. The idea is that the base station has to transmit data through four different paths (up, bottom, right and left). Besides the base station, which transmits at every time slot, only one node transmits information at a given time slot (while the other ones are receiving). There is an order for nodes' transmission, which is assumed to be A, B, C, and D. At the first time-slot, all four nodes receive signal $X_1$ from the base station:

- $Y_1^A = X_1 + Z_1^A$
- $Y_1^B = X_1 + Z_1^B$
- $Y_1^C = X_1 + Z_1^C$
- $Y_1^D = X_1 + Z_1^D$.

Node A transmits the estimate of $X_1$ during the second time-slot (this information will move upwards), while the other three nodes, B, C, and D, receive signal $X_2$ from the base station and the estimate of $X_1$ as interference proceeding from node A:

- $Y_2^A = -$
- $Y_2^B = X_2 + aX_1 + Z_2^B$
- $Y_2^C = X_2 + bX_1 + Z_2^C$
- $Y_2^D = X_2 + bX_1 + Z_2^D$.

[1]In practice, $X^1$ is not substracted, but $\hat{U}_1$ and $\hat{U}_2$ are jointly estimated.

At the third time-slot, node B transmits the estimate of $X_2$ (which will move downwards), and all other nodes receive $X_3$ from the base station plus the estimate of $X_2$ as interference proceeding from node B. This process continues with node C transmitting at time-slot 4, and node D transmitting at time-slot 5 (the base station always transmits). Then, the cycle gets repeated so that node A should receive the information $(U)$ corresponding to packets $X_1$, $X_5$, $X_9 \ldots$, node B the information from packets $X_2$, $X_6$, $X_{10} \ldots$, node C from packets $X_3$, $X_7$, $X_{11} \ldots$, and node D from packets $X_4$, $X_8$, $X_{12} \ldots$.

In a simple propagation environment, and assuming that the distance between the base station and the nodes is $d = 1$, $a = 1/2^{\alpha/2}$, and $b = 1/\sqrt{2}^{\alpha/2}$. $Z$ is assumed to be AWGN. Because of the topology, the interference in the nodes of all branches (up, bottom, right and left) will be very small except for nodes A, B, C, and D. Thus, in order to characterize the system, it is enough to guarantee reliable communications in these nodes.

The objective in node A is to obtain $U_5$, the information corresponding to packet $X_5$, during time-slot 5 (notice that successful recovery of $U_5$ at time-slot 5 means that the information messages $U_k$ will be recovered in every node. Thus, for simulation purposes we just need to investigate this problem). In the *interference aware decoding* scheme, the interference during time-slot 5 is not random noise, but a data transmission. Multiple-access decoding allows $U_5$ to be decoded in the presence of $bX_4$.

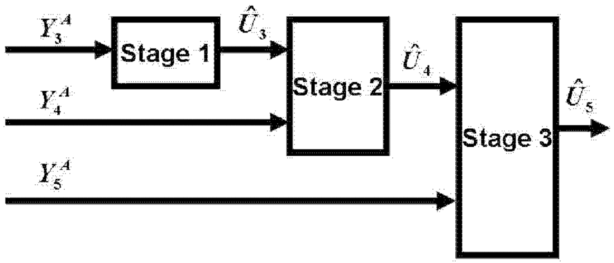


Fig. 5. Interference mitigating decoding for a star topology with 4 nodes decodes packet in three stages.

In the case of *interference mitigating decoding*, it takes three steps to decode $U_5$. As shown in Figure 5, during time-slot 3, node A's estimate of $U_3$ is denoted $\hat{U}_3$. Next, during time-slot 4, node A uses $\hat{U}_3$ as a priori information to obtain an estimate of $U_4$, denoted as $\hat{U}_4$. Again, during time-slot 5, node A makes use of $\hat{U}_4$ to obtain the estimate of $U_5$. This decoding process is performed by applying message passing (belief propagation) in the equations for time-slots 3 to 5, where each stage represents a multiple access channel in which all *a priori* information is exploited.

We also consider a star topology with five nodes at the vertices of a pentagon whose center is the base station. The idea is that the base station has to transmit data through five different paths. Besides the base station, which transmits at every time slot, only one node transmits information at a given time slot (while the other ones are receiving). There is an order for nodes' transmission, which is assumed to be A, B, C, D, and E. At the first time-slot, all five nodes receive signal $X_1$ from the base station:

- $Y_1^A = X_1 + Z_1^A$
- $Y_1^B = X_1 + Z_1^B$
- $Y_1^C = X_1 + Z_1^C$
- $Y_1^D = X_1 + Z_1^D$
- $Y_1^E = X_1 + Z_1^E$.

Node A transmits the estimate of $X_1$ during the second time-slot (this information will move upwards), while the other four nodes, B, C, and D, and E, receive signal $X_2$ from the base station and the estimate of $X_1$ as interference proceeding from node A:

- $Y_2^A = -$
- $Y_2^B = X_2 + bX_1 + Z_2^B$
- $Y_2^C = X_2 + cX_1 + Z_2^C$
- $Y_2^D = X_2 + cX_1 + Z_2^D$
- $Y_2^E = X_2 + bX_1 + Z_2^E$.

At the third time-slot, node B transmits the estimate of $X_2$ (which will move downwards), and all other nodes receive $X_3$ from the base station plus the estimate of $X_2$ as interference proceeding from node B. This process continues with node C transmitting at time-slot 4, node D transmitting at time-slot 5, and node E transmitting at time-slot 6 (the base station always transmits). Then, the cycle gets repeated so that node A should receive the information $(U)$ corresponding to packets $X_1$, $X_6$, $X_{11} \ldots$, node B the information from packets $X_2$, $X_7$, $X_{12} \ldots$, node C from packets $X_3$, $X_8$, $X_{13} \ldots$, node D from packets $X_4$, $X_9$, $X_{14} \ldots$, and node E from packets $X_5$, $X_{10}$, $X_{15} \ldots$.

In a simple propagation environment, $c = 1/(1.18d)^{\alpha/2}$, and $b = 1/(1.9d)^{\alpha/2}$. Z is assumed to be AWGN. Because of the topology, the interference in the nodes of all branches will be very small except for nodes A, B, C, D and E. Thus, in order to characterize the system, it is enough to guarantee reliable communications in these nodes.

The objective in node A is to obtain $U_6$, the information corresponding to packet $X_6$, during time-slot 6 (notice that successful recovery of $U_6$ at time-slot 6 means that all nodes will be able to recover the information of interest at the desired times. Thus, for simulation purposes we just need to investigate this problem). In the *interference aware decoding* scheme, the interference $bX_5$ during time-slot 6 is not random noise, but a data transmission. Multiple-access decoding allows $U_6$ to be decoded in the presence of $bX_5$.

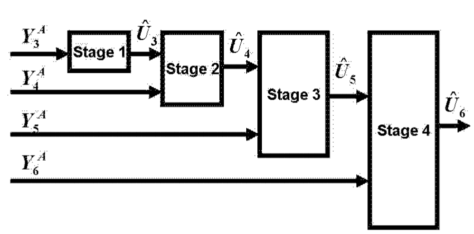


Fig. 6. Interference mitigating decoding for a star topology with 5 nodes decodes packet in four stages.

In the case of *interference mitigating decoding*, the process is similar to that of the star topology with 4 nodes, except that, as shown in Figure 6, another stage (total of 4) is necessary for the decoding of $U_6$.

## III. Simulation Results

### A. String topology

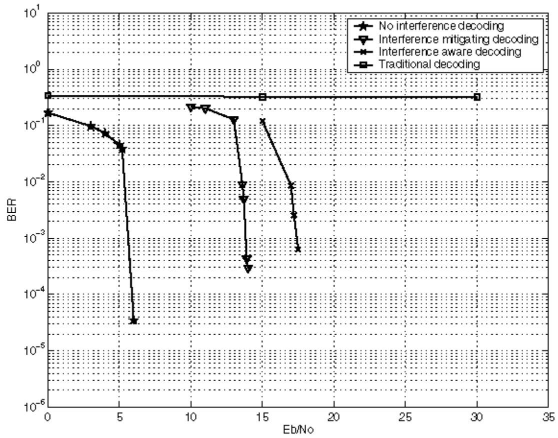


Fig. 7. For the string topology, performance of interference mitigating and interference aware decoding methods. In these plots it is assumed that the amplitude of the interfering signal is one third of the amplitude of the primary signal.

Figure 7 shows four sets of relationships between bit error rate and $SNR$ for the stream topology. In all cases the data rate is 3 information bits per channel. Each packet, $U_k$, has 7500 bits and is encoded utilizing bit interleaved coded modulation (BICM) with a 16 QAM constellation and a channel code of rate $R_c = 3/4$ consisting of the serial concatenation of 2 LDGM codes. First, we assume that $a_{-3} = 1/3$. This value is relevant to the case when nodes are uniformly spaced.

Notice that if the traditional approach is followed where interference is assumed to be AWGN, then reliable communications would be impossible with practical codes, since the operational rate of 3 information bits per channel use is approximately the same as capacity. The poor performance of traditional decoding can be seen by the nearly flat relationship between $SNR$ and bit error rate. Figure 7 also presents the performance of interference aware decoding. This shows that if the $SNR$ is high enough ($> 20\ dB$), then it is possible to correctly decode the transmission even in the presence of interference. The figure also shows that if interference mitigating decoding is used, then the packet can be correctly decoded if the $SNR$ is better than $12\ dB$. For reference purposes, Figure 7 includes the relationship between the $SNR$ and bit-error when there is no interference (i.e., $a_{-3} = 0$).

For different values of $a_{-3}$, the $SNRs$ ($E_b/N_0$) at which packets can be correctly decoded are different. Figure 8 shows these $SNRs$ (for $BER < 10^{-5}$) corresponding to $a_{-3} = 0.2, 1/3, 0.4, 0.6$ and $0.8$ for both *interference mitigating* and *interference aware decoding*. As expected, the $SNRs$ for *interference mitigating decoding* are lower than for *interference aware decoding*.

For *interference mitigating decoding*, it can be seen that the value of $SNR$ increases with $a_{-3}$ until $a_{-3} = 0.4$. After that point, the $SNR$ decreases when $a_{-3}$ increases. The

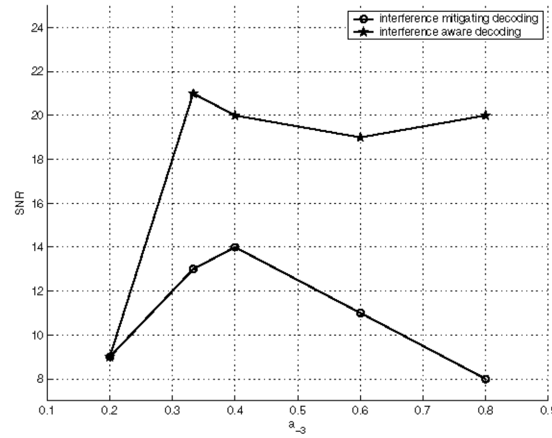


Fig. 8. For the string topology, required SNR for reliable information transmission ($BER < 10^{-5}$) as a function of the interference power.

explanation for this behavior is that decoding performance in the first stage is better if $a_{-3}$ is higher. Since the information from the first stage is passed to the second one, the increase in $a_{-3}$ improves the *a priori* information available in the second stage, and thus positively affects the overall performance (however, interference gets stronger in the second stage by the increase of $a_{-3}$). On the other hand, if $a_{-3}$ is very small, the estimate $\hat{U}_1$ in the first stage is bad, but interference in the second stage is also small when $a_{-3}$ is small, which leads to good overall performance. Thus, there is a trade-off between increasing $a_{-3}$ (better quality in the first stage but worse quality in the second) and decreasing it (better quality in the second stage, but worse quality in the first). Therefore, it is reasonable to expect that values of $a_{-3}$ in the middle range will lead to the best overall performance.

In the *interference aware decoding* scheme, it can be seen that the value of $SNR$ increases as $a_{-3}$ increases until $a_{-3} = 1/3$. After that point, $SNR$ decreases a little bit, and then keeps flat. Since in this method interference is treated as data transmission instead of noise, it is reasonable to think that higher values of $a_{-3}$ will result in stronger interference, and thus in worse performance. However, due to the 16 QAM labeling, the case in which $a_{-3} = 1/3$ does indeed lead to the worst possible interference, which explains the behavior of the $SNR$ curve.

### B. Star topology

Figure 9 shows four sets of relationships between bit error rate and SNR for the star topology with 4 nodes. In all cases the data rate is 3 information bits per channel. Each packet, $U_k$, has 7500 bits and is encoded utilizing bit interleaved coded modulation (BICM) with a 16 QAM constellation and a channel code of rate $R_c = 3/4$ consisting of the serial concatenation of 2 LDGM codes. It is assumed that $a = 1/2$ and $b = 1/\sqrt(2)$ ($\alpha = 2$). These values are relevant to the case when nodes are uniformly spaced. The poor performance of traditional decoding can be seen by the nearly flat relationship between SNR and bit error rate. Figure 9 also presents the performance of *interference aware decoding*. This shows that if the SNR is high enough, then it is possible to correctly

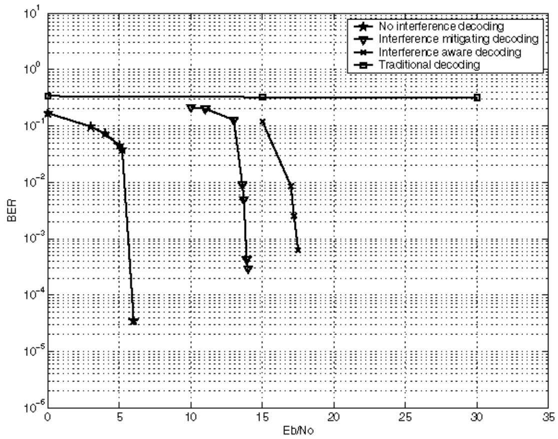


Fig. 9. Performance of interference mitigating and interference aware decoding methods for a star topology with 4 nodes.

decode the transmission even in the presence of interference. The figure also shows that if *interference mitigating decoding* is used, then the packet can be correctly decoded if the SNR is better than 15 dB. For reference purposes, Figure 9 includes the relationship between the SNR and bit-error when there is no interference. Notice that *interference mitigating decoding* outperforms *interference aware decoding* in about 3 dB.

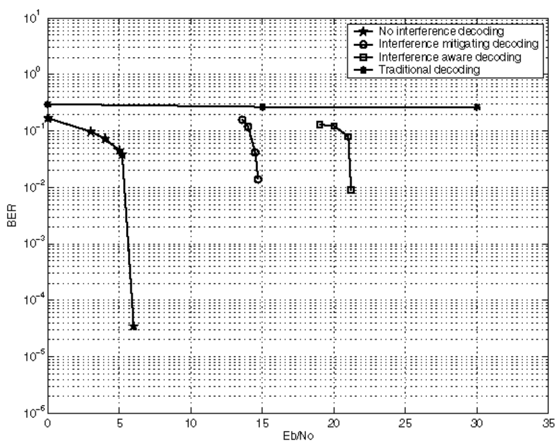


Fig. 10. Performance of interference mitigating and interference aware decoding methods for a star topology with 5 nodes.

Figure 10 shows the same curves for the star topology with 5 nodes. The system is the same as in the star topology with 4 nodes, except that it is assumed now that $a = 0.85$ and $b = 0.53$ ($\alpha = 2$). These values are relevant to the case when nodes are uniformly spaced. The performance obtained here is very similar to that of the star topology with 4 nodes, except that the difference between *interference mitigating decoding* and *interference aware decoding* is even greater, with the former outperforming the latter in more than 6 dB.

## IV. Conclusion

We have proposed a framework to mitigate the interference in high data rate mobile wireless networking, easily outperforming traditional decoding approaches. Although in order to illustrate the proposed techniques we have only considered simple models with interference limited to that of two neighboring nodes, the proposed ideas can be easily extended to more complicated environments (and more than two interferers) by interpreting this as a problem of multiple access with more than two users and *a priori* information.

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