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Re:	Call for Contributions, IEEE 802.16h Task Group on License-Exempt Coexistence, 2004-12-17, IEEE 802.16h-05/01
Abstract	Present RRM algorithm for distributed interference control
Purpose	Information
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Algorithms for distributed interference control

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Introduction

The scope of the paper is to present some insights in the existing Radio Resource Management algorithms, that may be useful for the 802.16h work.
Radio Resource refers to frequency channels, scheduling, C/I, adaptive modulation and coding.

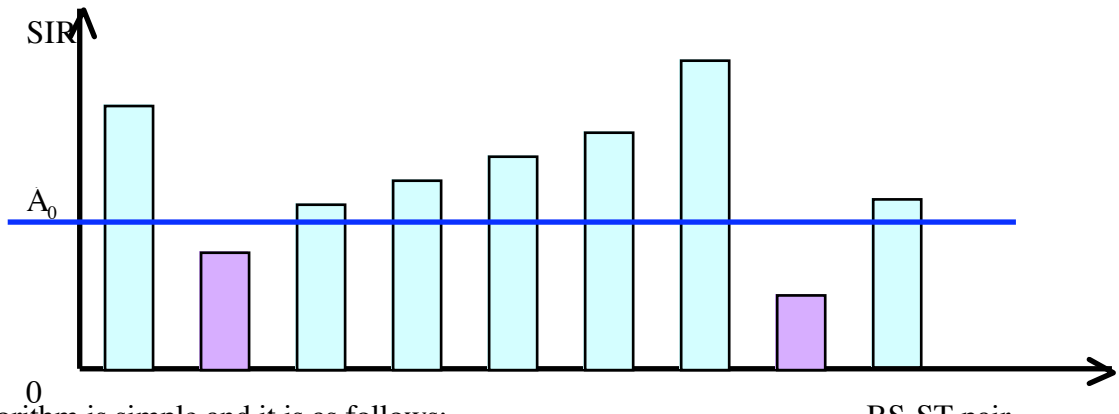
Radio Resource Management in cellular networks

There are many articles discussing this subject and proposing solutions. A simple algorithm, proposed in [1] and [2], is presented below.

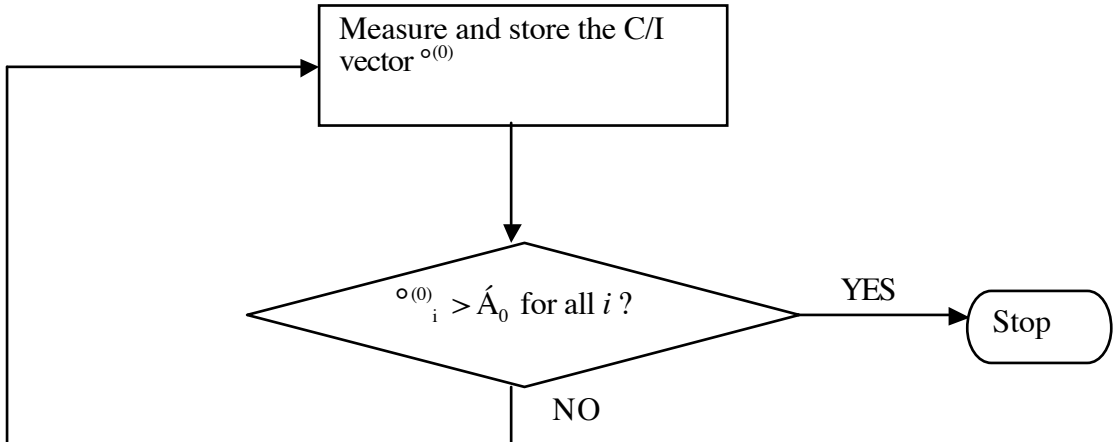
Limited-Information Step-Wise Removal (LI-SRA) Algorithm

The target of this problem is to eliminate the interference (supposing that a number of transmitters and receivers work in the same time) such that the obtained C/I is higher than the minimum one needed for a successful reception. The powers **P** of the transmitters are adjusted during this algorithm.

The following figure illustrates the starting case [2]:



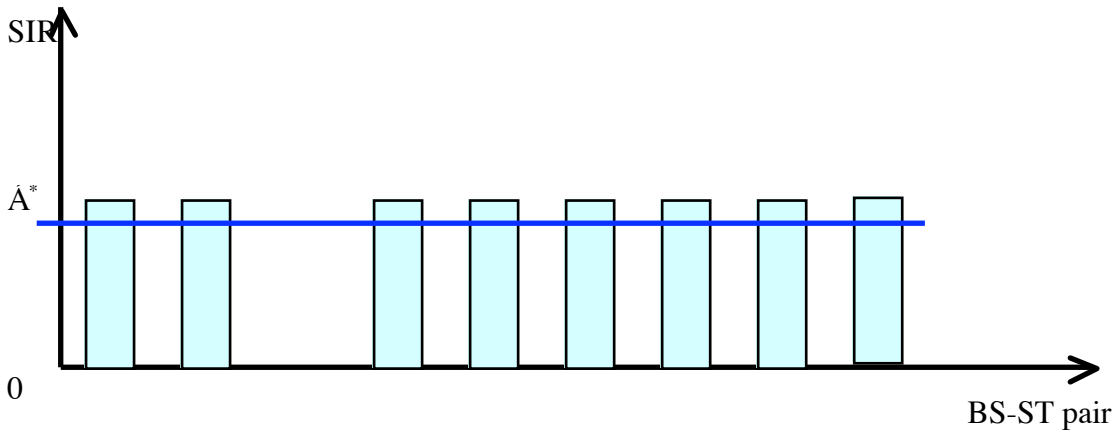
The algorithm is simple and it is as follows:



In [2], is shown that it is important to select , properly, and is recommended to select it as:

$$\_ = \_^{(n)} = 1/\sum_{i=1}^{Q} P^{(n)},\ n=1,2,....$$

After successful operation, supposing that one link has been removed, the balanced C/I may look as follows:



Discussion

A critical parameter for the algorithm is L, the maximum number of iterations we allow for balancing. During the balancing period the minimum (achieved) *C* / *I* level will increase gradually. The balancing algorithm does not guarantee that the *C/I's* for all links approach γ^* in a monotone fashion. This means that a link with initially sufficient *C* / *I* may, during the process of balancing, drop below the quality threshold. The link may stay there, and later in the process return to the *C*/ I level above the threshold.
We have to note that the LI-SRA algorithm still, in a sense, is a global algorithm. The balancing procedure, which is the computationally most intensive one, is almost completely distributed. **The removal procedure, however, requires the collection of data from the cells in order to compare the *C* / *I* values in the different cells.**
In the case of 802.16h, should be:

- Grouping of links that can achieve a balancing situation
- Communication protocols between systems to exchange the value of C/I;
- Receivers having the smallest C/I, that have the highest chance to be removed, should be actually scheduled in such a way that will not be influenced by the interference of the group from which have been removed, meaning that should be separated in time from the initial group.

Conclusion

The scope of presenting this algorithm was to show a possible direction for further investigations. There are many sources, indicating modifications and adaptations of this basic algorithm, to be used in ad-hoc networks that may be more suitable to 802.16h scope.

References

[1] J. Zander "Distributed Co-channel Interference Control in Cellular Radio Systems," *IEEE Transactions on Vehicular Technology*, vol. 41, No. 3, pp. 305-311, Aug. 1992.

[2] Jens Zander, Seoung Lyun Kim, "Radio Resource Management for Wireless Networks", 2001 Artech House