

The Comparative Analysis of Interference Management Methods in Contemporary Wireless Communication Systems

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Abstract

The most important characteristic of modern wireless communication systems (WCS) is today's rapid evolution to meet the ever-increasing demand for mobile services. Mobile traffic will continue to increase in the future with a large number of users and a wide range of service requirements. This is a challenge for the future WCS, which will provide high-quality and high-data rate services into limited spectrum, and always present interference. Classical approaches to eliminating interference in WCS are simple and based on the interference avoidance or minimization. At the same time, other factors, such as various orthogonal medium access techniques in the planning system must be taken into account. For example, when network planning is concerned with the space allocation of a given network, interference control through attenuation of wireless signals is viewed as an adequate solution. Despite demands for modern WCS increases, the interference is still the limiting performance factor. The use of orthogonally techniques induced by time, frequency or space cannot be considered a final solution to mitigate interference in real environment. Having all previous in mind, it is clear that handling interference is the central problem of WCS. Different methods to avoid and handle interference are under investigation, and the most promising is the method of the joint detection and estimation. Understanding, mitigation and exploitation of interference in the observed systems must be seen as the most important task in modern WCS development.

Keywords: *Analysis, Contemporary Wireless Communication Systems, Interference Management.*

1. Introduction

Requirements for wireless broadband services have exploded last years, and this trend will continue. This is a great challenge for designing the WCS. Having in mind that the radio spectrum is a very expensive resource, development of WCS should be directed

towards maximum spectral efficiency and maximum throughput. One of the main obstacles toward achieving this is interference. Therefore, it is of vital importance to be conversant with the best ways of handling interference in wireless networks. The interference can be classified into different types depending on causes which produce it. In a WCS the following aspects can be analyzed:

1.1 Self-interference.

Self-interference includes interference that occurs among signals that are transmitted from a single transmitter. The main causes of this interference are modulation type, carrier frequency offsets, Doppler effect, fast fading and transceivers non-idealities;

1.2 Multiple access interference.

Multiple access interference is interference among the transmissions from multiple transmitters using the same frequency resources to a single receiver. Even though the physical layer would allow for orthogonality, multiple access orthogonality may not be maintained in real environment due to synchronization errors, transceivers non-idealities, and the effects of wireless propagation channel;

1.3 Co-channel interference.

Co-channel interference is interference between links that reuse the same frequency band. In cellular systems this is also known as inter-cell interference. Reuse-one networks are particularly interesting, where all cells may utilize the full system bandwidth and the system becomes interference limited in terms of its capacity;

1.4 Adjacent channel interference.

This type of interference appears, for example, between links that communicate geographically close to each other using neighboring frequency bands.

Special attention is devoted to cognitive WCS because they are the key to success in handling dynamic network structure. Today, these trends are giving rise to new communication paradigms making use of cooperation and cognition as the main basic principles. The current wireless networks are aware of their surrounding environment to a very limited extent. However, this capability in wireless network will be highly developed in the future, as a consequence of exploiting both cooperative and cognitive principles. This particularly applies for cooperative wireless networks, where the communication scenario is highly dynamic, mobile devices need to have their capabilities adapted in a flexible manner, taking advantage of cognitive principles. The research concerning this doctoral thesis is also related to interference management in 4G cellular networks that use heavy spectrum reuse, because interference management is critical for high performance maintenance. It should be noted that high co-channel interference in the 4G systems downlink is one of the biggest challenges in the heterogeneous network deployment. As a matter of fact, the co-channel interference management has driven recent LTE releases, and two important features such as inter-cell interference coordination and coordinated multipoint communications have been introduced. This is one of the main issues to be addressed in future research.

2. Telecommunication Systems Classifications and Interference Influence

The communication system enables the successful transmission of idea or any other important information among individuals. The person from whom the thought originates carefully encodes his ideas into a sensible content, which is now ready to be shared with everyone. He is commonly referred to as the sender and the other party who receives the information from him is called the receiver or the recipient. The free flow of information between the sender and the receiver takes place because of the communication system.

The flow of information can be between two individuals. The information can flow from the individual to a machine, from the machine to the individual and even between two machines. Machines coupled together through networks also

provide signals for the individuals to respond, thus a type of communication system. In the above cases all the machines must work on similar lines and patterns, must be technically compatible and has to provide the same information, so that the individuals can decode the information well.

Types of telecommunication systems are:

- Radio communication systems
- Duplex communications systems
- Half duplex communications systems
- Tactical communications systems

2.1 Radio communication systems

The Radio Communications System (RCS) consists of several exterior communications subsystems, which, in combination, provide all exterior communications requirements for the ship with the exception of the Special Intelligence Communications requirements. The RCS subsystems are turnkey installations and consist of the following subsystems:

- High Frequency Communications System,
- Very High Frequency Communications (VHF Comms) System,
- Ultra-High Frequency Line-of-Sight Communications (UHF LOS Comms) System, Ultra High Frequency Satellite Communications (UHF SATCOM) System,
- Extremely High Frequency Satellite Communications (EHFSATCOM) System, Super High Frequency Satellite Communications (SHFSATCOM) System, Communications Support Segment (CSS),
- Naval Modular Automated Communications System (NAVMACS) II,
- Bridge To Bridge Communications System.

2.2 Duplex communications systems

Full-Duplex is like the ordinary two-lane highway. In some cases, where traffic is heavy enough, a railroad will decide to lay a double track to allow trains to pass in both directions. In communications, this is most common with networking. Our fiber optic hubs have two connectors on each port, one for each lane of a two-lane roadway. Full-Duplex fiber is two cables bundled or tied together to form the two-lane roadway. In 100Base-TX, the two lanes are housed in the same jacket. RS232 was also designed to handle

Full-Duplex but some of our short haul modems and converters give the user the option to go Half-Duplex or Simplex to reduce the number of conductors needed to connect between them.

2.3 Half-duplex communication systems

Half-Duplex is like the dreaded "one lane" road you may have run into at construction sites. Only one direction will be allowed through at a time. Railroads have to deal with this scenario more often since it's cheaper to lay a single track. A dispatcher will hold a train up at one end of the single track until a train going the other direction goes through. The only example I could think of for Half-Duplex is actually a Parallel interface. Even though parallel is eight lanes, data travels through the lanes in the same direction at the same time but never in both directions at the same time. The IEEE-1284 allows printers to send messages to the computer. The printer cannot send these messages while the computer is sending characters but when the computer stops sending characters, then the printer can send messages back. It's kind of like some roads that head into downtown. In the morning, they're one way roads, allowing traffic to go into downtown. In the evening their one way roads, allowing traffic to head out of downtown. The only advantage that Half-Duplex would have is the single lane or single track is cheaper than the double lane or double track.

2.4 Tactical communications systems

The Distributed Tactical Communication System (DTCS) provides Beyond Line-Of-Sight (BLOS), Over-The-Horizon (OTH), and On-The-Move (OTM) one-to-many tactical voice and data communications without the need for any local ground-based infrastructure. DTCS is managed by the DTCS Program Management Office (PMO), within the Enhanced Mobile Satellite Services (EMSS) Division under the Commercial Satellite Communications (COMSATCOM) Center in the Defense Information Systems Agency's (DISA) Network Services (NS) Directorate.

3. Interference Management in 4G

4G Mobile Standards apply the hard work (equivalent to 1) for achieving high system capacity

and simplification planning network. Improving the quality of the program comes from the SINR to be eliminated due to disturbance of disturbing cells, which have a profound impact on users at the end of the cell and the overall function of the system.

WiMAX 802.16m and Long-Term Evolution of the Third Network (3GPP-LTE) [5], including many 4G processes, are targeted for frequency distribution. As a result of rising levels, rising energy can result in loss of capacity due to the deletion of the SINR, but SINR (temptation test) vulnerable users. In this way, sound control plans are essential to improving the effectiveness of mobile users. As a result, 802.16m and 3GPP-LTE aims at multiple co-operative processes to improve the performance of the system: the use of semiconductor radio (RRM) radio frequency controls (FFRs).

Power control and intelligent antenna lead to a zero mix of other cells. Together, these strategies are aimed at eliminating violent demands on mobile work outcomes and the effectiveness of visual effects in previous versions.

4. Interference Management in 5G

Due to the abundance of 4G mobile communications, interoperability interventions are a major obstacle to the functioning of cells. However, although some network solutions have been introduced to control the 4G water intersection, many of these solutions provide the return to the real world. Managing the disturbance should be added to the management of the EU sector, as something that can be done again. Between all 4G boundaries, high bandwidth communication is one of the worst concerns, for the delivery of many networks that use renewable sources cannot be remembered on the future mobile phones. For example, co-management has developed LTE versions and launches two key features, such as the Interactive Interaction Coordination (ICIC) and the Coordinated Multi Point (CoMP). In particular, 4G LTE integration is primarily for network users and consumers. Managing network interaction is easy to use with asset users and to facilitate easy use by enhancing the older network. At the same time, by focusing solely on network management, many issues of action and restrictions apply, in particular, to the cost of repayment and renewal. Although not multilingual in the LTE, controlling intervention in

the UK is a solution to reducing network management issues.

Not long after, the EU team has noted that co-operation and communication sector can be extremely helpful [11] and 12 edition have begun to start EU support, but tomorrow. Based on recent and 4G lessons, Improvement Interoperability Management (AIM) is capable of being the best 5G driver. Additionally, when 4G sound interaction plans, AIM technology at 5G needs to be clarified and controlled by the speed of networking and co-operation.

5. Practical Challenges

Key customers and planning strategies increase the effectiveness of environmental processes, such as minimizing data reduction and enhancement of processes. While key developers and planning plans generally promise great technical success, there are still good issues we need to deal with really working. There is more than one signal on the cell phone call sound. This is very difficult for the recipient of the interventions. However, normal operation contains a set of interruptions: in fact, their received power is too high at the level of sound and can be compared to the required signal and the features of one or two interventions are sufficient. Additionally, additional AIM interventions are required. First of all, the blade speed should be tested correctly for identifying and solving the problem. Additionally, modulation and data plans and the rendering of a soundtrack site can be made with a network control feature. The alarm indicator can be disturbed by the signal receiver. However, this is to increase the burden of the work of an acceptable person and the loss of performance when predictability is unreliable. When combined with the signal delivery rate, the shipping area (TP) is required to notify the recipient of its features. There are many mobile communication systems, including LTE, send this information to the UIS CSI report. With the common people receiving, one CSI port in the EU has been accepted because the recipient features do not depend on the audio signal. However, with key recipients, one CSI report may be too short to describe the relationship between the game and the speed of the signal interference. To solve this problem, many CSI programs will be used on the LTE Release 11, as done on the CoMP. In this regard,

over half quarter CSI reports are based on a variety of audio hypothesis, which is a symbol of a variety of points. The shared planning role identifies the shared EU and broadcast plans for TPs sets, called collections, to facilitate the functioning of the entire team activity. This general plan will be broadly implemented or submitted based on a specific plan. In the middle, all the necessary information is shipped to the main control of the TCP collection and sends relevant information to each TP program. Although the plans are higher than those that are ever spent, they are involved in managing difficult tasks and storage responsibilities. On the other hand, in normal cases each TP performs its own statistics and offers potential risk information for general interaction. Because the size of the collection is too large, the planned plans are useful, as the summary is very small. In many instances, the programs are offered repeatedly and benefit from large latency. Multiple text messaging and submitting messages between different TPs are impossible. Transforming the message is usually done with background connections that integrate the types of TPs with high / latency-dependent dependence. However, the back-up is still uncertainty, and the next generation of cell phones will be defeated in the cooling machine.

6. Interference Simulation

The first challenge for the implementation of complex biodiversity conferences is by the permission of Thomas Young 1803. If light is lightened, the effect of the interference is reflected in the light. This is a former test called Young Experience for a Young Man. Hopefully, to ensure that these functions move quickly with Transformation Matlab, I will try to investigate the intervention that was born in the light Feld test. At the same time, the Yoshi experience is linked to the many basic philosophies (which have produced a significant result so far) enough to describe all the interesting ideas that can be obtained by trying. The measures are essential for the body or system, including many programs. Most of the technical features require mathematical models and computer tests. However, there are many cases where the mathematical model is dishonest. The balance of liquid fluid is by looking math and physiology. In such cases, bodily models must be very strong.

Physical regulations and chemicals are more practical than studies. In order to avoid balance (easily accessible systems), it is possible to use one method to address different approaches without choosing a specific purpose and sometimes a particular solution.

6.1 Double slit interference

Two-way illumination is a pattern that will appear on the screen, a pattern of bright and dark disruptions, and the most disturbing disturbance in the dark effects of the sharp spear will result in systemic disturbances, has it? At institutional level, disruptions are constructive because two waves work in one direction, so they go on stage. At a peak point, one of the waves is high by measuring the dimensions of other waves, so the two waves reach a bright scene, but the dark patterns and the length of the length of time are dark. Explaining the abuse is made by the FTT order of MATLAB. The process divided by two monochromatic waves is based on the 64x64 generation matrix and is determined by two points between the matrix and the second.

6.2 Interference in single slit

As they move to the lighthouse they begin to shine and experienced constructive relationships. Light comes from other equilibrium objects. Although there are some levels of change, the main place is an ideal disturbance area in all areas of light and high light when choosing both sides at the level. The facade edges and the selected element are below and because of the smallest dimension of the two elements they obtain 180 degrees or one half of the road goes to the list. If these two elements are shown on rare sets, both sides and under the same distance range cause deadly steps in both, so they are extremely difficult at the cost of all. An attempt was made to investigate an example of one-dimensional disorder. Since content is moderate, the size of the audio patterns found in one piece of paper shows a common value in all aspects, which contradict the art of art. Disruptions cannot be considered as continuous standards, but Gaussian values as a Russian. According to this concept, the effects of diffraction and intersection problems are also considered.

6.3. Interference in three slits

Another example of a stone-crooked distortion is in Fraunhoop, which is extended by another diaphragm. That is, all the screens are the same. Increasing the amount of granules makes the diffusion more difficult, but even more so, with easy access to each side, and twice the width of the phone. The two-dimensional description is made by MATLAB.

6.4 Interference in five slit

As the number of mixtures increases, the width of the ceiling is reduced, so that the left side of the blessing is increased, the size of the section is large, and that the distance is far from the center of the center, the fistula weakness decreases.

6.5 Interference in seven slit

Multilingual advances reflect high levels of high quality and higher levels. This is carried out in the lattice building and in many short circuits. This gives you very little and very high. Since column positions depend on the length of light, this gives a very good solution for sharing the waviest. The description of seven disks is designed for MATLAB

7. CONCLUSION

The attempt to determine two disturbances of the two waves is carried out with MATLAB's FTT command. Minor experiments were exposed to light in the idea of disturbances. As a result of a dual examination and a test that passes the test, the same tendency and content are reflected. However, because of the one-off diffraction ability, it cannot be represented in this study before the program is converted by focusing on the importance of muscles when designing Gaussian valuable things. The bidirectional coefficient test shows the average size between each other and the other to reduce the upper dimensions of the conductor dimensions. Although the progression of large boundaries shows that the water level and high climbing level are reduced. The results of the project show that the FFT is a powerful system for detecting disturbances and decaying the machine. Increasing confidence in Russian work can indicate gaps instead of the ongoing costs of existing jobs.

The demand for high speed wireless continues to grow due to the use of the smartphone, the internet and new wireless services. In principle, wireless communication can be generated through broadband broadcasts, to increase performance efficiency, and to increase the base of the baseline. For example, flexible material, multi-antenna and multicarrier modes provide a solution to the first two elements of these plans. It depends largely on price reduction in the market, reducing key infrastructure and network delivery, planning, maintenance and maintenance. When cell size is low, network allocation is adjusted and the port hinge is open and permanent, depending on automatic control and operating efficiency in order to maintain high interest and reliability. The expertise and analysis described at this conference provides a solution to these objectives. Cross-channel control (ACI) is a good way to ensure the use of and maintain the distribution of objects contrary to unacceptable internet. At this conference, ACI cases of violence are likened to DDD mobile programs. ACI control is required to ensure the eligibility of race use. The senders provided a way to improve the viewing of the online spirit, so the ACI barriers were eliminated because the potential for enhancing power was different. The proposed program allows the use of variable material between drivers and RF's powerful demands before the transceiver without destroying accuracy and reliability. If electricity is the main source of no ACI network, the problem of improvement is made for this. In another lesson, it includes the comparison of other ACI sources. There was no clear explanation of the fixing problem, which was the head of the investigation. It is important to develop ways to demonstrate how to implement OTMs. The correct information system can monitor the effectiveness of the proposed ACI control. The collaboration of the Channel and the (CCI), caused by the use of the field, is an important factor in reducing the wireless network performance in the future. From future programs require more than a small scale, the distance between the transistor and the available frequency of resources is reduced. It is an uncertainty of responsibility in ensuring effective economic efficiency. As a solution that may be a solution, new ways of reporting the new route (IAS) have been proposed and updated. The process is like opposing beacons, messages received by the recipient.

Power consumption information and transfer information allow independent control and legitimate management of the joint venture enterprise (CCM). IAS is shown to allow independent UL / DL modification, to allow spectrum sharing DDs, and provides access to complete, complete and efficient rope access.

Additionally, when you connect MAC to a noise connection, the function of the navigation path is more effective than the meter boundary of the orthogonal bandwidth. Results obtained in Independent UL / DC independent circuits were reflected in analytical and measuring measures. Additional research is required in the IAS system and its functionality. Particularly, the integration between success and astonishing burden should be thoroughly examined by considering the real-time reversal. The impact of the error forecast and the tariffs of the submitting section should be carefully considered. Additionally, IAS for MIMO transceivers must be successfully developed. When using MIMO transceivers, consumer price comparison can be a challenge for most recipients and service providers. Among users, there will be new services for creating local vehicles between users and machines. Device-to-Device (D2D) traffic efficiently works as a direct transfer tool. Although a D2D non-licensed tape provides a source of communication environment, DSS can demonstrate the ability to provide D2D accurately with the network as a mobile connection. Operating a license band can lead to more controlled and higher power control than compared to the unlimited boundary. However, the strong interruptions between D2D and mobile communications require ways to control the major interruptions to facilitate reliable and efficient performance.

Three ways are recommended: sound management, water disruption and the use of many substances, and to prevent the use of MODE. The proposed interaction strategies are aimed at improving the D2D system development and enhancing equipment. The proposed plans lead to interruptions between D2D and mobile communication. However, the use of visual abilities should be used in books, such as choice of accurate information, and other ways to control the proposed interventions. The proposed plans are based on the maintenance of basic stations.

In addition, internal interventions are only controlled. For example, increase this ability to increase the CoMP in cell transplantation and to eliminate intercellular interaction. Finally, despite the potential of the program, the process was very difficult. Analysis of trade, with regard to cost-effective costs, is useful in ensuring that the broadband use of the network can be fully utilized. Previously, the topic of broadcast research will answer the question whether the proposed ideas could be included. This allows you to directly control the interaction between different drivers and D2D numbers, by focusing on both channels and channel interruptions. The importance of these subjects has been identified by the interests of the corridor, where facilities for different institutions operate at a regular level. At this conference, D2D and mobile communication conditions are in line with the internet network. In particular, the use of IAS for most networks needs to be tested.

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