Resource Allocation for Wireless Multicast MIMO-OFDM Systems Using Water Filling Algorithm

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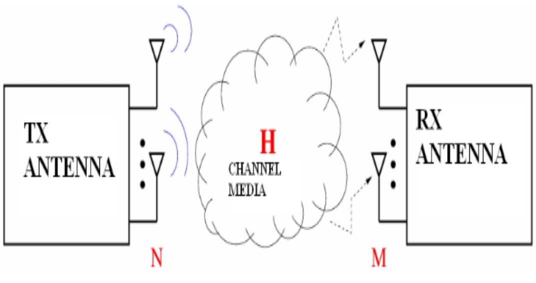
Abstract- Multiple antenna orthogonal frequency division multiple access (OFDMA) could be a promising technique for the high downlink capability within the next generation wireless systems, during which reconciling resource allocation would be a very important analysis issue which will considerably improve the performance with bonded Quos for users. . during this paper we glance into the performance of such cooperative OFDMA systems beneath realistic conditions. we have a tendency to propose a transceiver structure to scale back the interference between transmission subcarriers and receiving subcarriers. Its performance in terms of signal to interference and noise ratio (SINR) is evaluated by each analysis and simulation and is incorporated into a recently projected cooperation strategy for OFDMA systems to look at its performance beneath the realistic structure. it's shown that though the cooperation strategy suffers from performance degradation thanks to the residual interference between the transmission and receiving subcarriers, it still outperforms the traditional cooperation schemes. Moreover, most of this supply allocation algorithms ar restricted to the unit-caste system. during this paper, dynamic resource allocation is studied for multiple antennas OFDMA based mostly systems which give multicast service. The performance of multicast system is simulated and compared therewith of the unit-caste system.

Keywords- MIMO, OFDM. Cooperative, Water filling, Resource Consumption

I. INTRODUCTION

The next-generation wireless networks ar expected to supply broadband transmission Services akin to voice, internet browsing, video conference, etc. With numerous Quality of Service (Quos) needs. Multicast service over wireless networks is a very important and difficult goal orienting to several transmission applications akin to audio/video clips, mobile TV and interactive game There ar 2 key traffics, namely, unit solid traffics and multicast traffics, in wireless transmission communications.



Current studies in the main concentrate on unit-cast traffics. specifically, dynamic resource allocation has been known united of the foremost economical techniques to realize higher Quos and better system spectral potency in uncast wireless networks [1]. moreover, additional attention is paid to the uncast OFDM systems. Orthogonal Frequency Division Multiplexing (OFDM) is thought to be one amongst the promising techniques for future broadband wireless networks because of its ability to produce terribly high information rates within the multi-path attenuation setting. Orthogonal Frequency Division Multiple Access (OFDMA) may be a multiuser version of the favored OFDM theme and it's additionally referred as multiuser OFDM. Multiple input multiple output (MIMO) technologies have additionally received increasing attentions within the past decades [2, 3, 5]. several broadband wireless networks have currently enclosed MIMO technology in their protocols as well as the multicast system. Compared to single input single output (SISO) system, MIMO offers the upper diversity which may doubtless cause a increasing increase in capability.

II. EXISTING METHODOLOGY ANALYSIS

In multiuser OFDM or MIMO-OFDM systems, dynamic resource allocation invariably exploits multiuser diversity gain to enhance the system performance and it's divided into 2 kinds of optimisation problems: 1) to maximise the system turnout with the overall transmission Resource constraint ; 2) to reduce the transmit Resource with constraints on information rates or Bit Error Rates (BER). To the simplest of our data, most dynamic resource allocation algorithms, however, solely think about unit solid multiuser OFDM systems. In wireless networks, several multimedia system applications adapt to the multicast transmission from the bottom station (BS) to a bunch of users. These targeted users incorporates a multicast cluster that receives the information packets of identical traffic flow. The at the same time accomplishable transmission rates to those users were investigated. Recently scientific researches of multicast transmission within the wireless networks are paid additional attention.

Amplify Forward methodology for Co-Operative MIMO-OFDM Communication:-

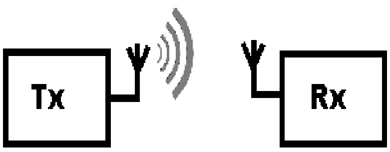
In Phase 1, the supply node transmits the signals by method of broadcasting, whereas the destination node and also the relay node receive the signals. In Phase 2, the relay node amplifies the Resources of the signals received from the supply node and forwards them to the destination node. In Phase 3, the destination node combines and decodes the signals received from the supply node in part one and also the relay node in part a pair of thus on restore the initial data. AF is additionally referred to as non-regenerative relaying theme and it's primarily a process methodology for analogy signals. Compared with different schemes, AF is that the simplest. Besides, because the destination node will receive freelance attenuation signals from the supply and relay nodes, full diversity gain and smart performance may be achieved with this theme. However, AF theme is at risk of noise propagation impact as a result of the relay node amplifies the noise on the source- relay channel once the retransmitted signals ar amplified.

Delay Forward methodology for Co-Operative MIMO-OFDM Communication:-
In part one and part three, DF theme processes the signals identical method as AF. In Phase 2, the relay node decodes and detects the signals received from the supply node before it forwards the signals to the destination node. Hence, DF is additionally referred to as regenerative relaying theme. Obviously, DF is basically a digital signal process theme. though noise propagation drawback won't ensue, the signal process in DF for the most part depends on transmission performance of source-relay channel. If Cyclic Redundancy Check (CRC) isn't enforced in writing, full diversity orders can not be obtained. Moreover, the errors brought by the relay node throughout signal reception and secret writing can accumulate with the rise of hops, so touching diversity advantage and relay performance. of these demonstrate that the transmission characteristics of source-relay channel have nice impact on the performance of DF communication systems.

III. PROPOSED METHOD

In this section, we tend to elaborate on the system model of the multiuser fastened relay system. initial we tend to describe the system diagram and main assumptions of the system, and so we tend to gift the downlink signal model.

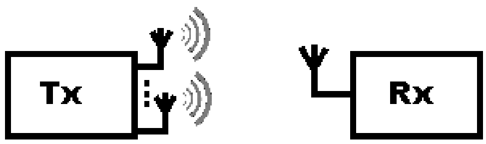
Resource Allocation on SISO System:-
The simplest sort of communication system may be outlined in MIMO terms as SISO - Single Input Single Output. this is often effectively a customary radio channel - this transmitter operates with one antenna as will the receiver. there's no diversity and no extra process needed.



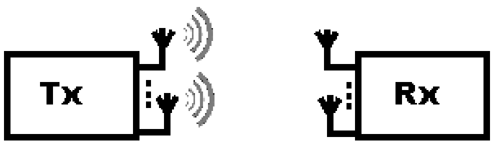
Resource Allocation on SIMO System:-
The SIMO or Single Input Multiple Output version of MIMO happens wherever the transmitter incorporates a single antenna and also the receiver has multiple antennas. this can be additionally referred to as receiving diversity. it's usually wont to alter a receiver system that receives signals from variety of freelance sources to combat the consequences of attenuation. it's been used for several years with radio radiation listening / receiving stations to combat the consequences of part attenuation and interference.

SIMO has the advantage that it's comparatively straightforward to implement though it will have some disadvantages therein the process is needed within the receiver. the utilization of SIMO is also quite acceptable in several applications, however wherever the receiver is found in a very mobile device reminiscent of a cellular phone telephone, the amount of process is also restricted by size, price and battery drain.

Resource Allocation on MISO System:-
MISO is additionally termed transmit diversity. during this case, an equivalent knowledge is transmitted redundantly from the 2 transmitter antennas. The receiver is then able to receive the optimum signal that it will then use to receive extract the desired knowledge.



Resource Allocation on MIMO System:-
Where there's quite one antenna at either finish of the radio link, this is often termed MIMO - Multiple Input Multiple Output. MIMO will be accustomed give enhancements in each channel hardiness yet as channel turnout.



In order to be able to benefit from MIMO fully it is necessary to be able to utilize coding on the channels to separate the data from the different paths. This requires processing, but provides additional channel robustness / data throughput capacity.

	2 Antenna	4 Antenna	8 Antenna
SISO	4.2674	4.2565	4.2681
SIMO	4.915	5.7067	6.5878
MISO	4.4347	4.5919	4.7181
MIMO	6.1909	10.1027	17.9687

MIMO Using Water filling Process
We derive bounds of possible total rates of the MIMO mounted relay system mistreatment writing, that has been shown to be total capability optimum. The total rate

mistreatment dirty paper writing will be expressed as a operate of the pre-coding matrix F and therefore the relay process matrix approach is to directly optimize the total rate with reference to the matrices F and W, however, this approach optimizes sizable amount of parameters and has terribly high procedure value.

WATERFILLING ALGORITH STEPS:-
1. we tend to don't got to Re-order the MIMO-OFDM sub channel gain realization during a descending order.
2. Take the inverse of the channel gains.

$$Pt+\sum_{i=1}^{n}\frac{1}{H_i}$$

3. Water filling has non uniform step structure due to the inverse of the channel gain.

$$Capacity=\sum_{i=1}^{n}\log_2(1+PowerAllocated*H)$$

4. Initially take the sum of the Total Resource Pt and the Inverse of the channel gain .It gives the complete area in the water filling and inverse Resource gain.
5. Decide the initial water level by the formula given below by taking the average Resource allocated (average water Level).

$$\frac{Pt+\sum_{i=1}^{n}\frac{1}{H_i}}{\sum channels}$$

6. The Resource values of each sub channel are calculated by subtracting the inverse channel gain of each channel.
7. In case the Resource allocated value becomes negative stop the iteration process.

$$Powerallocated=\frac{Pt+\sum_{i=1}^{n}\frac{1}{H_i}}{\sum channels}-\frac{1}{H_i}$$

Further, during this formulation, the optimizers might not be distinctive. therefore finding a globally optimum resolution is troublesome. To resolve this drawback, we tend to introduce many style structures for the parameters F and W. This ends up in total rate lower bounds which will be computed victimization low quality algorithms. The thought of water filling is extended to multiple users, wherever one resource is allotted to at least one user. sadly, the process quality of the best resolution explodes, as a result of the 2 issues of allocating users to resources and distributing a user's transmit Resource budget are coupled. whereas the best resolution is of interest for theoretical analysis, it's vital flaws that forestall its use in a very real-world application Users are handled in a very Round-Robin fashion, and also the best free resource is tentatively allotted to the present user. Since the simplest resource is picked initial, the signal/noise ratio reduces for every further resource.

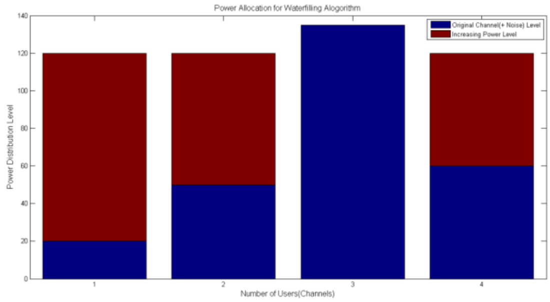


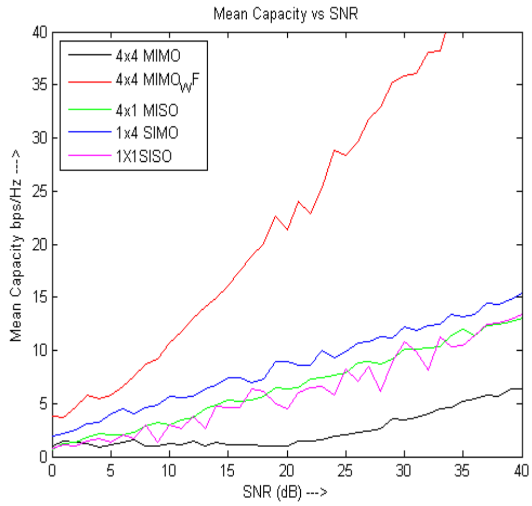
Fig:1: Water Filling Model

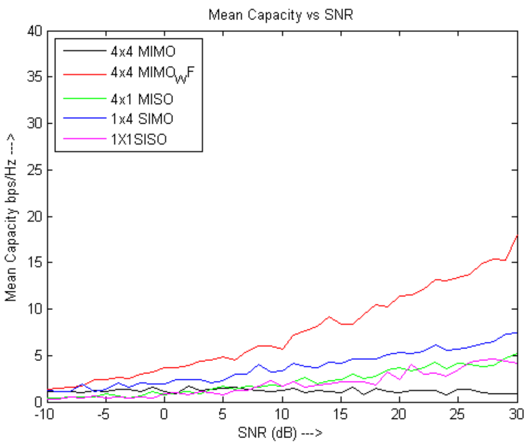
1. SIMULATION RESULTS:-

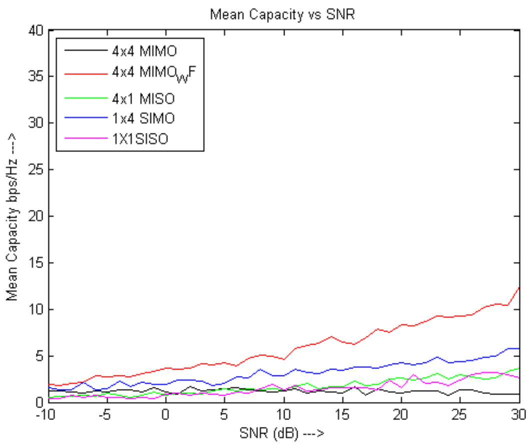
The process stops, once the ratio drops below a user-defined threshold. the quantity of resources for any user will be restricted to enhance the performance of cell-edge users at the expense of add outturn. The rule takes the ability budget of every user as a parameter (again, parenthetically one could allot a lot of Resource to cell-edge users).

Noise Variable	SISO	SIMO	MISO	MIMO	MIMO Water filling
10db	8.5bps	12bps	11.5bps	4.5bps	35.2bps
20db	5bps	8.5bps	8.25bps	2.85bps	17bps
30db	3bps	2.85bps	2.35bps	1.75bps	6.5bps

The mode parameter switches between fixed-Resource allocation as shown in Figure a pair of half a pair of) and water filling as in Figure 2 half 4). The code will be additional optimized for mounted Resource allocation by substitution the reiterative "water fill ()" software package with another one that splits a user's Resource equally between resources allotted to the user. the method of water filling is analogous to running the water within the vessel. The UN shaded portion of the graph represents the inverse of the facility gain of a particular portion representing the shadow represents the facility allotted or the water .shows the most water level. the entire quantity on water crammed (Resource allocated) is proportional to the Signal to noise magnitude relation of the channel.







IV. CONCLUSION

A particular subcarrier resource allocation approach Investigated during this paper could be a methodology supported nodes that transmit and receive on adjacent OFDM subcarriers at the same time. To perform the investigation we have a tendency to projected a transceiver structure that permits OFDM users to transmit and receive at the same time on adjacent subcarriers so the system tradeoffs and limitations of this approach may be understood. The performance of the transceiver was evaluated by each analysis and simulation and it absolutely was shown that the non-ideal characteristics of subsystems can limit the accomplishable SINR [14]. especially our investigation shows that the consequences of quantisation error and LO part noise ar a lot of vital than different scheme imperfections corresponding to PA nonlinearity and Tax ratio imbalance [13]. add capacities of multicast and unit-caps schemes ar shown for multiple antenna OFDM systems. Here it's supposed that there's no channel Resource distinction between the users. within the multicast system, it's supposed that four users receive constant contents, whereas within the uncast system the contents of users ar completely different from one another. three by one multicast and uncast system mean that three users receive constant contents united cluster and also the left one user receives completely different content. two|and a couple of|and a pair of} by a pair of multicast and uncast system means 2 users receive constant contents united cluster and also the left 2 users ar uncast users. it's noticed that the multicast theme with the projected methodology are able to do higher capability than the uncast theme or the mixed cases. The a lot of multicast users exit, the upper system capacities may be achieved.

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