CO ORDINATED INTERFERENCE CANCELLATION METHODOLOGY FOR MIMO FOR MULTIPLE ACCESS INTERFERENCE MITIGATION

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Abstract

Communication has been an interesting arena for the advancement of networking corporations. Data traffic on the channel has introduced various sorts of interferences both at the receiving end as well as the transmitting end. Multiple access interference (MAI) is a type of interference caused by multiple cellular users who are using the same frequency allocation at the same time. It is at Massive MIMO receiver. The encoding of the digital signal with Kasami code is applied at the transmitter of Massive MIMO and decoding is applied with Kasami code at receiver to reduce the multiple access interference.

INTRODUCTION

Multiple antenna a transmitter facing interference from different antenna among themselves at same transmitter. A strategic approach has been employed involving Kasami precoding which utilizes the information of MIMO or Massive MIMO configuration and interference level by decoding the UCI (Uplink control information) from PUCCH (Physical uplink control channel) and PUSCH (Physical uplink shared channel). If it has interference at transmitter with multiple antenna ports then we classify it as the Multiple access interference and carry out the algorithm.

KASAMI PRECODING:-We are encoding, the digital signal with Kasami Code at transmitter of Massive MIMO and decode with Kasami code at receiver to reduce the multiple access interference. Kasami sequences are binary sequences of length 2^N – 1, where N is an even integer Kasami sequences have good cross-correlation values approaching the Welch lower bound. There are two classes of Kasami sequences- the small set and the large set.

SYSTEM ARCHITECTURE: DEPICTION THROUGH FIGURES FOR MULTIPLE ACCESS INTERFERENCE MITIGATION:

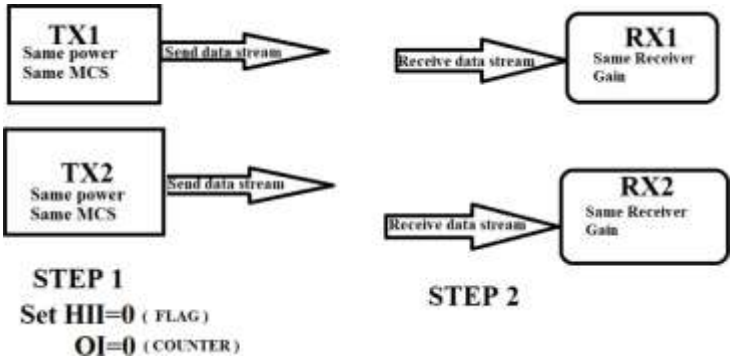


Fig A. 1-Step

INTIAL STATE 0 i.e S0

1. Receive the stream with same receiver gain at two receiver channels and perform SINR check.

If SINR ≥ SINR_threshold
Then set HII= 1 and OI=0 (counter) Else
HII=0 and OI=0
Store the respective RBA in data base for future transmission of pattern of RBA (Resource Block Area).

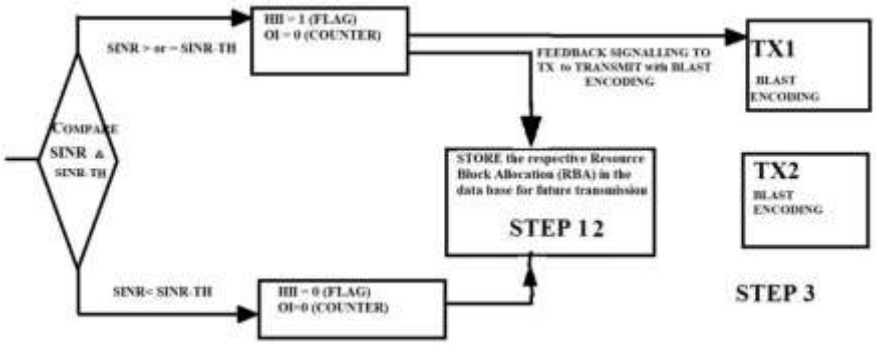


Fig A. 2-Step

Send feedback / signaling to TX to transmit with BLAST encoding.

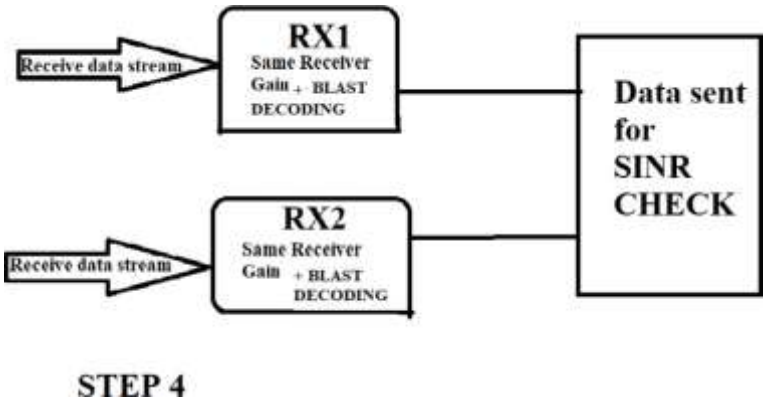


Fig A. 3-Step

Repeat step 4.2 with BLAST decoding .
If SINR ≥ SINR_threshold
Then set HII=1 and OI=1 (counter) Else
HII=0 and OI= 1
Store the respective RBA in data base for future transmission of pattern of RBA (Resource Block Area).

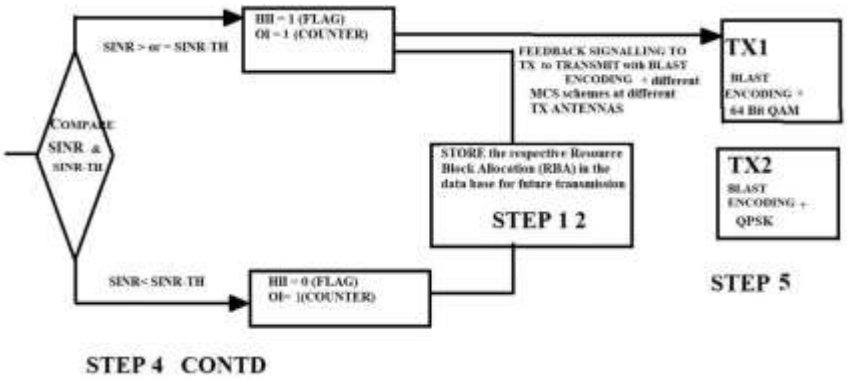


Fig A. 4-Step

Send feedback / signaling to Tx to transmit with BLAST encoding with two different MCS schemes AT 2 TX antennas .

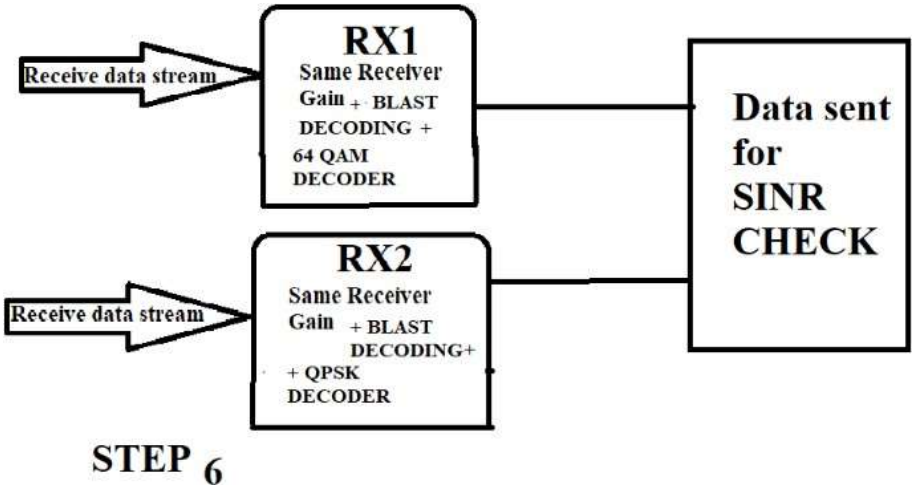


Fig A. 5-Step

Repeat step 4.2 with BLAST decoding with 2 different MCS decoding at 2 different RX antennas.
If SINR ≥ SINR_threshold
Then set HII= 1 and OI = 2 (counter) Else
HII=0 and OI=2
Store the respective RBA in data base for future transmission of pattern of RBA (Resource Block Area).

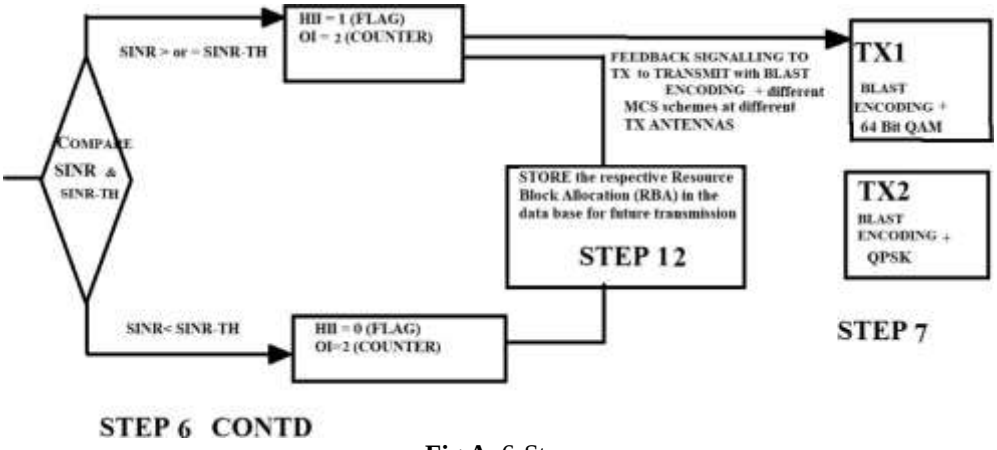


Fig A. 6-Step

Send feedback / signaling to Tx to transmit with BLAST encoding with two different MCS schemes AT 2 TX antennas.

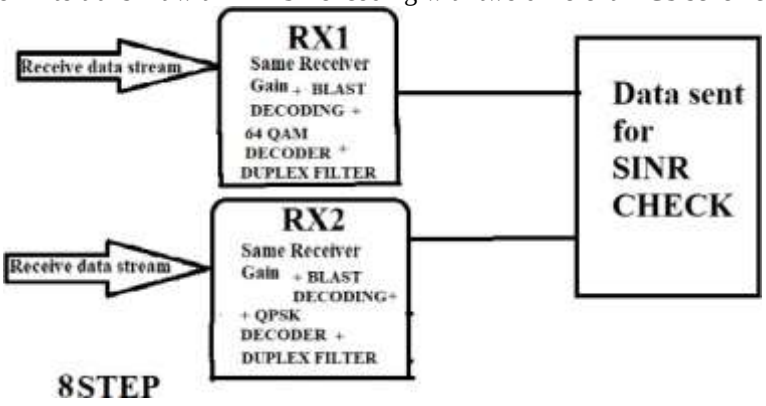


Fig A. 7-Step

At RX antennas, BLAST DECODING + 2 different MCS DECODING +Duplex Filter.
If SINR ≥ SINR_threshold
Then set HII=1 and OI=3 (counter) . Else
HII=0 and OI=3
Store the respective RBA in data base for future transmission of pattern of RBA (Resource Block Area).

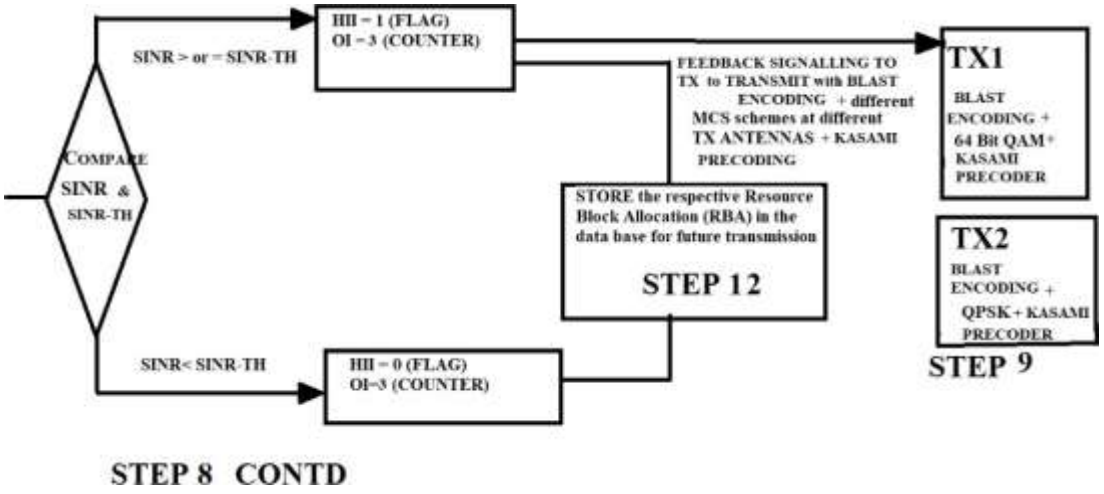
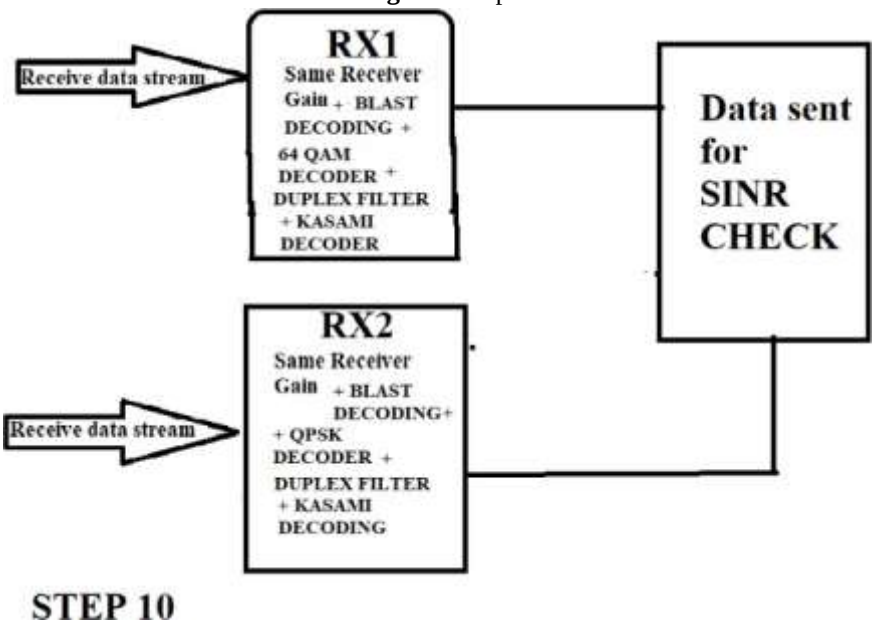


Fig A. 8-Step

Send signaling / feedback to TX to encode the data with BLAST + two different MCS schemes + KASAMI ENCODING at precoder.

10. Repeat step 2 with BLAST decoding + two different types mcs decoding + KASAMI DECODER +DUPLEX FILTER
If SINR ≥ SINR_threshold
Then set HII= 1 and OI = 4 (Counter) Else
HII=0 and OI=4 .
Store the respective RBA in data base for future transmission of pattern of RBA (Resource Block Area).

Fig A. 9-Step



Absent the Resource Block Allocation. (RBA).

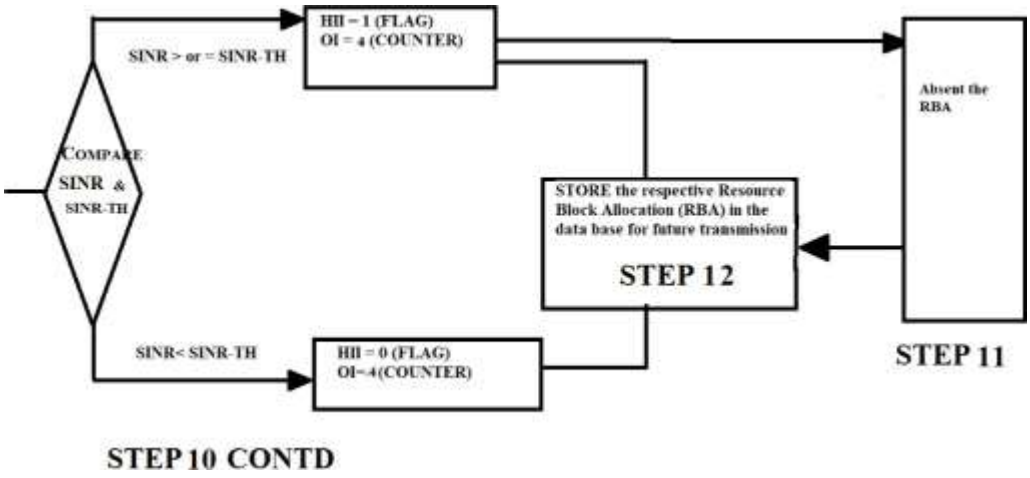


Fig A. 10-Step

Store the respective RBA in data base for future transmission of pattern of RBA (Resource Block Area).

PRE SELECTION OF MULTIPLE ACCESS INTERFERENCE MITIGATION ALGORITHM:

Step-1: Get the information of MIMO or Massive MIMO configuration and Interference level by decoding the UCI (Uplink Control Information) from PUCCH (Physical Uplink Control Channel) and PUSCH (Physical Uplink Shared Channel)

Step-2: If it has Interference at Receiver with multiple antenna ports then classify it as Multiple Access interference case.

ALGORITHM FOR MULTIPLE ACCESS INTERFERENCE:

Step-B.4.1:
Send 2 streams from 2 TX antennas at the same power and at same MCS schemes . Set HII=0 , OI =0 (counter) , RNTP = 0 .

Step-B.4.2:
Receive it at same gain at 2 receiver channels . If SINR ≥SINR_ threshold
Then set HII =1 , RNTP =0 , OI=0 (COUNTER) .
Else
HII=0 , RNTP=0 ,OI=0 .
Store the respective RBA in data base for future transmission of pattern of RBA(Resource Block Area) .

Step-B.4.3:
Send feedback / signaling to TX to transmit with BLAST encoding.
Check the SINR is increasing, then proceed to next step in Algorithm otherwise start with next RBA

Step-B.4.4:
Repeat StepB.4.1 with BLAST DECODING If SINR ≥SINR_ threshold
Then set HII=1 , OI= 1(counter) , RNTP =0 .
ELSE
HII=0 , RNTP=0 ,OI=1.
Store the respective RBA in data base for future transmission of pattern of RBA(Resource Block Area) .

Step-B.4.5:
Send feedback signaling to TX to transmit with WALSH HADAMARD PRECODING + BLAST ENCODING
Check the SINR is increasing, then proceed to next step in Algorithm otherwise start with next RBA

Step-B.4.6:
REPEAT StepB.4.1 with WALSH HADAMARD DECODER + BLAST DECODER

If SINR ≥SINR_ threshold
Then set HII=1 , OI=2(counter) , RNTP =0 .
ELSE
HII=0 , RNTP=0 ,OI=2 .
Store the respective RBA in data base for future transmission of pattern of RBA(Resource Block Area) .

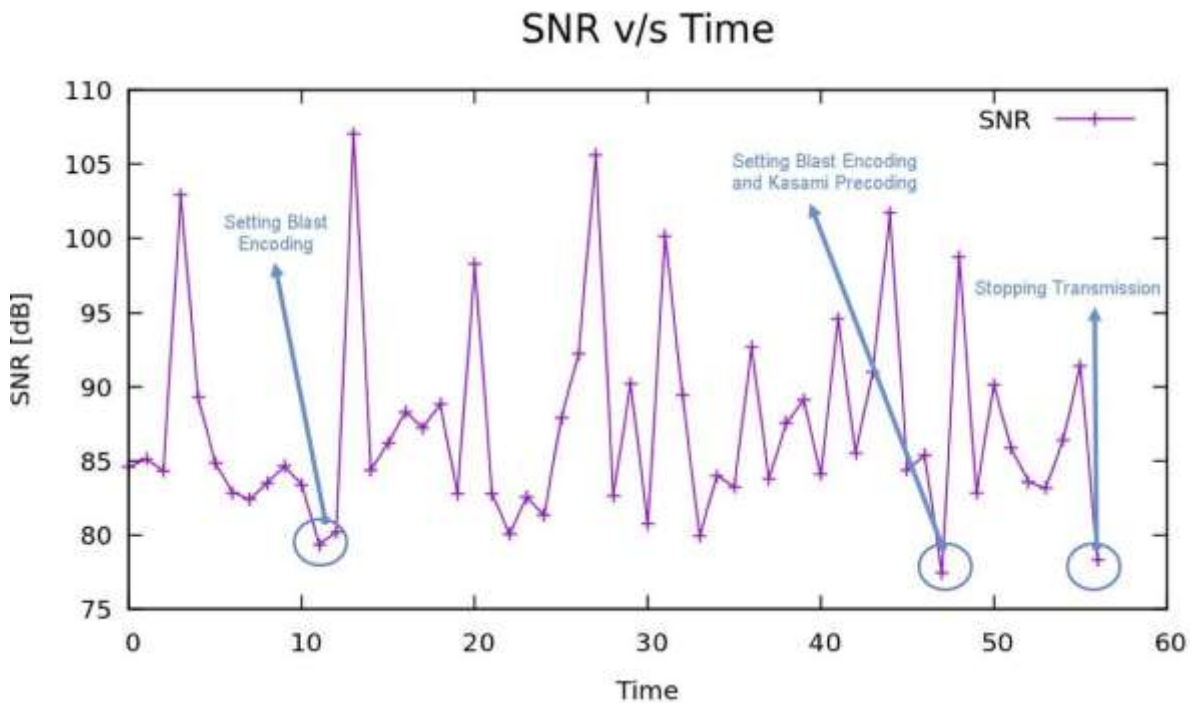
Step-B.4.7:
SEND feedback signaling to TX to transmit with more power + BLAST ENCODING + WALSH HADAMARD ENCODING.
RNTP =1 .
Check the SINR is increasing, then proceed to next step in Algorithm otherwise start with next RBA

Step-B.4.8:
Repeat StepB.4.1 with walshhadamard decoding + blast decoding . If SINR ≥SINR_ threshold
Then set RNTP =1 , HII=1, OI=3. (counter) Else HII=0 , RNTP=0 ,OI=3 .
Store the respective RBA in data base for future transmission of pattern of RBA(Resource Block Area) **.**

Step-B.4.9:
ABSENT the RBA

Step-B.4.10:
Store the respective RBA in data base for future transmission of pattern of RBA(Resource Block Area) .

RESULTS WITH CONCLUSION:



The Scenario is for 2*2 MIMO Transmitter and Receiver for 2 port receiver wherein we are continuously increasing the Multiple Access Interference.

Here we found that even we are linearly increasing the Multiple Access Interference along with time there is increase in SNR once we apply BLAST Coding, Kasami precoding and RNTP increase and finally when SNR reaches non bearable extend we will stop the data from sending through RBA(Resource Block Allocation).

We are maintaining the Pattern of RBA, antenna Configuration and power levels applied as records which can used to determine and control the Self Interference in future when similar conditions happens.

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