ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 3, Issue 11, November 2015

MIMO Scheduling in Fourth Generation Using Greedy Algorithm for Multi-User Cellular Transmission

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ABSTRACT: Multi-user MIMO scheduling in the 3GPP LTE-Advanced cellular uplink is considered. The uplink allows for preceded multistream transmission from scheduled user and it can be assigning the same time-frequency resource. Based on some practical constrains exploting these features is a challenging to maintain a low signalling overhead. The scheduling problem in 3GPP LTE-A cellular uplink is NP-hard, it can be compose as the maximization of the submodular set function to matroid and multiple rucksack constraints. so then we propose Constant factor polynomial-time approximation algorithms and performance are demonstrated in simulations.

KEY WORDS: Rucksack, multiuser scheduling, matroid, NP-hard, resource allocation, submodular maximization.

I. INTRODUCTION

LTE is the process to generate interface by the 3rd Generation Partnership Project[1]. The 3GPP LTE-A and the IEEE802.11 are the two cellular networks classified as the 4G cellular networks. LTE commonly marketed as 4GLTE is a standard wireless communication for high speed data for mobile phones and data terminals. LTE [as specified in the 3GPP release 8 and 9 document series does not satisfy the technical require the 3GPP consortium has adopted for its new LTE Advanced standard. The main requirements for the new access network are high spectral efficiency, high peak data rates, short sound trip time as well as flexibility in frequency and bandwidth. The goal of LTE was to increase the capacity and speed of wireless data networks. The 4G uplink supports the spectral efficiency of15 bps/HZ and the cell average spectral efficiency of 2bps/HZ, ultra-low latency and the bandwidth of up to 100MHZ.

In order to attain aggressive stipulation, the 3GPP LTE-A uplink is based on the mutated form of orthogonal frequency-division multiplexing based multiple access. OFDMA is a multi-user version of the popular OFDM digital modulation scheme. Multiple access is achieved in OFDMA by assigning subsets of subcarriers to individual users. MIMO uses multiple transmitter and receivers that modulated with OFDMA[1]. It allows preceded multistream transmission from each scheduled user. OFDMA allows spectral efficiency gains via channel dependent frequency domain scheduling. In this paper the target is on the 3GPP LTE-A uplink and MU MIMO scheduling for the LTE-a UL. The 4G cellular system that will be expand on the 3GPP LTE-A standard. The frequency domain scheduling is done in the LTE-A UL[2]. The scheduler assigns one or more resource blocks to each scheduled user.

To design practical uplink MU-MIMO resource allocation algorithm for the LTE-A cellular networks. The layout of resource allocation along weighted sum rate utility maximization for finite user queues and finite precoding codebooks. The user rates are in forced to lie in basic achievable rate of multiple access channel and represents the NP-hard problem in resource allocation. The resource allocation problem can be formulated as the Rucksack constraints, and solved by polynomial time randomized constant factor approximation algorithm. In this we used greedy algorithm and it yields a constant factor algorithm[11-14].

Resource allocation over OFDMA has been widely used in single user scheduling problems to maximize the system utility. The scheduled user can assign non-overlapping subcarriers. multiuser scheduling in the uplink has consider the trade off between fairness and efficiency. The single user UL LTE scheduling problem is NP-hard[15], it is based on constant factor approximation algorithm which is incorporate for MU scheduling.

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II. RELATED WORK

1.MU-MIMOSCHEDULING: Recognize a single-cell uplink along k users and one base station (BS) which is pretended to have Nr≥1 receive antennas. Users k has $N_t \geq 1$ transmit antennas and its power budget is P_k. N denote the total number of resource blocks available (RBs). We infer each RB to have unit size. $H_K^{(n)}$ denote the $N_r \times N_t$ channel matrix seen by the BS from user k on RB n whichever we assume is known perfectly to the BS. We certify e=(u ,c ,W) signify a 3-tuple,where 1≤u≤k denotes a user, W $\varepsilon\ w$ (such that tr (w^+w)=1) indicates a precoder from a codebook which is finite W and C $\varepsilon\ C$ that is a valid assignment of RBs Selected from the set c which contains all probable valid assignments. Especially each c is an N-length vector with binary valued {0,1} entries and an RB i belongs to c {i e c} if c contains one in its i^{th} position,i.e.., c(i)=1.The ground set of all possible such 3-tuples.

e = (u , c, W) = c_e = c, W_e = W,

u_e= u, $H_e^{(n)} = H_u^{(n)} \forall n$.

The base station, which has been selected or scheduled by a subset a A< ε .Base station can be modeled as the output of MIMO multiple access channel by receiving the signal vector from each resource block.

$y^{(n)} = \sum_{e \in A} c_e$ (n) $H_e^n W_e^{(n)} X_e^{(n)} + v^{(n)}$

Max $\sum_{1 \leq k \leq K} \propto_k r_k$

Where $\propto_k > 0$, $1 \leq k \leq K$

represents the positive weight of K^{th} user.

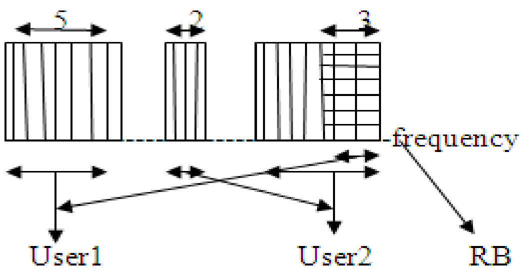

Fig.1.RB Allocation in the LTE-A UL: The assignment of RBs to each user is represented by a shaded region.

Where $v^{(n)}$~CN(0,I) is the additive Gaussian noise and $X_e^{(n)}$ is the input vector corresponding to 3-tuple $\underline{e}$. The input vector transmitted by user u_e on RB n.

2. Two chunks per-user:

To form at-most two non-contiguous chunks ,each scheduled users assigned a set of resource blocks. A set of contiguous resource blocks is a chunks .It may allows one chunk of contiguous resource blocks to assign, with the DFT spreading operation that each scheduled user must employ, it will ensures the low transmit peak-to-average –power ratio(PAPR).In the LTE-A UL the DFT spreading can be assigned up to two chunks. To provide more flexibility scheduling and PAPR.

3. RUCK SACK PROBLEM:

Ruck sack problem or Knapsack problem is a problem in combinatorial optimization. The most common problem being solved in the 0-1 rucksack problem, which restrict the number X_i of copies of each kind of item to zero or one. Given a set of n, each with a weight W_i and a value V_i along with a maximum weight capacity W,

maximize $\sum_{i=1}^{n} v_i\ x_i$

Subject to.$\sum_{i=1}^{n} w_i\ x_i \leq$ W and $x_i \in \{0,1\}$.

Where x_i represents the number of instances of item i to inclide in the rucksack., the problem is to maximize the sum of the values of the items in the rucksack so the sum of the weight is less or equal to the rucksack capacity.

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Algorithm I: Greedy Algorithm for LTE-A UL MU-MIMO

1. Initialize $\underline{S}$=∅
2. Repeat
3. Determine
   $\underline{\hat{e}}$ = arg $\max_{e \in \varepsilon \backslash S}$ $\{h(S \cup e)\}$ and set $\hat{v}$ =h(s ∪ $\hat{e}$) - h($\underline{S}$)
4. If $\underline{\hat{v}}$ >0 then
5. $\underline{S}$ ←S∪ e
6. end if
7. until $\hat{v}$ ≤ 0 or $\hat{e}$ =∅
8. output $\underline{S}$

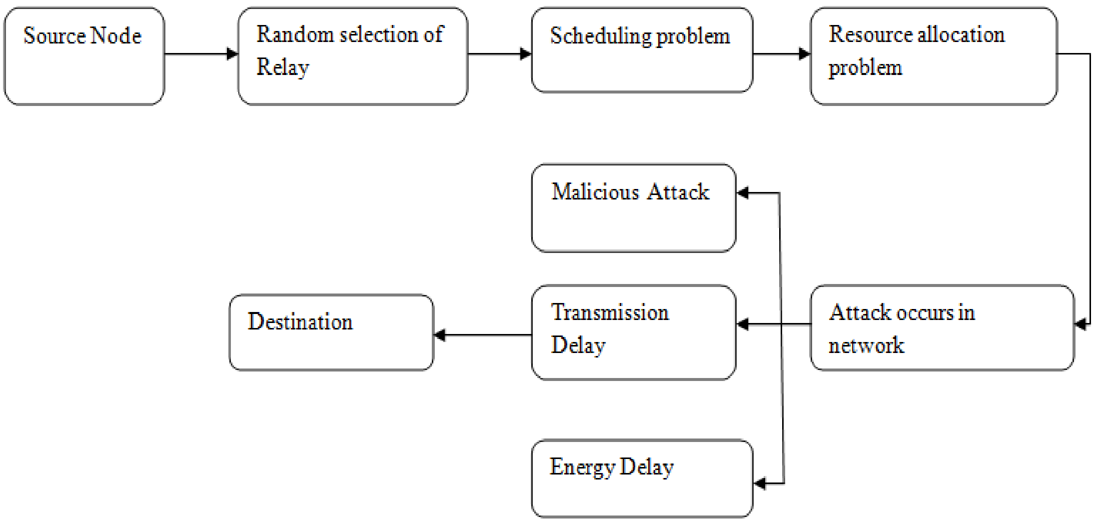
proof: The key observation of K rucksack constraints is expressed by the partition matroid constraints. The k rucksack constraints are the column-sparse rucksack constraints a non-zero entry appears only once in each column. The total K+L+M are column-sparse constraints in 3-tuple can appear in almost M+Δ +1 non zero coeffecients.
The function h(.)is the sub-additive i.e.,

h(u)≤h(u_1)+h(u_2)+),∀ u_1, u_2, u: u_1, u_2= u

The combinatorial algorithm is difficult to design that can combine both matroid and rucksack constraints. The greedy algorithm is well known specialize a Algorithm to our problem of interest.
We maintain set S in this algorithm. In each evaluation we add 3-tuple to S in Algorithm I i.e., the largest incremental gain of all feasible 3-tuples which have not yet selected and the offered incremental gain is positive. The process continuous till it becomes positive incremental gain with no feasible 3-tuple or it is being left. Ruck sack constraint to be matroid constraint by using sufficient condition.

III. PROPOSED ALGORITHM

BLOCK DIAGRAM



SOURCE NODE

Determining source routes requires accumulating the address of each device between the source and destination during route discovery. To accomplish source routing, the routed packets contain the address of each device the packet will traverse. This protocol is truly based on source routing whereby all the routing information is maintained

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at mobile nodes. It Route Reply would only be generated if the message has reached the intended destination node (route record which is initially contained in Route Request would be inserted into the Route Reply).To return the Route Reply, the destination node must have a route to the source node.

RANDOM SELECTION OF RELAYS

The relays which selects the forwarding nodes to send the packets. The route request would be inserted in to the route reply. The mobile nodes sends the information randomly to the destination which finds the shortest path. The nodes which have the energy capacity to store the data. The node which have the overhead it move on to the next node or alternate node.

SCHEDULING PROBLEM

The nodes which are transverse the information. While sending the optimization problem is occurs to rectify the greedy algorithm is used. The algorithm is the best solution. Always takes the shortest edge connecting a known node to an unknown node.

RESOURCE ALLOCATION

The resource allocation for the multi user. While allocating the resource the problem will occurs NP-hard. To overcome the problem constant factor polynomial time approximation algorithm is used. It forward the information to the alternate node.

ATTACKS OCCURS IN NETWORK

The information are transverse in the node. The path which are chosen to the next to next node the attacks will occur the malicious attack which is data loss while forwarding the information the multiple number of user are transmitting the data in the multiple channels. While the two information intracted in the same node to node can have the energy capacity. The node doesn't have the capacity their will be the energy delay occurs. The delay occurs in the node it finds the next node to transmit the data the extension of the time delay it has the transmission delay. The information are reached the destination.

TABLE I

SYMBOL DEFINITION

K	Number Of Users	N	Number of RBs
N_t	Number of TX antennas at each user	N_r	Number of RX antennas at BS
P_u	Power budget of user u	Q_u	Buffer size of user u
C	N-length vector representing a valid RBs	W	Precoder matrix having unit Frobenius norm
w	Finite codebook of all precoder matrices	C	Set of all valid RB assignments
e = (u , c, W)	3-tuple denoting allocation of RB assignments c and precoder W to user u	ε	Ground set containing all possible 3-tuple
u_e	User in 3-tuple	c_e	RB assignment in 3-tuple of ε
$H_e^{(n)}$	Channel matrix seen from user u_e on RB n	W_e	precoder in 3-tuple e

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IV. SIMULATION RESULTS

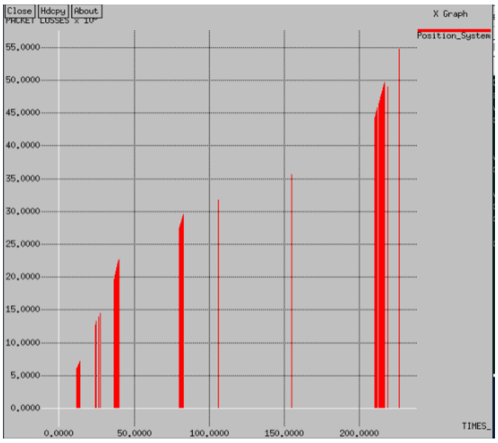

Fig 1. Packet loss Vs Time

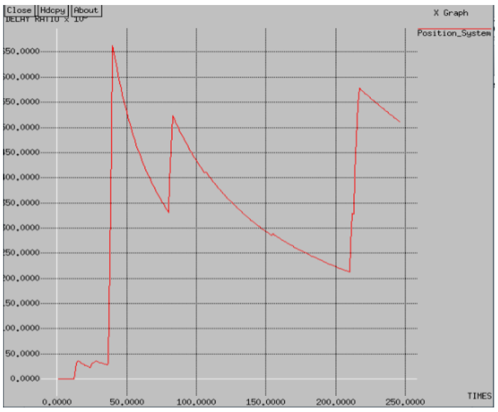

Fig 2.Delay Vs Time

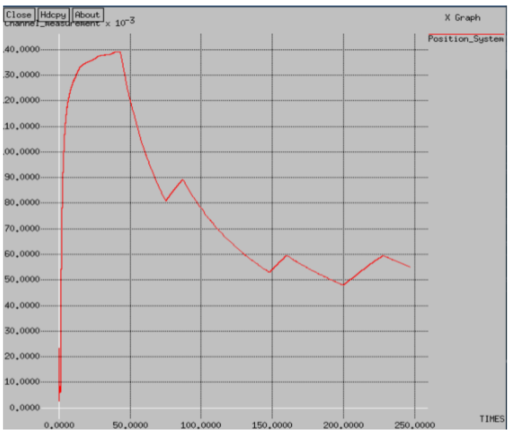

Fig 3.Channel Measurement Vs Time

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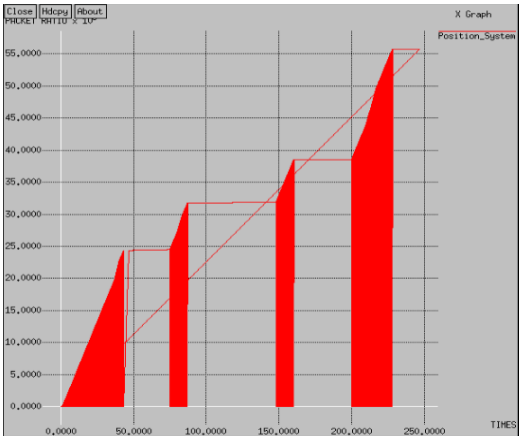

Fig 4. Throughput Vs Time

V. CONCLUSION AND FUTURE WORK

We recognize resource allocation in the 3GPP LTE-A cellular transmission that concede for MIMO from each scheduled user further multi-user scheduling. The same time frequency resource are assigned in the multi user. The NP- hard is a problem in resource allocation and constant-factor polynomial time approximation is proposed.

Enhance localization-aided localizability (LAL) protocol. certain locations in the network might be more expensive to instrument than others because they are less accessible. We might also have several sensor models to choose from, e,g., a high cost, high accuracy sensor, and a low cost, low accuracy sensor.

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