Massive MIMO Optimization with Compatible Sets

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Massive MIMO Optimization With Compatible Sets
Technical Report

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1 Introduction

In this report we provide results for those experiments and scenarios whose results were omitted from our paper \cite{1}. In Tables 2–1, we provide a reference of the experimental parameters used, however, readers are referred to the paper for a full explanation of the meaning of each parameter and the method for conducting the experiments.

The following results are contained in this report. For Experiment 1, the column generation iteration number vs. the dual objective for maximum ratio combining with optimal and static power control, as well as for zero forcing with fair, optimal, and static power control. Experiments 2 and 3 were omitted from the paper, and so full results for these experiments are provided here. For Experiments 4 and 5, results are given here for scenarios 2–6.

References

<table>
<thead>
<tr>
<th>Experiment</th>
<th>Near distance</th>
<th>Far distance</th>
<th>Other parameters</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>50 m</td>
<td>200 m</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>200 m</td>
<td>400 m</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>50 m</td>
<td>100 m</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>50 m</td>
<td>100 m</td>
<td>$\mu$: 1, 5...50; step 5, $K$: 20</td>
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<tr>
<td>5</td>
<td>50 m</td>
<td>100 m</td>
<td>$K$: 4...40, step 4</td>
</tr>
<tr>
<td>6</td>
<td>50 m</td>
<td>500 m</td>
<td>$K$: 40 total: 8 near, 32 far</td>
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</table>

Table 1: Experiment configurations.

<table>
<thead>
<tr>
<th>Scenario 1</th>
<th>Uplink demand $\hat{h}$</th>
<th>Downlink demand $\hat{h}$</th>
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<tbody>
<tr>
<td>Group</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Near</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Far</td>
<td>2</td>
<td>2</td>
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Scenario 2

<table>
<thead>
<tr>
<th>Group</th>
<th>Uplink demand $\hat{h}$</th>
<th>Downlink demand $\hat{h}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Near</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Far</td>
<td>10</td>
<td>10</td>
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Scenario 3

<table>
<thead>
<tr>
<th>Group</th>
<th>Uplink demand $\hat{h}$</th>
<th>Downlink demand $\hat{h}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Near</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>Far</td>
<td>10</td>
<td>2</td>
</tr>
</tbody>
</table>

Scenario 4

<table>
<thead>
<tr>
<th>Group</th>
<th>Uplink demand $\hat{h}$</th>
<th>Downlink demand $\hat{h}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Near</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>Far</td>
<td>2</td>
<td>10</td>
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Scenario 5

<table>
<thead>
<tr>
<th>Group</th>
<th>Uplink demand $\hat{h}$</th>
<th>Downlink demand $\hat{h}$</th>
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<tr>
<td>Near</td>
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<td>2</td>
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Scenario 6

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<td>10</td>
</tr>
<tr>
<td>Far</td>
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Table 2: Parameters used for experiments

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<th>Value</th>
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<td>$\rho$</td>
<td>10 dB</td>
</tr>
<tr>
<td>$\hat{\rho}$</td>
<td>10 dB</td>
</tr>
<tr>
<td>$M$</td>
<td>100</td>
</tr>
<tr>
<td>$\mu$</td>
<td>1.0</td>
</tr>
<tr>
<td>$S$</td>
<td>1</td>
</tr>
<tr>
<td>$P$</td>
<td>12</td>
</tr>
<tr>
<td>$\alpha$</td>
<td>3.7</td>
</tr>
<tr>
<td>$R$</td>
<td>200 m</td>
</tr>
<tr>
<td>$K$</td>
<td>40</td>
</tr>
</tbody>
</table>

Table 3: Scenarios for experiments
2 Experiment 1

Figure 1: Iteration number vs. dual objective for MRC with optimal power control

Figure 2: Iteration number vs. dual objective for MRC with static power control

Figure 3: Iteration number vs. dual objective for MRC with downlink power control

Figure 4: Iteration number vs. dual objective for ZF with fair power control

Figure 5: Iteration number vs. dual objective for ZF with optimal power control
3 Experiment 2
Figure 11: Number of pricing problem iterations

Figure 12: Solution time

Figure 13: Iteration number vs. dual objective for MRC with fair power control

Figure 14: Iteration number vs. dual objective for MRC with optimal power control

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4 Experiment 3
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Figure 23: Max node power
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Figure 30: Iteration number vs. dual objective for ZF with fair power control

Figure 31: Iteration number vs. dual objective for ZF with optimal power control

Figure 32: Iteration number vs. dual objective for ZF with static power control

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5  Experiment 4

5.1  Scenario 2

Figure 34: Frame size

Figure 35: Total power

Figure 36: Max node power

Figure 37: Number of pricing problem iterations

Figure 38: Total solution time
Figure 39: Total solution time, enlarged view

Figure 40: Solution time for pricing problem

Figure 41: Solution time for master problem
5.2 Scenario 3

Figure 42: Frame size

Figure 43: Total power

Figure 44: Max node power

Figure 45: Number of pricing problem iterations

Figure 46: Total solution time
Figure 47: Total solution time, enlarged view

Figure 48: Solution time for pricing problem

Figure 49: Solution time for master problem
5.3 Scenario 4

Figure 50: Frame size

Figure 51: Total power

Figure 52: Max node power

Figure 53: Number of pricing problem iterations

Figure 54: Total solution time
Figure 55: Total solution time, enlarged view

Figure 56: Solution time for pricing problem

Figure 57: Solution time for master problem
5.4 Scenario 5

Figure 58: Frame size

Figure 59: Total power

Figure 60: Max node power

Figure 61: Number of pricing problem iterations

Figure 62: Total solution time
Figure 63: Total solution time, enlarged view

Figure 64: Solution time for pricing problem

Figure 65: Solution time for master problem
5.5 Scenario 6

Figure 66: Frame size

Figure 67: Total power

Figure 68: Max node power

Figure 69: Number of pricing problem iterations

Figure 70: Total solution time
Figure 71: Total solution time, enlarged view

Figure 72: Solution time for pricing problem

Figure 73: Solution time for master problem
6 Experiment 5

6.1 Scenario 2
Figure 79: Solution time for pricing problem

Figure 80: Solution time for master problem

6.2 Scenario 3

Figure 81: Frame size

Figure 82: Total power

Figure 83: Max node power

Figure 84: Number of pricing problem iterations
Figure 85: Total solution time

Figure 86: Solution time for pricing problem

Figure 87: Solution time for master problem
6.3 Scenario 4

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Figure 89: Total power

Figure 90: Max node power

Figure 91: Number of pricing problem iterations

Figure 92: Total solution time
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Figure 99: Total solution time

Figure 100: Solution time for pricing problem

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7 Experiment 6
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Figure 117: Iteration number vs. dual objective for MRC with downlink power control

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Figure 120: Iteration number vs. dual objective for ZF with static power control

Figure 121: Iteration number vs. dual objective for ZF with downlink power control