Exploiting MMORPG Log Data toward Efficient RMT Player Detection
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Summary
Automatic detection of RMT players using log data
- Ranking all players with regard to their “suspiciousness”
- Manual verification starting from rank 1

Issues of Operating MMORPG
MMORPG: Multi-player online role-playing game
Countermeasure against unfavorable behavior
- RMT: Real-money trading
- Harassment (PK, robbing)
- Manual investigation requires human effort and time
- Effective use of huge volume of log data

Solution
Computes “suspecthood” using statistics derived from log data
Provided data
- Log data (Action log, Chat log)
- List of manually identified RMT players
Derived four types of statistics from both types of data
- TCC: The total number of utterances recorded
- TAC: The total number of action records
- AT: The amount of minutes in which at least one action is taken
- TCH: The amount of virtual currency handled in the period
(The absolute values of currency increase and decrease)

Table 1: Mean Values of Statistics

<table>
<thead>
<tr>
<th>Type</th>
<th>n</th>
<th>TAC</th>
<th>AT</th>
<th>TCC</th>
<th>TCH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seller</td>
<td>10</td>
<td>254.4</td>
<td>55.9</td>
<td>1.3</td>
<td>12,209.2</td>
</tr>
<tr>
<td>Collector</td>
<td>4</td>
<td>745.5</td>
<td>139.3</td>
<td>46.8</td>
<td>23,247.0</td>
</tr>
<tr>
<td>Eamner</td>
<td>15</td>
<td>106,137.8</td>
<td>16,772.5</td>
<td>11.0</td>
<td>13,438.7</td>
</tr>
<tr>
<td>Others</td>
<td>971</td>
<td>75,008.8</td>
<td>3,718.0</td>
<td>951.0</td>
<td>3,111.0</td>
</tr>
</tbody>
</table>

Preliminary Investigation
0. Assumption
RMT players handle huge amount of currency
15,250 players ⇒ top 1,000 players based on TCH

1. Statistical Analysis
Significant differences between RMT players and others

2. RMT Player Detection
Different statistics achieved the best results for each type of RMT players

Table 2: The Number of Extracted RMT Suspects

<table>
<thead>
<tr>
<th>Statistics</th>
<th>Seller</th>
<th>Collector</th>
<th>Eamner</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>10</td>
<td>4</td>
<td>15</td>
<td>29</td>
</tr>
<tr>
<td>TCH</td>
<td>639</td>
<td>452</td>
<td>80</td>
<td>639</td>
</tr>
<tr>
<td>TAC</td>
<td>998</td>
<td>889</td>
<td>360</td>
<td>998</td>
</tr>
<tr>
<td>TCC</td>
<td>1,000</td>
<td>1,000</td>
<td>1,000</td>
<td>1,000</td>
</tr>
<tr>
<td>AT</td>
<td>990</td>
<td>891</td>
<td>48</td>
<td>990</td>
</tr>
<tr>
<td>TCH/TAC</td>
<td>72</td>
<td>133</td>
<td>419</td>
<td>419</td>
</tr>
<tr>
<td>TCH/TCC</td>
<td>226</td>
<td>347</td>
<td>349</td>
<td>349</td>
</tr>
<tr>
<td>TCH/AT</td>
<td>81</td>
<td>123</td>
<td>643</td>
<td>643</td>
</tr>
</tbody>
</table>

Target Commercial MMORPG
“Uncharted Waters Online”
- TECMO KOEI GAMES CO., LTD.
- http://global.netmarble.com/uwo/

Target period
2009/8/30~2009/9/13
(in which the operators had identified RMT players)

Acknowledgement
Our greatest thanks to TECMO KOEI GAMES CO., LTD.

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Problems of RMT in MMORPGs
- Imbalances virtual economy
- Direct attacks to general players
- Unauthorized behavior
- Prevents new players
- Discourages existing players

Earners spend long time at a low frequency of action
Sellers and collectors take actions less frequently

Earners (15)
Sellers (10)
collectors (4)
RMT players deal with a huge volume of virtual currency

Future Work
Explore a more effective statistics
-especially from short-term log data
Apply to other game titles