Background

What is a Bot

A Bot is an exploit. It is an automated program used for gaining an unfair advantage during online gameplay.

What are HIPs

Human Interactive Proofs
- Cumbersome for system traffic
- Obtrusive to players

Mass Multiplayer Online Games

Affected Games
Outline

1 Background
   ● Game Bots
   ● Game Playing Characterization

2 HOP System
   ● Client-side Exporter
   ● Server-side Analyzer
   ● Performance and Scalability

3 Experiments
   ● Setup
   ● Results
   ● Other Bots

4 Limitations

Background

Fun, Win and Profit

Early bots used small server farms. Sophistication came early with homebrewed clients.
   ● Client patches made to break bots

The Arms Race

● Bot coded for new client patch begets another patch by the game
● Emergence of pixel reading configurable bots

Advanced Bots

● Use pixel scanning
● Construct macros for automation
### Simple Bots are Simple

MMOGs provide a large variety of possible interactions for players to perform, therefore their actions should include such variety. Bots have no need for this variety to be efficient.

### High Level Behavioral Differences

<table>
<thead>
<tr>
<th>Human</th>
<th>Bot</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burst pattern with strong locality</td>
<td>Repetitive, simple tasks</td>
</tr>
</tbody>
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### Movement

Bots do not optically perceive output data. Instead of being bounded by mechanical physics they glean some information from memory (i.e. Health or location coords).

### Meet Glider Bot

Glider Bot is a WoW bot that runs concurrently with the client with admin privileges to circumvent Warden. Fights monsters and picks up items based on pre-configured locations and monster names based on current character level. 40 hours of collection.

### Meet The Humans

30 individuals ranging in age from 18-45+ and skill level from none-10+ years. 55 hours of collection.

### Input Parameters

- Keystroke
- Point
- Pause
- Click
- Point-and-Click
- Drag-and-Drop
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HOP Client

- Small, Standalone external program
- However, would ideally be incorporated into the integral executable or existing anti-cheat system

HOP Server

Neural Network

Figure 5: An overview of the HOP system

Figure 6: A Cascade Neural Network
Impact

The nature of MMOGs dictate that the HOP system be lightweight and have minimal impact upon either game client or server.

Performance

- 16 bytes per user input
- Client-side bandwidth consumption negligible
- Exporter presence is imperceptible to end-user

Scalability

- Designed for thousands of simultaneous users
- Valgrind estimates neural network memory consumption at 37Kbytes
- Single-threaded multi-client model

Scalability continued

- 1 user input = 16 bytes
- 1 block = 4 inputs = 64 bytes
- 16 outputs = 2 bytes of bit array
- Total: aprox. 66 bytes per user

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Limitations

Total Data
- 95 hours of logged gaming over 3 million raw user inputs

Bot Data
- 40 hours of logged gaming
- 10 bot instances
- 7 areas of varying terrain
- levels 1-30
- 50% warrior/50% mage

Human Data
- 55 hours of logged gaming
- 30 people
- level 1-30
- 60% melee/40% caster

Test Sets
- 20 partitions
- each partition has a separate training set
- training set consist of either 9 bots and 30 humans or 10 bots and 27 humans
- test set is the remaining 1 bot or 3 humans
**True Positives and True Negatives**

**Decision Times**

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   - Setup
   - Results
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4. **Limitations**

**HOP for Diablo 2**

- without retraining the neural network
- MMBot instead of Glider
  - coded using AutoIt and does not ready from memory

**Diablo 2 Results**

- 20 hours of recorded game time
- True Positive = .864
- True Negative = 1.0
Limitations

- small group size
  - hardware variation
  - more bots
- allows for evasion

Questions

Questions?