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DETECTING ONLINE GOLD FARMERS USING NETWORK ANALYSIS

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Abstract: **Many of the online games played by people these days have their own eco-system. In the ecosystem players can purchase in-game assets using game money. Players are able to obtain game money by active participation or "real money is trading" through available official channels. Here gold farming group comes into the picture .Gold farmers, are players who stay online for extremely long hours and earn in-game assets for the purpose of selling the in-game money they accumulate for real-world money. Also gold farming bots with multiple accounts will gain more benefits & assets for playing the game in this way while the people who play sticking to the normal rules suffer. So to stop this, we are proposing a system which targets to find out such groups and block those groups of farming bots.**

Keywords: *MORPG, Game BOT, GFG*

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I INTRODUCTION

Since last half decade people of wide age range are attracted by online games and are fascinated by the online games . Massively multiplayer online role-playing games (MMORPGs) are one of the most popular types of online gaming where there are millions of dedicated users and fans from all around the world. The design of MMORPGs is in such a way that requires cooperation between players so as to accomplish difficult tasks, interact with other players & earn in game assets. The success of an MMORPG is measured by the number of active users and volume of their interactions. To that end, virtual economy is one of the important aspects of MMORPGs .Some player who are eager to achieve a high level in a short time employ real money to gain experience or to obtain valuable virtual goods in MMORPG. Game items and virtual money trades are done in games but those are restricted to the game world.

However, as games become more popular, in-game assets become tradable outside the game world and become valuable assets in the real-world economy as well. As a result of this, the ecosystem of gold farmers has arisen. Professional gold farmers are players that likely belong to poorer regions who play games a whole day and sell their obtained virtual goods in order to earn the same amount of money as much as (or even more than) what they might earn for real work.

Gold farming groups (GFGs) are organizations who gather and distribute virtual goods & in-game assets for capital gain in the online game world [1]–[3].They hire low cost labourers to establish their organization. Alternate to this they design programmable bots that don't need to be paid for their work & GFGs can gain more profit.

To provide a boost and vitality to the online game world it is important to manage the virtual economy well. So for the reason, online game designers and operators (companies) thoroughly consider and maintain economic factors in the game system. For example, online game companies continuously monitor the possible inflation rate and the status of redistribution of cyber-wealth, configuring the drop ratio of items (e.g., armors and weapons), the total amount of currency in circulation, and the price of staple (raw) commodities. GFGs employ bot programs an artificial intelligence (AI) program that can play a game without human control to increase the efficiency of playing & gathering money. And also GFGs spread malicious programs (malware) to steal money from the accounts of other players in the game. To that end, gold farmers are categorized into two types. The first type is micro-workers. The second type is unmanned and automated gold farmers also known as bots. They actively hire monitoring personnel and deploy

log analysis systems to distinguish game bot players from normal players. So we have achieved our end goal by banning the bots using various techniques thus minimizing the harm to the existing eco system

II OBJECTIVES

1. The goal of our investigation is to identify individual bots that compromise part of the trading networks within GFGs.
2. To detect GFG activities and control their underground economy.
3. To distinguish bots from human players using behavioral patterns or their response to interactive tests.

III RELATED WORK

Gold farmer detection methods have evolved over the years, and the literature on the problem can be classified into three generations of related works. The first generation of such methods is signature-based, and utilizes client-side bot detection such as antivirus programs or CAPTCHA-based techniques. However, the first generation of commercial products could be thwarted using techniques learned from reverse engineering. Also, methods using CAPTCHA are known to be user-unfriendly, and contribute to user annoyance. Finally, solving CAPTCHA has generated a thriving business that uses mechanical Turks utilized by underground players. The second generation of methods focused on data mining techniques, and used server-side bot detection systems, which focused mainly on distinguishing between a bot and a benign player by analyzing server-side log files. Such techniques are widely used commercially and are coupled with logging techniques and various data mining algorithms for highly accurate bot detection. However, making a variant of an existing bot that can generate new behavioral patterns to thwart an existing detection technique is very easy and heavily utilized by gold farmers. Moreover, this method targets gold farmers individually. Companies have less insight of who belongs to the same group, and GFGs fight banning by continuously creating new gold farmers, making current banning efforts ineffective.

The third generation methods are a surgical strike policy. They can detect all industrialized GFGs by group assuming that members in a group have frequent interaction and abnormal patterns.

IV LITERATURE SURVEY

[1] *Dark Gold: Statistical Properties of Clandestine Networks in Massively Multiplayer Online Games* , Brian Keegan .

He proposed that Gold farmers ply their trade on the periphery of a complex and heterogeneous trade network. Rather than interacting directly with the general population, farmers broker their transactions through a complex network of undetected affiliate characters. Although farmers form fewer connections than lay characters, they trade very intensely within their highly-clustered immediate networks. His sampling of the data and subsequent analysis is also necessarily biased by the heuristics employed by the game developer to identify deviant players and almost certainly omits the interactions of some actors engaged in unidentified deviant acts.

[2] *Surgical strike: A novel approach to minimize collateral damage to game BOT detection* , Hyukmin Kwo.

He proposed that the previous methods for GFG detection have focused on the user's behavior analysis, but they could detect only gold farmers, not whole GFGs. In his study, he focused on the virtual economy in games and traced abnormal trade networks formed by the gold farmers. As a first step, he extracted the trading network of GFGs only from the whole of the trading network, and then he separated each GFG by community detection method. In a second step, he classified characters in GFG by their role. BOT users login every day, they have a long play time, and they pay every month without any hesitation. Because of this reason, banning all BOT player is not the optimal method for game companies. This method is helpful to block users selectively without doing massive banning operation that can harm the game company's potential profit. As a result, with this small size of banning operation, he found a way to impact the GFGs.

[3] *Crime Scene Reconstruction: Online Gold Farming Network Analysis* . Jiyoung Woo.

He proposed a system in which he extracted the trading network of GFGs from a larger and richer trading network. Then to separate each GFG using community detection methods to identify them in groups. In a second step, he classified the characters in a GFG based on their roles by considering a selective banning scenario to regulate and enforce correct economic norms. This method is helpful for blocking malicious users selectively as opposed to massive banning operations, which may harm the entire game. As a result, using such selective banning operation we can precisely target and weaken GFGs while minimizing the harm to the existing ecosystem.

[4] *Automatic Detection of Compromised Accounts in MMORPGs* , Jehwan Oh.

He built a model that detects compromised accounts in online game using p-value change based on users past behavior. In this paper, He looked at the problem of compromised account detection in MMORPGs using p-value change model based on user behavior analysis. In particular, he found two features to be really effective this purpose - the session length and experience points. Session length is a measure of how engaged a player is within the game and experience points is a measure of the player's achievement.. To evaluate his proposed model, he adopted three metrics

(precision, recall, and F-score) that measure the classification performance.

5..*Server-Side Bot Detection in Massively Multiplayer Online Game* , Stefan Mitterhofer.

He proposed a novel approach that relies solely on a server-side analysis of character (or avatar) behavior to expose bots and avoid many of the drawbacks found in client-side solutions. He focused specifically on the game character's movement by extracting way points that describe the traveled path and finding repeated patterns in the route taken. He implemented and evaluated his approach in WoW concentrates on simple bots as they exist in online games such as poker. His technique, in comparison, is intended for more complicated games, but it's completely transparent to the end user and has no influence at all on the gaming experience. His technique is independent of traffic conditions and applicable to a wide range of MMOGs.

[6] Sequence-Based Bot Detection in Massive Multiplayer Online Games , Christian Platzer.

His contribution is threefold: He discussed a detection technique which uses Levenshtein Distances between action sequences to detect in game bots. He implemented detection tool on a server- and client-side instance and an in-game, client-sided add-on that is capable of monitoring its own event horizon. He evaluated approach based on a worst-case scenario. He utilized several commercial bots, a self-written bot and a group of human players to produce the necessary data.

[7].*The Ones That Got Away: False Negative Estimation Based Approaches for Gold Farmer Detection* , Atanu Roy.

His paper makes the following contributions: It shows detecting gold farmers from MMO networks can be re-defined as a false negative estimation problem and uses capture recapture technique to find a maximum likelihood estimate of undetected gold farmers. It uses a graph partitioning algorithm over a co-extensive MMO network to trace the undetected gold farmers using the capture recapture technique's maximum likelihood estimates. The paper applies network data to address the rare class classification problem.

V PROPOSED SYSTEM

A: We write purchase module for any inapp purchase game. In purchase module we design game purchase module which contain selling and buying criteria for the particular game.

B: Second task is to create bot which can play game automatically. For this we have to analyze whole software logic of the game. After understanding whole logic or algorithm of the game we are ready to create bot which can play game automatically.

C: Now the main task is to detect bot. we can detect bot by three scenarios which are as follows.

- Time period
- Location
- If someone is playing game more than 8 hour or 24 hour then obviously it is suspicious so in this scenario we declare this player as a bot and block.

Last scenario is to find whether there is a group which can play game from different devices but location and IP are same. Then it will come under suspicious activity and we block that user.

VI ARCHITECTURE

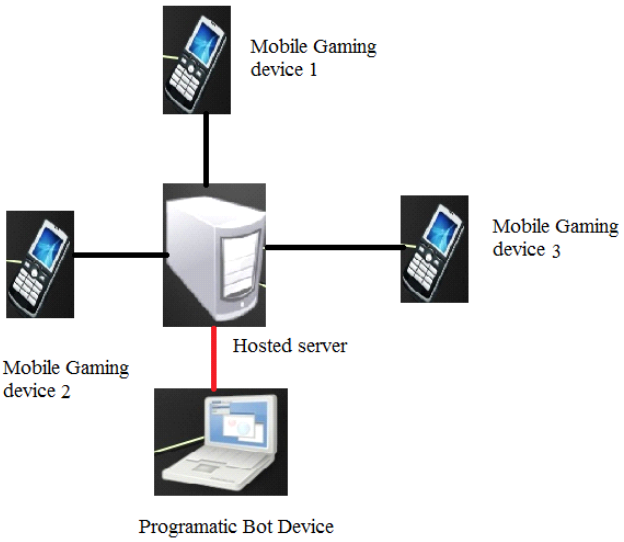


Figure 1. Block Diagram of System

VII ALGORITHM

Algorithm 1

1. Start.
2. Host Web Game on Server.
3. Play Game with 4 user.
4. IF User Playing More Than 8 Hours a Day
5. THEN Add To Suspicious Table
6. Reoccurring Behavior
7. Ban User From Playing.
8. ELSE Any Location Playing More Than 12 Hours
9. THEN Repeat Steps 5,6,7.
10. Continue
11. END.

Algorithm 2

1. If player is online for 1 hour pop up a notification like you are playing for 1 hour and mark severity level as 1.
2. After 2 hours of continuous playing send a notification please log out and log in again and mark severity level as 2.
3. If he does log out and log in then remove player from suspicious list of bot players else add him in the suspicious list and mark severity level as 3.
4. Then check for the ip addresses of the players of suspicious list if some are having same IP addresses and severity level as 3 or 2. If true block them.

5. Then check for continuous winning and continuously playing for 8 hours and severity level as 3. If there are any block them.

VIII ADVANTAGES

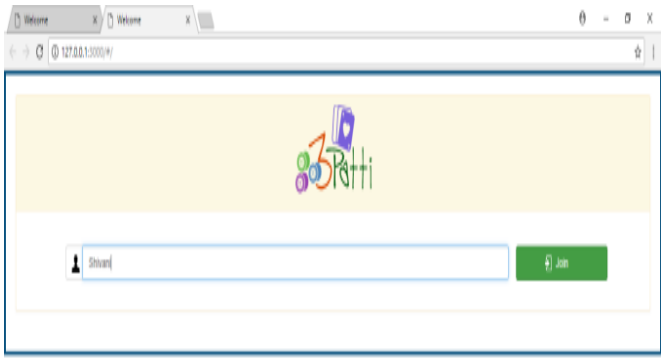
1. To Save Game money Earns in transactions by the Bot
2. To stop degradation of game Experience for users.
3. To stop generating Illegal money this can be lead to generate illegal money use in the funding for illegal business.

IX DISADVANTAGES

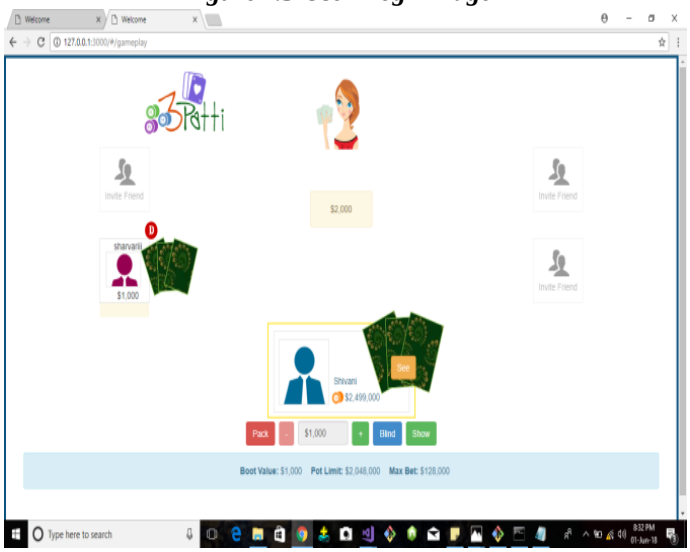
1. Gold farming can affect a game economy by causing inflation. They may degrade the game experience.

X RESULTS

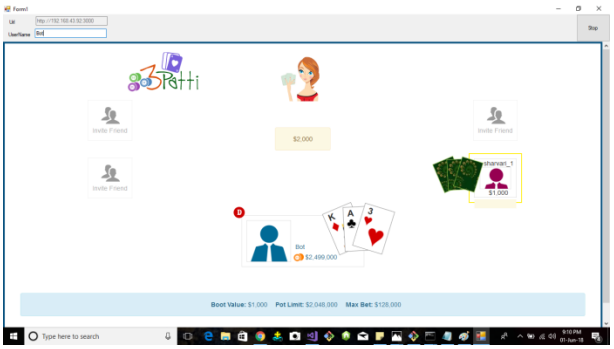
FigureX.2 Login page



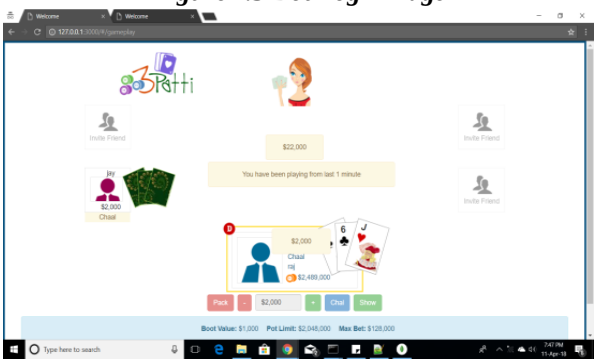
FigureX.3 User-Login-Page



FigureX.4 Normal Game Between 2 users

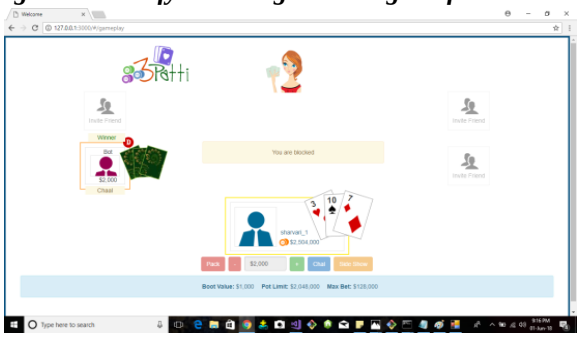


FigureX.5 Bot Login-Page

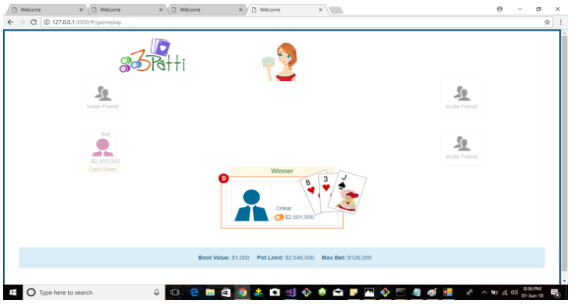


FigureX.6 Notify:-For Playing Since 1 minute

FigureX.7 Notify:-For Logout & Login After 3 Minute



FigureX.8 Bot Always Won



FigureX.9 Bot Has Blocked

XI CONCLUSION

We proposed a framework for detecting GFGs. The framework has the following merits to control GFGs

1. It detects only GFG characters without normal players.
2. It separates each GFG. If a game company quickly realizes that a GFG has become sufficiently big to break the game balance, the game company can take proper actions on time.

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