

Capstone : Operation of Aion Game Dataset Exploration

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Introduction

The operation of Aion game dataset is provided in five files. Two of the files pertain to player (Player Information and Player Actions). The rest of the three files pertain to game (Group Activities, Social Interaction and Network Activity Diversity). In the below section, we delve into individual data files and assess on what analysis can be made on the data files

Description of Dataset Features and Analysis to be performed

Player Information features

Player Information Features		
Actor	Player ID	These two features probably uniquely identify a player
A_Acc	Player Account	
Act_time	Captures time of login	
loc_x	Location(X-coordinate) of player in the game	These three features identifies the location of player in the game
loc_y	Location(Y-coordinate) of player in the game	
loc_z	Location(Z-coordinate) of player in the game	

etc_str1	IP address (first 3 bytes)	These two features identifies the IP address of the machine from where the player is logged in
etc_num2	IP address (last byte)	

Analysis to be performed

1. Login frequency
 - a. Features to be used: Actor+A_Acc, Act_time
2. Play time:
 - a. Features to be used: Actor+A_Acc, Act_time
3. Number of IP addresses
 - a. Features to be used: Actor+A_Acc, etc_str1, etc_num2
4. Movement analysis:
 - a. Analyze the avatars movement trajectories based on the assumption that there is a difference between human players trajectories and those of game bots
 - b. Features to be used: Actor+A_Acc, loc_x, loc_y, loc_z

Player Actions Features

Player Action Features		
Actor	Player ID	These two features probably uniquely identify a player
A_Acc	Player Account	
Log ID	Type of Action in Game	Each log id represents a type of action.
Count	Count of action done	

The following table describes the player action type against the Log Id.

Log ID	Action Type
143	Experience count
202	Obtaining items count
187	Earning game money
156	Abyss count or player kill count
148	Experience repair count

151	Use portal count
137	Killed by player count
138	Killed by non player count
142	Teleport count
146	Reborn count
??	Sit count

Analysis to be performed

A player can acquire player kill points by defeating players of opposing factions. Player kill points can be used to purchase various items from vendors. Player kill points are also used to determine a player's rank within the game world. In the Aion game2, the more player kill points a player has, the higher is the rank of the player. The high ranking player can feel a sense of accomplishment. In addition game bots often connect to the game and can play for 24 consecutive hours, differently from human users, that typically are not able to play during several time-windows, for instance during work and sleep ones. Considering that usually when a user reaches a certain rank level he obtains powers to fight the enemies more effectively, game bots can more easily obtain these powers, and the attacker once their characters have obtained the powers resell them to other users.

Each of the above player actions can be made as features on which analysis can be done w.r.t. target variable of classifying that set of actions against a bot or human.

Group Activities

Group Activities Features		
Actor	Player ID	These two features probably uniquely identify a player
A_Acc	Player Account	
Act_time	Time of group action recorded	
Log_id	Type of Group activity	Each log id represents a type of group action. It ranges from the value 603 to 612. It is unclear what individual group activity value means. However, on a whole we could characterize on the point that Bot might not be doing much of group activity than humans.

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Analysis to be performed

1. Party play time
 - a. Formed by two or more players in order to undertake quests or missions together.
 - b. Some game bots perform party play but the aim of that is to acquire game money and items faster.
 - c. Feature to be used: Actor+A_Acc, Act_time for finding Party play time spent. Compare the times between humans and bots.
2. Guild activities

Social Interaction Diversity Features

Social Interaction Diversity Features		
Actor	Player ID	Uniquely identifies a player
A_Acc	Player Account	
GuildAct_count	Count of Guild actions	The social interaction diversity feature indicates the entropy of party play, friendship, trade, whisper, mail, shop, and guild actions. Game bots concentrate only on particular actions, whereas human users execute multiple tasks as needed to thrive in the online game world.
GuidJoin_count	Count of Guild joins	
a126_5_Degree	Party Play?	
a134_5_Degree	Friendship?	
a219_5_Degree	Trade?	
a229_5_Degree	Whisper?	
a247_5_Degree	Mail?	
acha_5_Degree	Shop?	
Type	Human or Bot	Output classification

Analysis to be performed

The social interaction diversity feature indicates the entropy of party play, friendship, trade, whisper, mail, shop, and guild actions. Game bots concentrate only on particular actions, whereas human users execute multiple tasks as needed to thrive in the online game world.

We can quantify the social interaction diversity of social interaction by calculating the Shannon diversity entropy, which would take into account all these features and output a

value that would represent the social diversity of the player. This can then be compared for humans vs bots.

https://en.wikipedia.org/wiki/Diversity_index#Shannon_index

Network Measures Diversity Features

Relating to the NM category, the player's social interaction network can be represented as a graph with, characters as the nodes and interactions between them as the edges. An edge between two nodes (players) in this graph may, for example, highlight the transfer of an item between the two nodes. The features of NM include the degree centrality (NM1), betweenness centrality (NM2), closeness (NM3), eigenvector centrality (NM4), eccentricity (NM5), authority (NM6), hub (NM7), PageRank (NM8), and clustering coefficient (NM9).

Network Measures category feature Description

1. Degree centrality: This features represents the centrality focused on the degree. The more edges an actor has, the more important it is.
2. Betweenness centrality: It counts the number of shortest paths between two nodes on which a given actor resides.
3. Closeness centrality: An actor is considered important if it is relatively close to all other actors. Closeness is based on the inverse of the distance of each actor to every other actor in the network.
4. Eigenvector centrality: Indicates that a given node has a relationship with other valuable nodes. A high eigenvector value for an actor means that a node has several neighbors with high eigenvector values
5. Eccentricity: The eccentricity of node v is calculated by computing the shortest path between node v and all other nodes in the graph; then the longest shortest path is chosen.
6. Authority: Exhibits a node pointed to by many good hubs.
7. Hub: Exhibits a node that points to many good authorities.
8. PageRank: Assigns a numerical weight to each element of a hyperlinked set of documents, such as the World Wide Web, with the purpose of "measuring" its relative importance within the set.
9. Clustering coefficient: It quantifies how close neighbors are to being a clique: a clique is a subset of all of the edges connecting pairs of vertices of an undirected graph.

Analysis to be done

For each of the features of Party play, friendship, trade, whisper, mail, shop, and guild; calculate the degree of interaction using the original features and use the derived values for classification.

References

1. <http://ocslab.hksecurity.net/Datasets/game-bot-detection>
2. https://www.researchgate.net/publication/301640460_Multimodal_Game_Bot_Detection_using_User_Behavioral_Characteristics
3. <https://www.iit.cnr.it/sites/default/files/game-bot-detection.pdf>
4. https://en.wikipedia.org/wiki/Diversity_index#Shannon_index
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