

Chapter 18

Game Playing Tactic as a Behavioral Biometric for Human Identification

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ABSTRACT

This chapter expands behavior based intrusion detection approach to a new domain of game networks. Specifically, our research shows that a behavioral biometric signature can be generated based on the strategy used by an individual to play a game. We wrote software capable of automatically extracting behavioral profiles for each player in a game of poker. Once a behavioral signature is generated for a player, it is continuously compared against player's current actions. Any significant deviations in behavior are reported to the game server administrator as potential security breaches. In this chapter, we report our experimental results with user verification and identification, as well as our approach to generation of synthetic poker data and potential spoofing approaches of the developed system. We also propose utilizing techniques developed for behavior based recognition of humans to the identification and verification of intelligent game bots. Our experimental results demonstrate feasibility of such methodology.

INTRODUCTION TO BEHAVIORAL BIOMETRICS

Behavioral biometrics are a valuable tool in many security tasks, which require identification or verification of an individual. Behavioral biometrics are often employed because they can be easily collected non-obtrusively and are particularly useful in situ-

ations, which do not provide an opportunity for collection of stronger - more reliable biometric data. We investigated strategy used while playing a game as a type of a behavioral biometric (Yampolskiy & Govindaraju, 2008b). The game of poker is used as an example of a game with a clearly identifiable player strategy. The profile produced for each player is used as the person's behavioral-biometric profile. This chapter is based on "Strategy-Based Behavioral Biometric a Novel Approach to Automatic Identi-

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fication” by R. Yampolskiy and V. Govindaraju, which appeared in the International Journal of Computer Applications in Technology, Special Issues on Automated Identification Technology. The chapter presents a new comprehensive view of research results previously published in a number of venues including: (Yampolskiy, 2006, 2007a, 2007b, 2008) and (Yampolskiy & Govindaraju, 2006a, 2006b, 2007, 2008a, 2008b).

Our approach can be used by online casinos to detect a masquerader who is utilizing a stolen account on a game server or a player trying to cheat by using an AI bot in order to win more money. Both are currently big problems in the world of online gaming and a successful solution is beneficial not just from theoretical but also from a practical point of view. Advantages of the developed solution are listed below:

- No special hardware required
- No noticeable enrolment period
- Provides continuous player verification
- Identifies user not the system or geographic location

ON THE GAME OF POKER

In our experiments we used a variant of poker known as Texas Hold'em. It is a game of incomplete information with rules which are easy for beginners to understand, but the game takes years to master. The rules are simple; each player (number of players can be between 2 and 10) gets two private cards from a standard deck of 52. A round of betting takes place after which only players who wish to play their hand remain in the game. The rest of the players give up their claims to the money in the process known as Folding. Poker is played for money and the amount to bet can either be structured (Limit) or unstructured (No Limit). The process of increasing the amount of money necessary to play is known as Betting or Raising, if another player has already engaged in Betting.

After the first round of betting 3 community cards are revealed known as the flop. Another round of betting takes place. This is followed by another revealed card known as the Turn. After another round of betting the final card, known as the River, is revealed and a final round of betting takes place. The remaining players go to the Showdown in which all still participating players open their private cards to examination by other players and the player with the best Hand (2 private cards) wins all the money contributed to the Pot (bank) in this hand. The ranking of hands is based on the five best cards out of 7 available (2 private and 5 community cards). The ranks are: Straight Flush, 4-of a kind, Full House, Flush, Straight, Set, 2 pair, 1 pair and finally the weakest is the high card. A straight is 5 cards in a row based on the rank. Flush is 5 cards of the same suit. Full House is a pair and a Set. A set is 3-of a kind.

Players also take turns being the Dealer or the person who distributes the cards and is the last one to act in latter betting rounds. The player to the left of the dealer is known as the Small Blind because he has to contribute a small forced Bet to the pot pre-Flop. The person to the left of the Small Blind is known as the Big Blind and has to contribute a large forced Bet pre-Flop. This is done to encourage active participation by players instead of conservative waiting for the best possible hand pre-flop such as AA (two aces). In case of a draw (same card combination is displayed at showdown by multiple players) money in the pot is equally divided among such players. If a player runs out of money he has an option of limiting his loses by going All-In, which means only contributing his remaining money to the pot, regardless of the contribution amount from other players. In this case the player who goes All-In can only win a portion of the Pot proportional to his All-In bet.

Overall, Poker game strategy is heavily influenced by the nature of your opponents, amount of money at the table, your position around the table and tendency of players to Bluff (deceive others

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