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Protec 21

- ***Catch card counters in the act***
- ***Catch shuffle trackers***
- ***Catch table hoppers – players working in a team***
- ***Catch cheaters by analyzing abnormal winning patterns***
- ***Clear non-counting suspects of suspicion***
- ***Analyze your own house shuffle for weaknesses that trackers can exploit***
- ***Design more secure shuffles that require less table downtime***
- ***Rate the play of your regular players***
- ***Check out the house edge of your own rules***
- ***Try out the effects that different rule variations have on the house edge***

Let's start with a very basic overview. Blackjack is the one casino game that can be beaten by skilled players. There are two main reasons for this.

- (1) High cards tend to favor the player and low cards tend to favor the House.
- (2) The ratio of high-to-low cards remaining fluctuates as the shoe gets depleted.

Skilled players, otherwise known as card counters (and their more advanced counterparts, shuffle trackers) can mentally keep track of the relative composition of the cards remaining in the shoe. If an abundance of small cards has been dealt, this will naturally mean that the cards remaining in the shoe are relatively rich in high cards. At this time, the skilled player will recognize that "the count has gone up". Knowing the statistical fact of high cards favoring the player, the card counter will make large initial wagers knowing he is more likely to win the hands that are played when the count has gone up. When the count drops down again - in other words, when an abundance of high cards has been dealt, meaning the majority of the cards remaining in the shoe are low value cards - the card counter will tend to bet as little as possible without attracting suspicion.

Using Protec 21 in your surveillance room will open up an amazing new window onto your Blackjack players. By entering one shoe of data onto your target player, you will have an idea of what sort of threat he poses to your House bankroll. One more shoe of data, and Protec 21 will generate a comprehensive, easy to understand report of the player's skill level, with full mathematical analysis on the reasons for the player's rating

Entering the surveillance video into Protec 21 couldn't be easier. Using the PC's keyboard, a touch screen monitor or speech recognition, you input the playing information into the PC as it happens in real time on the screen. Five minutes of practice using the keyboard will get you started and within half an hour you'll be generating a report on a player in real time!

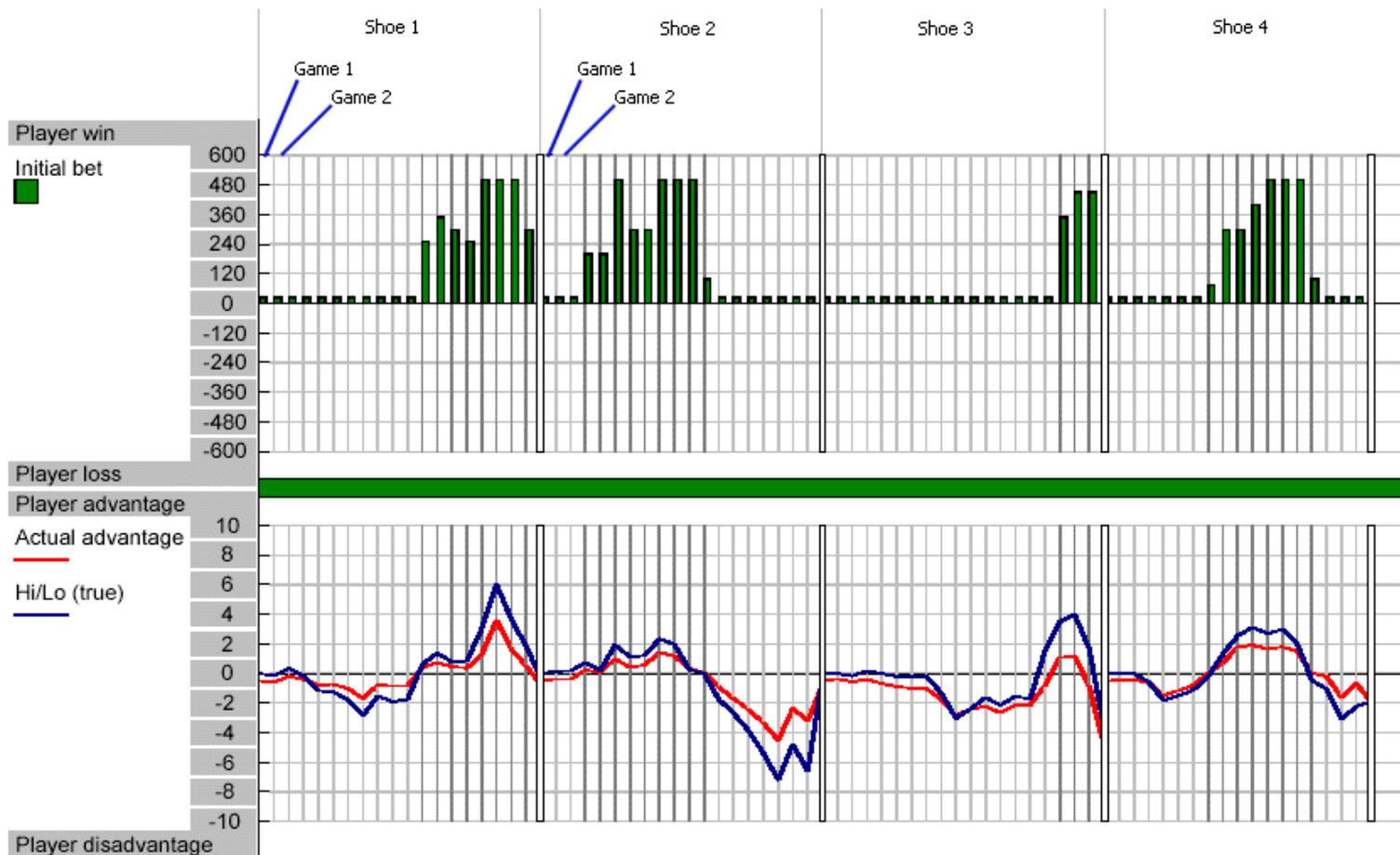
You can enter a shoe of data on a suspect now, and another shoe on the same person, next week. To generate a report for a particular player, you can combine all or selected sessions for that player into one profile for analysis.

Let's take a look at the reports Protec 21 can provide.

The graph below is taken from the sample database shipped with Protec 21.

- Graphs are divided into an upper and lower section, by a heavy green line.
- The upper section shows the size of the player's bet.
- The lower section shows the fluctuating advantage of the shoe.
- Shoes are divided by heavy vertical lines.
- Games are divided by gray vertical lines.
- Thick gray vertical lines are used to draw attention to games where large bets were placed.

The following graph shows four shoes of play.



Looking at the top half of the graph (the green bars) it can be seen that in the first shoe, the player placed small bets (\$25) for the first eleven games. Then the bets rose, up to a maximum of \$500 for games 16 to 18. The player bet \$300 on the last game of that shoe.

Now, let's examine what the fluctuating advantage was doing throughout that first shoe of play. Look at the red line in the lower half of the graph. It starts at just below zero. This represents the house edge (as determined by the values entered into the Rule Set). As the games progress and the shoe gets depleted, the advantage naturally fluctuates. At around game 11, the advantage crosses over the zero axis into positive territory. It spikes up to around 3% at game 17 and falls again towards the end of the shoe.

The red line represents the most mathematically accurate advantage calculation. However, this counting system is so complex that no human can do it mentally. That's why simpler counting systems such as Hi-Lo were developed. Many other counting systems have been developed (such as Halves, Hi-Opt, Omega, Revere, Zen and so on) and essentially they all aim to get as close to possible as the red line. In the graph above, the Hi-Lo count is represented by the blue line. As you can see, Hi-Lo does a pretty good job of keeping up with the red line.

So if there was a card counter sitting at the table during the first shoe above, then in his mind he would be keeping a track of that blue line. (Assuming he was using Hi-Lo.)

How will this knowledge affect his betting behaviour? He will place large bets when he has the advantage, and small bets when the house has the advantage. So now go back and look at the total picture of the first shoe. The correlation between the size of each wager and the fluctuating count is obvious. It might be a coincidence on this one shoe. But see how, over the course of four shoes, the player's bet consistently increases when the blue line is elevated.

This player will be classified by Protec 21 as a card counter. The full analysis of a the card counter as shown above can be seen on page 5.

Contrast the card counter with a typical player, who has no perception of the fluctuating advantage. Such a player will show no correlation between his bet size and the count of the shoe, and is not a long-term threat to the house bankroll. An analysis of a typical player is shown on the next page (page 4).

Finally we have the shuffle tracker. This person is more dangerous than a card counter because he has knowledge of specific sections of the shoe. If a section of a shoe is rich in "high" cards (tens and aces) that favor the player, the shuffle tracker can increase his bets during this section, regardless of how high or low the count currently is. The key issue with the tracker is that he will place large bets during periods where the count is falling. As you can see from the tracker analysis on page 6, Protec 21 has not considered him as a card counting threat. You can see that the correlation between the bet size and the count is not that of a card counter. Instead, the high bets are placed where the count is falling – in other words, the tracker is placing high bets right at the time the good cards are coming out of the shoe. The tracker analysis correctly shows him to be a high level threat to the house bankroll.

How Does Protec 21 Determine a Counter and Tracker?

Over each shoe, the software algorithm looks at the size of the bet for each game where the fluctuating advantage was in the player's favor. It sums all such bets and divides the total by the number of games in player advantage. This is the player's average "advantage" bet. The algorithm makes a similar calculation for the games where the player was at a disadvantage, to arrive at an average "disadvantage" bet. Dividing the advantage bet by the disadvantage bet results in a ratio which in essence is the player's "effective bet spread". For typical players who do not perceive the fluctuating advantage, this value will be around 1.0 because their high advantage bets will tend to cancel out their high disadvantage bets. A card counter will score a substantially higher effective bet spread because his big bets correlate closely with a high count.

A similar algorithm is used for shuffle trackers but with one big difference. A shuffle tracker's advantage is defined by a game where the count declined during the game. In other words, a shuffle tracker has knowledge that a section of high cards is about to be dealt from the shoe, and places large bets accordingly. During this period where the high cards are being dealt from the shoe, the count is falling by definition.

Protec 21 has other algorithms too, such as the traditional Expected Value and the accuracy rating (percentage correlation to a "perfect" card counter). The end result is a concise and accurate summary of the target player.

The reports on the following pages represent a typical player, a card counter, and a shuffle tracker. to see how Protec 21 can help you justify barring a skilled player. Just as importantly is the ability to clear players that are wrongly suspected of having sufficient skill to overcome the house edge.

Also notice the advantage graphs in each of the following three reports - they are the same. These three players were sitting at the same table at the same time.

PROTEC 21 Betting Strategy Report

Player name: SAMPLE Style, Typical

General information

Time period of analysis:	11 Nov 1997
Number of shoes played:	4
Number of rounds played:	75
Total amount bet/won:	\$8650 / \$775
Average bet:	\$115
Rule set in use:	DigitAce Systems
House edge:	0.51 %
Graph definition used for analysis:	EV (Actual advantage)
Average proportion of each shoe for which a bet was actually placed:	83 %

Counter analysis

Calculates the betting strategy used by the player when the count (advantage) was positive. This indicates that there was a relative surplus of high cards remaining in the shoe.

Average advantage bet / Average disadvantage bet:	1.0 *
Betting strategy correlation with ideal Counter:	68 %
Total rounds where there was an advantage:	36 %

Counter rating: Typical style * Threat thresholds: 3.0 (low) to 7.0 (high)

Tracker analysis

Calculates the betting strategy used by the player when the count (advantage) was dropping. This indicates that there was a relative surplus of high cards actually being dealt from the shoe.

Average advantage bet / Average disadvantage bet:	0.9 *
Betting strategy correlation with ideal Tracker:	44 %
Total rounds where there was an advantage:	57 %

Tracker rating: Typical style * Threat thresholds: 1.8 (low) to 5.5 (high)

Session analysis

Calculates the overall past betting performance by the player, with the data given. This indicates the likelihood of success the player has had to date.

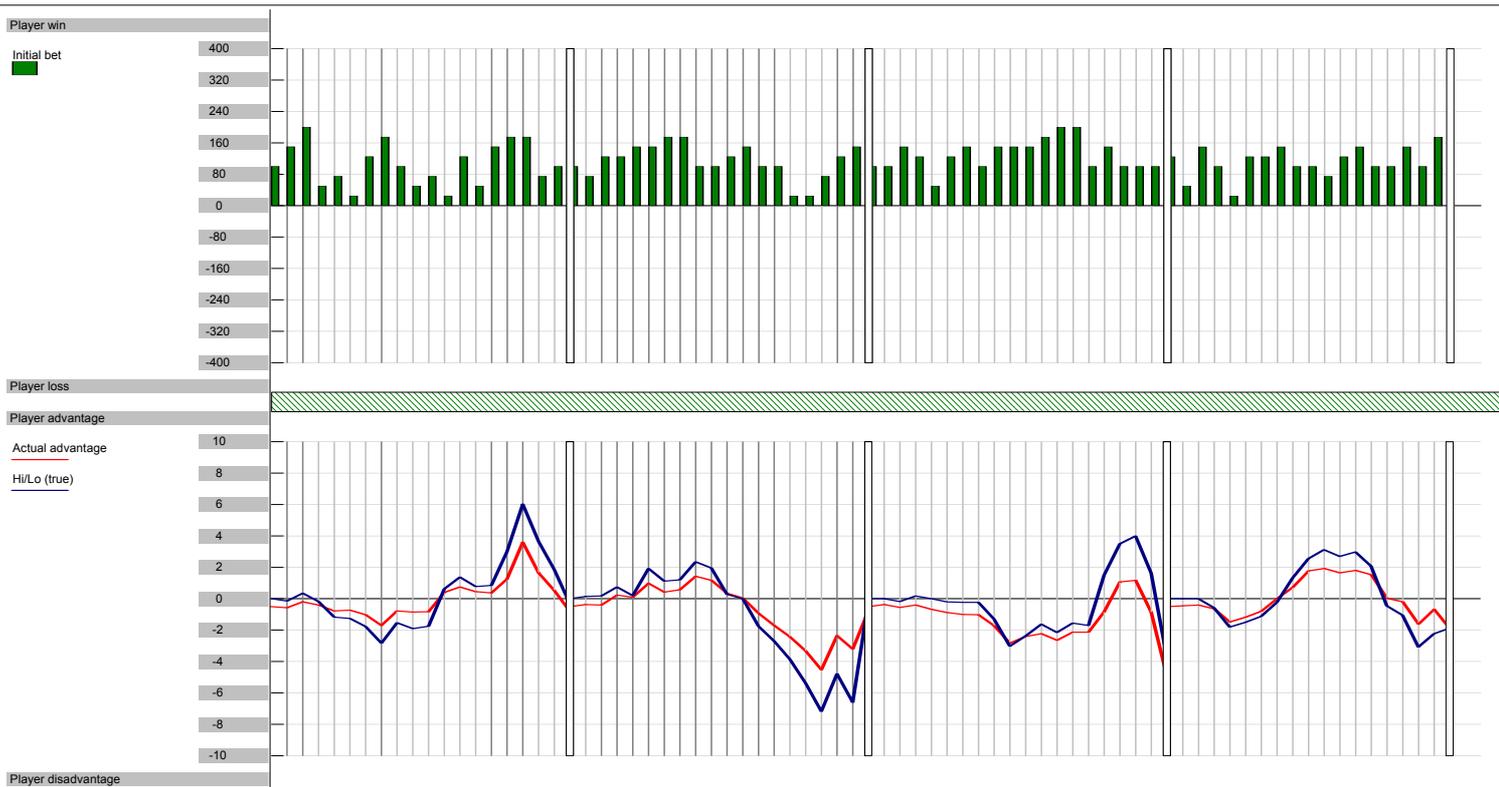
Player's overall past betting strategy rating: -0.55 *

Session rating: Typical style * Threat thresholds: 0.0 (low) to 1.0 (high)

Summary

There is no evidence to suggest that the player poses a threat to the house bankroll.

Overall rating: Typical style



PROTEC 21 Betting Strategy Report

Player name: SAMPLE Counter, Card

General information

Time period of analysis:	11 Nov 1997
Number of shoes played:	4
Number of rounds played:	75
Total amount bet/lost:	\$11150 / \$4800
Average bet:	\$148
Rule set in use:	DigitAce Systems
House edge:	0.51 %
Graph definition used for analysis:	EV (Actual advantage)
Average proportion of each shoe for which a bet was actually placed: 83 %	

Counter analysis

Calculates the betting strategy used by the player when the count (advantage) was positive. This indicates that there was a relative surplus of high cards remaining in the shoe.

Average advantage bet / Average disadvantage bet:	12.4 *
Betting strategy correlation with ideal Counter:	98 %
Total rounds where there was an advantage:	36 %

Counter rating: High-level threat * Threat thresholds: 3.0 (low) to 7.0 (high)

Tracker analysis

Calculates the betting strategy used by the player when the count (advantage) was dropping. This indicates that there was a relative surplus of high cards actually being dealt from the shoe.

Average advantage bet / Average disadvantage bet:	3.0 *
Betting strategy correlation with ideal Tracker:	58 %
Total rounds where there was an advantage:	57 %

Tracker rating: Moderate threat * Threat thresholds: 1.8 (low) to 5.5 (high)

Session analysis

Calculates the overall past betting performance by the player, with the data given. This indicates the likelihood of success the player has had to date.

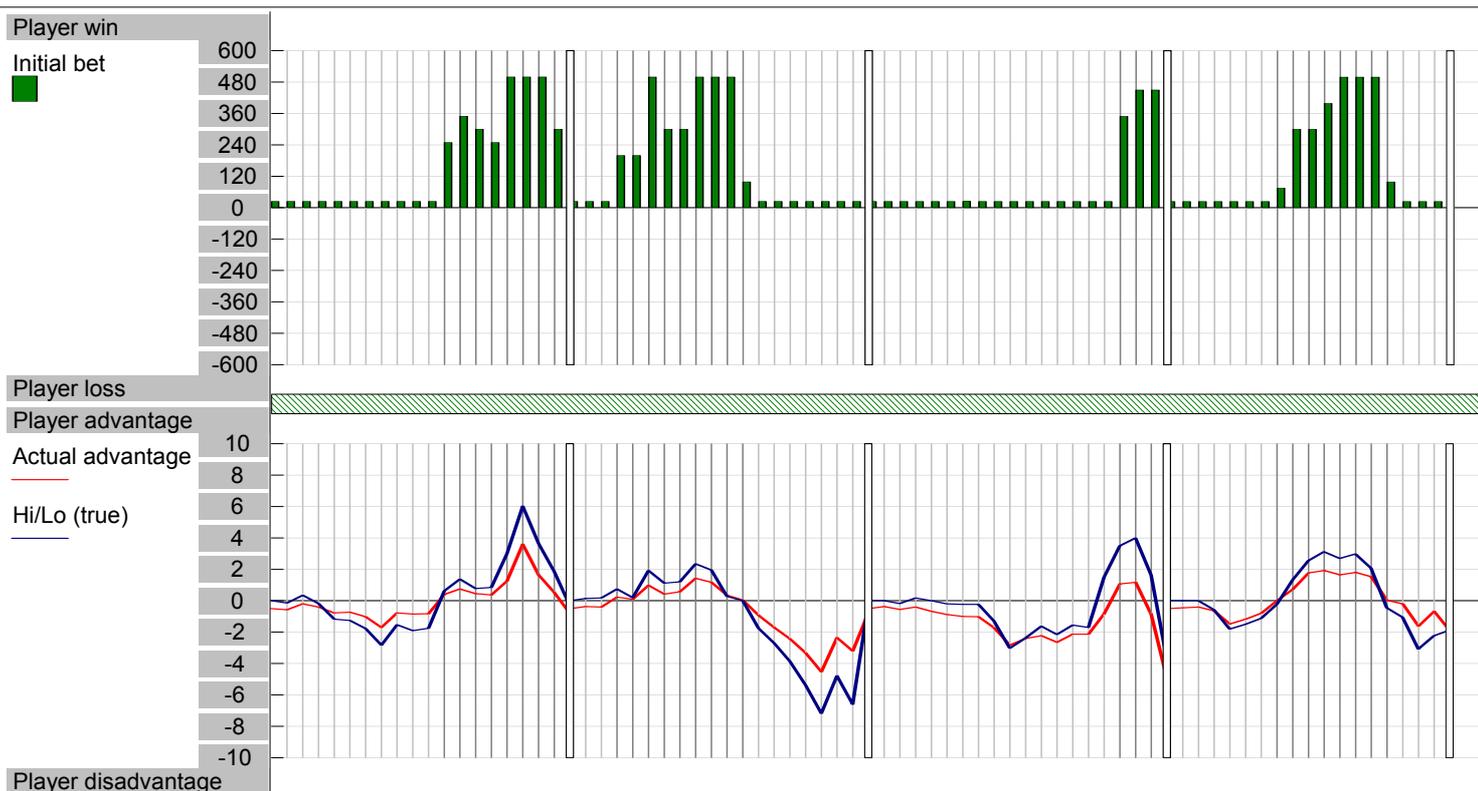
Player's overall past betting strategy rating: +0.44 *

Session rating: Moderate threat * Threat thresholds: 0.0 (low) to 1.0 (high)

Summary

There is strong evidence to suggest that the player poses a threat to the house bankroll.

Overall rating: High-level threat



PROTEC 21 Betting Strategy Report

Player name: SAMPLE Tracker, Shuffle

General information

Time period of analysis: 11 Nov 1997
Number of shoes played: 4
Number of rounds played: 75
Total amount bet/lost: \$15675 / \$650
Average bet: \$209
Rule set in use: DigitAce Systems
House edge: 0.51 %
Graph definition used for analysis: EV (Actual advantage)

Average proportion of each shoe for which a bet was actually placed: 83 %

Counter analysis

Calculates the betting strategy used by the player when the count (advantage) was positive. This indicates that there was a relative surplus of high cards remaining in the shoe.

Average advantage bet / Average disadvantage bet: 1.4 *
Betting strategy correlation with ideal Counter: 56 %
Total rounds where there was an advantage: 36 %

Counter rating: Typical style * Threat thresholds: 3.0 (low) to 7.0 (high)

Tracker analysis

Calculates the betting strategy used by the player when the count (advantage) was dropping. This indicates that there was a relative surplus of high cards actually being dealt from the shoe.

Average advantage bet / Average disadvantage bet: 5.9 *
Betting strategy correlation with ideal Tracker: 77 %
Total rounds where there was an advantage: 57 %

Tracker rating: High-level threat * Threat thresholds: 1.8 (low) to 5.5 (high)

Session analysis

Calculates the overall past betting performance by the player, with the data given. This indicates the likelihood of success the player has had to date.

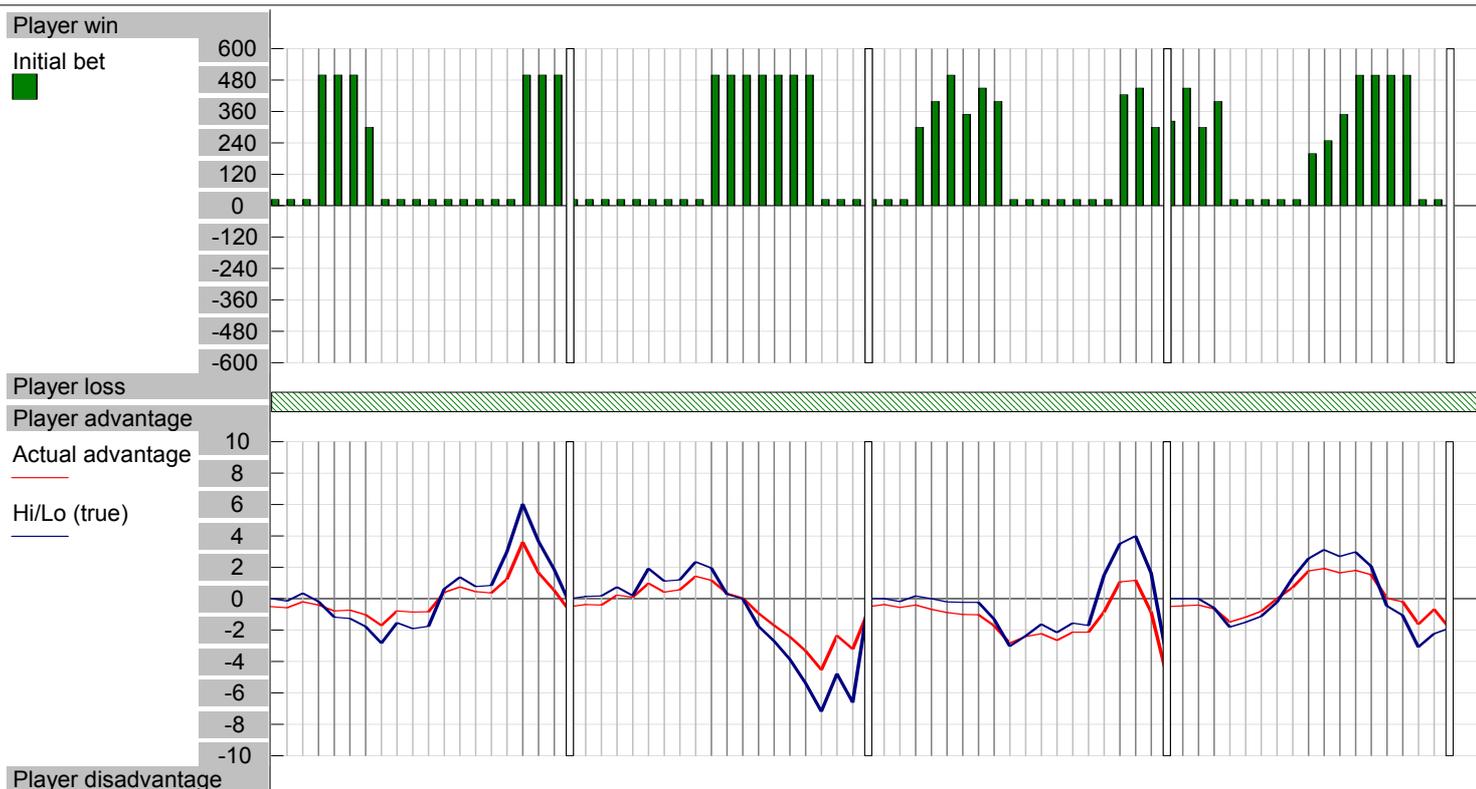
Player's overall past betting strategy rating: +1.00 *

Session rating: High-level threat * Threat thresholds: 0.0 (low) to 1.0 (high)

Summary

There is strong evidence to suggest that the player poses a threat to the house bankroll.

Overall rating: High-level threat



PROTEC 21 Playing Strategy Report

Player name: SAMPLE Counter, Card

General information

Number of rounds:	75
Number of decisions:	109
Deviations from basic strategy:	5
Accuracy to basic strategy:	95%
Winning deviation hands:	1 (20%)

Playing report for basic strategy deviations

-- Round 10 of Shoe 1 (Count at start of round: -1.9) -----

Dealer: [3,6,T] (Total 19)

Box: 3 Bet: \$25 Decisions: 2 Basic strategy deviations: 1
(Count: -1.7) [3,8] *Hit (Double) [3] Stand (Total 14: Lose)

-- Round 15 of Shoe 1 (Count at start of round: +0.9) -----

Dealer: [9,5,3] (Total 17)

Box: 3 Bet: \$250 Decisions: 2 Basic strategy deviations: 1
(Count: +1.8) [7,3] *Hit (Double) [T] Stand (Total 20: Win)

-- Round 19 of Shoe 3 (Count at start of round: +1.6) -----

Dealer: [T,A] (Total 21)

Box: 3 Bet: \$450 Decisions: 2 Basic strategy deviations: 1
(Count: -0.9) [9,2] *Hit (Double) [9] Stand (Total 20: Lose)

-- Round 9 of Shoe 4 (Count at start of round: +1.3) -----

Dealer: [5,A,4] (Total 20)

Box: 3 Bet: \$300 Decisions: 2 Basic strategy deviations: 1
(Count: +2.8) [4,5] *Hit (Double) [3] Stand (Total 12: Lose)

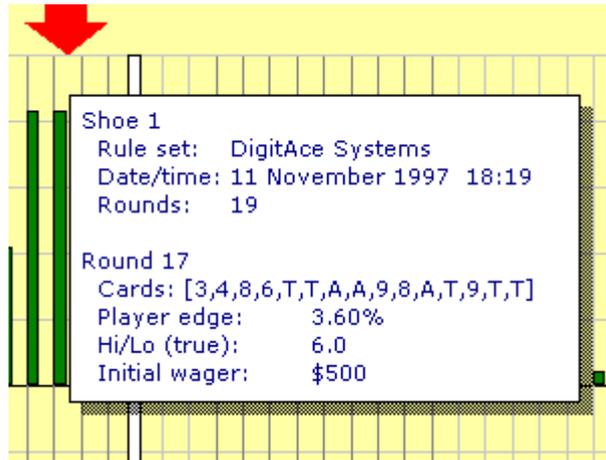
-- Round 13 of Shoe 4 (Count at start of round: +3.0) -----

Dealer: [2,8,8] (Total 18)

Box: 3 Bet: \$500 Decisions: 2 Basic strategy deviations: 1
(Count: +3.2) [T,5] *Hit (Stand) [2] Stand (Total 17: Lose)

More About The Graphs

- When you're viewing a graph on the screen, you can select how many shoes to display on the screen. Off-screen shoes can be scrolled into view.
- By right-clicking the mouse on any game in any shoe, a pop-up panel appears showing a summary of the current game.



- When entering data on a player, you can mark periods where the player was put under "heat" by casino staff whilst playing. When viewing a graph, these periods are marked on the graph with a red bar. Any change in betting behaviour that coincides with the player being put under overt heat will be evident from the graph.

The graphs in the preceding samples show the player's initial bet, vs. the actual advantage (red line) and the Hi-Lo count (blue line). However Protec 21 is capable of many more sophisticated graphing options for advanced users. The following parameters can be used to construct new graphing algorithms.

Wager and Win/Loss	Counting Systems
<ul style="list-style-type: none"> • Initial bet • Splits & doubles bets • Game win/loss • Insurance bet • Insurance win/loss • Side bet • Side bet win/loss 	<ul style="list-style-type: none"> • Assign any value to any card • Convert to True count • Reset to zero at start of each game • Multiply and offset running count • Subtract house edge

Protec 21 is shipped with a range of counting system pre-installed, including Ace, Crush, Halves, Hi Opt II, Hi-Lo, Insurance efficiency, Omega II, Optimal, Revere, Sixes and Fives, Zen, and variations on each of these such as true and running count. You can even enter your own counting system into Protec 21 and then analyze old data against the new count!

Expected Value graphs can be created by combining the different types of graphs.

Up to ten graph algorithms can be displayed simultaneously on any given player and each can be drawn in any color and as a line or bar graph.

The Playing Strategy Report on the previous page indicates the player's adherence to basic strategy play. This information is useful in determining the overall skill level of the player, even if the player is not card counting. The system reports on the number of strategy deviations that result in a win. A high value would typically raise suspicion of cheating.

There's even more to Protec 21, such as the Shuffle Analysis module that allows you to analyze and improve your own shuffling procedures, and the Rule Set database that allows you to enter your House rules and calculate a house edge. Maintain a database on your players and surveillance staff, and password protect all of Protec 21's sensitive functions from unauthorized staff.

For more information, full contact details for TCS John Huxley can be found at www.tcsaces.com and for DigitAce Systems at www.digitace.com.