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What is Bj-Sim

BJ-Sim is a program that simulates <u>players</u> at a casino blackjack <u>table</u>. Players can be added or removed from a table, and their behavior can be set for how they play, how they bet, and when they <u>terminate</u> their play.

BJ-Sim allows users to decide how virtual players will play on a virtual table, then set these virtual players going for a large number of hands. It does not attempt to involve the player in playing individual hands as most Blackjack games do. The aim of BJ-Sim is to evaluate playing strategies using large scale simulation.

Bj-Sim has the potential to evaluate around 5 million hands an hour on a 486 DX-66 using a super summary mode.

Graphs

Graphs are used to view detail run information. Each graph type is shown in its own window and plots all players. Graph types are listed below. The x axis of all graphs is always a measure of the number of complete hands. The y axis is different for all graph types, and described below.

Types

Bank Balance
This plots the current bank balance of players. The y axis uses the same bank units as shown in the text details lines

Bet Amount
This plots the amount bet per hand. The y axis is in monetary bank units. As the bet amount can vary wildly, a smoothing factor is applied. See the Smoothing section below.

Card Count
This plots the current card count variable for each player.

Bet Returns
This plots the Returns as seen in the text details line output. As this value can vary wildly, the graph has smoothing applied. See the section below on smoothing.

Player Wins
This plots player wins. The y axis represents wins, losses and draws where a win increases this value by 1, and a loss reduces this number by 1. This number is unaltered by a Draw.

Smoothing
Smoothing is used to flatten out a graph, where the plotted points are so scattered that a graph trend is difficult to see. Smoothing can be set for the Bet Amounts and Bet Returns graphs. The amount of smoothing can be set using the horizontal slider control. The higher the number, the smoother the graph.

Use Graphing
Graphing can be enabled or disabled, without losing the graphing settings, or closing and opening each window individually.

Table

The table stores settings for casino rules, and local table options.

Description
This is optional text that is associated with a table, where notes can be made about table settings.

Double on Split Hand
This determines if doubling on a split hand is allowed.

Table Limits
All casino tables have an upper and lower limit. Valid ranges for the Upper scroll bar are 5 to 30000. Valid ranges for the Lower scroll bar are 1 to 5000. The units used are the same as applies to the betting amount. If a player attempts to place a bet outside of these limits, the bet will automatically be adjusted to the nearest upper or lower limit.

Random Source
This sets the random number generator used to shuffle the deck. There are two types of random number sources supported :

Standard
This is the standard random number generator that is used in the average compiler. Whilst quick, most random number generators supplied with compilers are supposedly below par, so one other generator can be selected, and that is LGM.

LGM
LGM stands for Lewis, Goodman and Miller. This algorithm appeared nameless, and so LGM is used as it was first proposed by these people. It is supposed to be a more thorough random number generator, and for that it can be a little slower than the standard algorithm.

Cut deck % from top
This scroll bar sets the point at which the dealer shuffles the deck. Valid points vary from 5% to 100% from the top of the deck. Cards are drawn from the top of the deck, so the lower the value, the more often the deck get shuffled.

Shoe Size
This is the number of decks used on the table. Decks from 1 to 50 are supported. While no casino uses up to 50 decks, the affect on variations in deck size are worth investigating.

Players

Player List
This represents the seating arrangement at the table, where cards are dealt from seat 1 (top row) to seat 5 (bottom row). Where a seat is not allocated to a player, the label empty is shown. Player names are shown in the appropriate position in this list once a player has been allocated to the seat.

Add
This adds players to the table. Adding a player requires a name to be allocated. Players without names will not be allocated to the table. Once a name is allocated, the player details can be filled in. Players by default terminate player almost immediately, so it is very important to fill out player details.

Remove
This removes allocated players from the table, making the seat position available for a player to be added again. Once a player is removed from the table, all information about that player is lost.

Edit
The behaviour of a player can be edited after the player has been added to the table. Pressing the Edit button will bring up a player edit dialog box.

Reset
Players can be reset individually, by pressing the `Reset` button for that player, or all players can be reset by pressing the `Reset All` Button.

A player reset sets the following :

Who won last (for betting purposes) is set to draw
The last bet (for betting purposes) is set to the table minimum
The bank is set to zero.
The round count (for termination reasons) is set to zero.
Termination conditions are reset, so the player is free to bet again.
The card counting variable is set to zero.

Reset All
Resetting all applies the above resetting operations to all players currently on the table.

Player Details

Betting

The player can use the following betting strategies :

Flat
The player uses a constant betting value as set by the VAR1 variable. In this case, VAR2 is not used.

Win Up
If the player lost the last hand, then decrease the bet by the amount set in VAR1. If the player won the last hand, then increase the bet by the amount set in VAR2.

Win Down
This is the opposite of the Win Up system. If the player lost the last hand, then increase the bet by the amount set in VAR1. If the player won the last hand, then decrease the bet by the amount set in VAR2.

Win Reset
This system increases the bet by a percentage of the previous bet, and resets the bet on a winning hand. The resetting bet is set to VAR1. The percentage increase is set by VAR2. To create a double on nothing system, set VAR2 to 100. The new bet is calculated as

```
(Oldbet + (OldBet x (VAR2/100))
```

Players keep an internal counter in their heads of the current amount to bet. If this goes below the minimum table limit, the bet is forced to be the same as the lower limit. The player however, maintains this internal counter, and does not adjust it for table limits. If for example, the lower table limit was $5.00, and the player was using a Win-Down system, and kept winning, the bet would not rise above the $5.00 minimum until the player`s internal bet tracing calculated a bet above $5.00 was needed.

Description
This is the Player name. Spaces are allowed, so that the name can describe the behaviour the player uses when playing. Players cannot be added to the table if they don`t have a name.

Termination
The player stops betting when any one of the termination reasons are met. The player however, continues to play.

Rounds Max
The round counter for players is incremented on every complete hand. When this number of complete hands have been played, the player terminates betting.

Upper Bank
This is the upper set point for the player`s bank. If this setting is exceeded, the player stops betting.

Lower Bank
This is the lower set point for the player`s bank. If this setting is exceeded, the player stops betting.

Chart
This applies a previously defined chart to this player. A file dialog box will prompt for the name of the chart file to load. Charts can be changed by loading a different chart later. See Charts

Card Counting
Applies card counting behaviour to this player. See Card Counting

Card Counting

Card counting is used on all cards that come off the pack. Each <u>player</u> can see all cards that come off the pack. When a player makes a decision based on card counting, it is on all cards seen up to the player decision (which is determined by the <u>dealer</u> card, own card, and all player cards dealt so far.

Cards
A card counting variable is used to alter the current bet. This section changes the value of this variable.

The card counting variable is set according to each card that comes off the deck. To increase the card counting variable, enter a positive value in the VAL section (a preceding `+` sign is also acceptable). To decrease the card counting variable, enter a negative value in the VAL section.

The card counting variable applies to currently edited player only. Each player has their own variable.

Note that a shuffle resets this variable to zero.

Vars
Once the current card counting variable is evaluated, the VARS section is used to establish how this variable should affect the current bet. Each column of this grid defines a range for the card counting variable. A search is made from left to right for a range that satisfies the current card counting variable value. As soon as a match is found, the values in the VAL row is added to the current bet. If this value is negative, the result is a subtraction for the current bet.

The high and low values of these ranges are inclusive.

Up to eight ranges can be defined.

On / Off Flag
The application of card counting can be turned on or off using this switch.

Charts

This chart defines the actions a player takes during play. Player hands are listed on the left, and the dealer`s card is listed at the top.

The first line from top to bottom that matches the current player`s hand and dealer card, is taken as the action to use. This implies for example, that Ace-3 (14) is used instead of 14 (14) which is later in the table.

If the player resolves the action to be a double (based on the current chart), the table will check if a double is allowed (based on the number of cards). If the request is rejected, a hit is used.

The currently selected chart is shown in the panel at the top of this screen.

Press the `Done` button when all editing has been completed.

Editing

This chart can be edited by using the mouse to select a range of cells in the same manner as a spreadsheet is used. Once one or more cells are selected, the action for that block can be set by pressing any of the action buttons at the top right of the screen. Allowed actions are STAY, HIT, DOUBLE or SPLIT. Take note that all cells in the selected range must allow such as an action, before it is accepted. Splitting A3 for example is not legal, and is rejected.

If a chart is edited after a player has loaded it, the changes do not come into effect until the player reloads the chart.

Loading

The chart to edit can be loaded using the `Load Chart` button. All charts have the file extension `RLE`.

Save As

The `Save As` Button only allows saving charts to files that do not currently contain a chart, and prompts for a file name.

Save

This saves the current chart, if one exists.

Summary

The Summary button activates a summary mode to view results. It is used for very large runs, where the computer could be left for hours at a time to calculate long term results.

Update Window
This region periodically shows the bank and bet for each player loaded on the table. The rate at which this display is refreshed is determined by the display refresh rate (see description below), but all <u>hands</u> are calculated as usual.

Bank
This is the current <u>bank</u> of a particular player.

Bet
This is the current bet of a particular player

Complete Hands
This shows the number of <u>completed hands</u> per player. This number is not reset until the `Reset All` button is pressed or the particular player is reset.

Go
This starts the summary running. Play continues until all <u>players</u> have <u>terminated</u>, or the stop, exit or reset buttons are pressed. Pressing the exit button stops the summary run and returns control the main screen.

Stopping and exiting this screen does not reset play, it only pauses it. This allows modifications to players or the <u>table</u>, or removal and additions of players. A graph run or two can be activated before returning to the super summary. The only rule to remember is that play is only paused, when using different viewing modes, and the termination condition for the super summary is the termination of all players.

Stop
This pauses the summary run until Go is again selected.

Reset All
This resets all players on the table. See Reset All in <u>Players</u>.

Display Refresh Rate
The display output is sampled from the simulation results at a rate set by these presets. A value of 50 indicates that the output is refreshed by every 50 or so <u>complete hands</u>. The larger the value, the less often the output is updated, the smaller the value, the quicker it updates. Note that the quicker the refresh rate, the slower the simulation runs.

Average Hands / Sec
The displays the current rate of progress by the simulator as the number of <u>complete hands</u> calculated per second. The value can vary during running, as the computer allocates computing time to the application. This value will of course vary on different computers, with different processing speeds.

Text Line

Text output windows are available for detail runs for each player. Each window only contains output for one player. Every action the player performed on the table during the run is shown in detail.

The text line dialog box determines what is shown in the text output windows, and which players on the table will produce a text output window.

All detail information is stored for each player on every run, so that a text window for a player can be added after the run, with all the information available, without performing a second run.

Details

Shuffle Flag
Should the shuffle flag column be included

WhoWon
Should the Who won flag be included

Player Blackjack
Should the player Blackjack flag be included

Player Hand
Should the cards for the player be shown

Dealer Details
Should any of the dealers details be shown (this includes the dealers cards, their value and whether the dealer has blackjack)

Card Count
Should the player card count be shown.

Apply To
This sets which players in the table will produce a separate text window output. Removing players will disable the relevant text window output.

Partial Details
Should partial hand information be shown on the output window.

Text Output Window

If a player on the table has text output allocated (see <u>Text Line</u>), then a Text Output Window will be produced on every detail run. The purpose of this window is to show all details available for all <u>hands</u> produced during the run.

Sections

End
This is the output line number for this window.

Ct (Count)
This is the card counting variable value at the point in time the player had to decide how to play the hand.

S (Shuffle)
Did a shuffle occur in this hand, (* means yes)

Vl (Value)
This is the value of the players hand.

Wn (Won)
This indicates the win/lose state of the players hand. * means the player won, - means the player drew with the dealer. This column is blank for lost hands.

BJ (Blackjack)
This indicates if the player`s hand is blackjack. * means yes, - means both the player and the dealer had blackjack. This column is blank otherwise.

Bt (Bet)
How much did the player bet for this hand.

Ret (Return)
How much was the return for the player for this hand.

Bank
This is the value of the player`s bank after this hand was completed.

Act (Action)
This indicates the action the player`s action. H means hit, S means split, D means double, and a blank column indicates Stay.

Rs (Reason)
What reason did the player have for requesting the above action. The values given in this column is the x axis index of the current chart of the player, If the player was forced to stay, as the previous request was a double, then Db is shown.

Cards
The players hand as dealt from left to right. Note that T indicates ten.

Dval (Dealer Value)
The value of the dealer`s hand

BJ (Dealer Blackjack)

Did the dealer have blackjack.

Cards (Dealer Cards)
The dealer`s hand as dealt from left to right. Note that T indicates ten.

Printing

The print option prints a selected portion of the text output window. The range of output can be selected using the `From` and `To` buttons. These are inclusive results numbers as shown on the left of the text output window.

Output is sent to the currently selected printer. See Windows documentation for how to the set the current printer.

Scrolling

The output for this window can be scrolled up and down, with <u>complete hands</u> being the smallest scrolling increment, i.e. scrolling up or down would have a complete hand at the top of the window at all times

DeskTop

The current desktop consists of the table, with all its settings and all the players, with all their settings. Current graphs, textlines and window positions are display options and are not stored in these files.

Desktops can be loaded or saved at any time, with the players window updated accordingly.

Help

This the help system. Help is available about currently open dialog boxes by pressing F1, which will bring up a context sensitive help. While there are no help buttons on each dialog, pressing F1 would have the same effect.

⏩ Go Button

This performs a detail run, based on the current table and players settings. A progress indicating box will appear while the PC is calculating all details for all players. The progress can be stopped at any time by pressing the cancel button. If there are no players on the table, a warning message will appear. If There are no graphs or text output windows applied to any of the players, no output will be produced.

Rules of Play

These are the rules of play on this table.

The Dealer
The Dealer must hit on 16 or less, regardless of all other players hands. e.g. All players could be busted, but the dealer hand would still need to be completed.

The Shoe
Cards are always taken from the top of the shoe, until the split point is reached, at which time the complete shoe is shuffled again. This could be in the middle of a hand, or any other time.

Order of Play
A complete round consists of :

1. Card given to dealer
2. Two cards are given to each player from position 1 on the table.
3. Each hand is completed starting from position 1. Split hands are completed before moving on to the next player
4. The dealer`s hand is completed
5. All hands are evaluated as won, lost, standoff, blackjack, busted etc..
6. All cards are tossed into a card bucket

Splitting
Splits are allowed for all pairs. An attempt to set splitting outside of pairs will be rejected. There is no limit to the number of split hands.

Doubling
Doubling is allowed on a player hand pair totaling 9, 10 or 11 only. The dealer can have any value card. The chart will not allow the setting of the doubling action outside of the range 9 to 11. If a hand totals between 9 and 11 inclusive, but is not a pair (e.g. 3,4,4), then a HIT is used instead of the DOUBLE. Doubling a split hand is allowed.

Who won ?
If both the player and dealer have blackjack, the result is a standoff. If a player hand busts, the dealer always wins, even if the dealer busts.

Instant results

Load any of the example files shipped with Bj-Sim by pressing the Desktop button and selecting a file. Press the Graphs button, and a list of graph types are shown. Select Bank Balance, then press OK.

The desktop is now set for some output, so press the Go button. A bank balance graph should appear. The process of pressing of the Go button and viewing of the graph can be repeated as many times as desired.

Press Exit to shut down the program.

Putting players on the table

To put a player on the table, open the players list box, by pressing the players button. Select an empty seat on the table by clicking on the empty seat to select it, then press the Add button. The player is now on the table, and player behavior should now be set, as the player is bound to terminate play immediately.

Loading a desktop file removes all the players on the table, and replaces them with the players stored in the file.

Saving settings

The setting up of players on the table can be a very time consuming task. Once the players are set up, they can be saved by selecting Save Desktop from the File menu. Turning graphs and text output on are not so time consuming and are not saved in desktop files.

Change casino rules

Casino rules are set by editing the table settings. Possible settings to change are the number of decks in the shoe, the cut point in the deck, the upper and lower betting limits of the table, and whether doubling is allowed on split <u>hands</u>.

Change player behavior

Player behavior is set in the Player details dialog box. Behavior that can be set includes betting styles and amounts, responses to given <u>hands</u>, termination conditions and card counting behaviours.

To change behavior, press the player button to bring up the player selection box. Select the player from the player list box by double clicking the name. Edit the player details box that appears, then press OK.

Players always STAYS

The text line output window will show the player electing to stay on all <u>hands</u> dealt, as silly as the hand may seem. This can happen if the player does not have a valid chart to work with. This can be due to a chart not being allocated to the player

This can also be caused by loading a desktop with a player that uses a chart that is not available on the system. The chart name the player needs is stored in the desktop file, and each player attempts to load their charts. If any of the players cannot locate their charts, they will chose to stay on all hands.

Shutdown after credit screen

There are internal checks to verify the software that runs Bj-Sim. If any of the validation checks fail, the program will just shut down after the credit screen. Try reinstalling the software if this problem arises, and scan the hard disk for allocation errors.

Pressing go does nothing

If pressing the go button appears to do nothing, check that some text line output is selected, or some graph is selected. If neither of these is selected, then pressing this button will appear to do nothing,

If the progress window does not appear after pressing the go button, something is really amiss.

Drowning in a sea of windows

If all players are on the table, and all graphs and text output windows are set to be shown, the resulting screen will have 5 graph windows and 5 text output windows, as well as the player screen if open. This can be make things hard to read.

Options are to close all windows individually, but they will just pop up again on the next detail run, or disable all seat positions for text output, and disable all graph types, or disable the use graphing option in graphs.

Any of these windows can be rebuilt without running another detail run, by selecting them to show again.

Settings aren`t saved

The only items stored in the desktop files are the table settings and all player settings. Graphs, text output settings and window positions etc.. are not saved. These are usually the operations that take the least time, whereas player setups can be time consuming.

Reports show ridiculous profits

There are times the bank balance graph heads up and up, such as in bet doubling systems. It is best to check the table settings for a reasonable upper bank bound, and cut point in the deck.

The usual cause of misleading results is the table setup being too open, as is the default state.

Average hands / second varies

When running the summary screen, the average <u>complete hands</u> per second results can wander about a bit. This is due to the amount of computing time allocated to the program by Windows.

This output is a very good guide to computation speed. Where exact values are needed for whatever reason, it is best to run for more than a few minutes with a stop watch and add up the results manually.

Card count does not add up

The card count output for the text output window is calculated at the point the player had to make decision based on this variable.

Because this program uses card counting to vary the bet, the point at which the player makes a decision for the next bet is the end of the text line, so the text line should add up to the card count. If this program were to vary the player action (from the player chart), then the end of the text line would not represent the point at which the player made a decision, because the dealer`s hand would not have been completed for the action on the current line. This is not the case, but may be introduced in later versions of the program.

Splitting can confuse the issue. Just bear in mind what order the cards came off the deck, as completed split hands are shown with the full dealer hand, when the dealer hand was actually resoloved after all the split hands were played to completion.

Keep in mind that other players are using cards as well, so adding up the cards for one player, without taking others into account will not tally.

In all cases, the output is actually adding up correctly, but It can be difficult to determine the true count, especially with multiple players.

Betting peaks aren`t on the graph

The graph smoothing function can really flatten out spikes in the betting graph. Such spikes can exist in the double of nothing system of betting, where the table upper bank limit is set high. The only solution to this is to reduce the smoothing factor on the graph. It is possible to set and reset the smoothing factor as often as required, without having to do a detail run again.

The betting column in the text detail window shows absolute betting values, where betting peaks can be read.

Where is Surrender and Insurance

Most strategies don`t use insurance or surrender and as such are not evaluated. If (and only if) a strong demand exists to evaluate surrendering or insurance, it will be added in a future version

Example1

This desktop is setup with a standard type table with an upper and lower setting of $5.00 to $500.00. See the Table description by pressing the table button.

The first player bets the same amount $5.00 all the time, terminates play if $10,000 is either won or lost, or after 1,000,000 hands. This player uses a STANDARD chart.

The Second player is set the same as player one, but uses the Win Up system.

The Third player is set the same as player one, but uses the Win Down system.

Example 2

This uses the same table setting as example 1, but player settings are different.

The first player uses a double or nothing system. The second player resets the bet on a win, and if losing, increases the bet by 50%. The third player is the same as player 2, but increases the bet by 150%. The last player uses a double or nothing system, but starts with a larger bet of $20.00.

Example 3

This is the same as Example 2 except the table limit has been raised to $20,000.00. The amount of crashes to the bank balance due to table limits is reduced from Example 2.

Example 4

This uses card counting as such works on registered versions of Bj-Sim only. It will load on the Shareware version, but wont count cards.

This has two card counters, using a flat betting system, and a standard table of $5.00 to $500.00 range, with 6 decks and cut 1 deck from the bottom.

This is best viewed using the super summary mode, as card counting has long term gains, whereas other bet variation strategies tend to have short term returns. Go into super summary, press go, and let the players go for a million or so hands.

Player

A Player in this simulator is the same as a game player in a casino. They can be added and removed from the table, indicate appropriate actions when prompted to by the dealer, and place bets on the table at the appropriate moment.

Dealer

The dealer deals the cards, evaluates the hands, and draws cards from the shoe, as happens in a real casino

Table

The definition of table is really all attributes of the gambling environment that is not covered by the Player(s) and the dealer. This includes shoe size and betting limits.

Splitting

Splitting is the creation of two playing hands from an initial hand of two cards, where the two cards are of the same value (e.g. 3,3 or 9,9). These newly created hands are then played separately.

Bank

Each player has a bank. It is the current tally of wins and losses on the table, and is initially set at zero. Resetting a player, sets their bank to zero.

Card Counting Variable

This is a variable that tracks cards coming from the shoe. It increases or decreases according to parameters set in the players card counting section.

Terminate

All simulations need some termination condition. This simulator relies on preset termination conditions for the table (number of complete hands played) and players (bank thresholds and rounds played)

Hand

A hand is set of cards as played by players of the dealer. The value of the hand is the summation of the cards it consists of. Aces can take the value 1 or 11, depending on context of use.

Blackjack

Blackjack is a hand that consist of 2 cards. One being an ace, the other can be either a 10, Jack, Queen or a King.

Action

An action is a response a player gives to the dealer, when the player is asked to either HIT, STAY, DOUBLE or SPLIT.

Partial Hand

The hand is in a state of play. i.e. the hand can still be changed. When the last action the player requests is a double or stay, then the hand is deemed complete, i.e. cannot be changed.

Complete Hand

A hand whose last action was to double or stay, i.e. cannot be modified any more.

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