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Simon

(54) **POOL SEEDING FOR PARIMUTUEL BETTING OPERATIONS**

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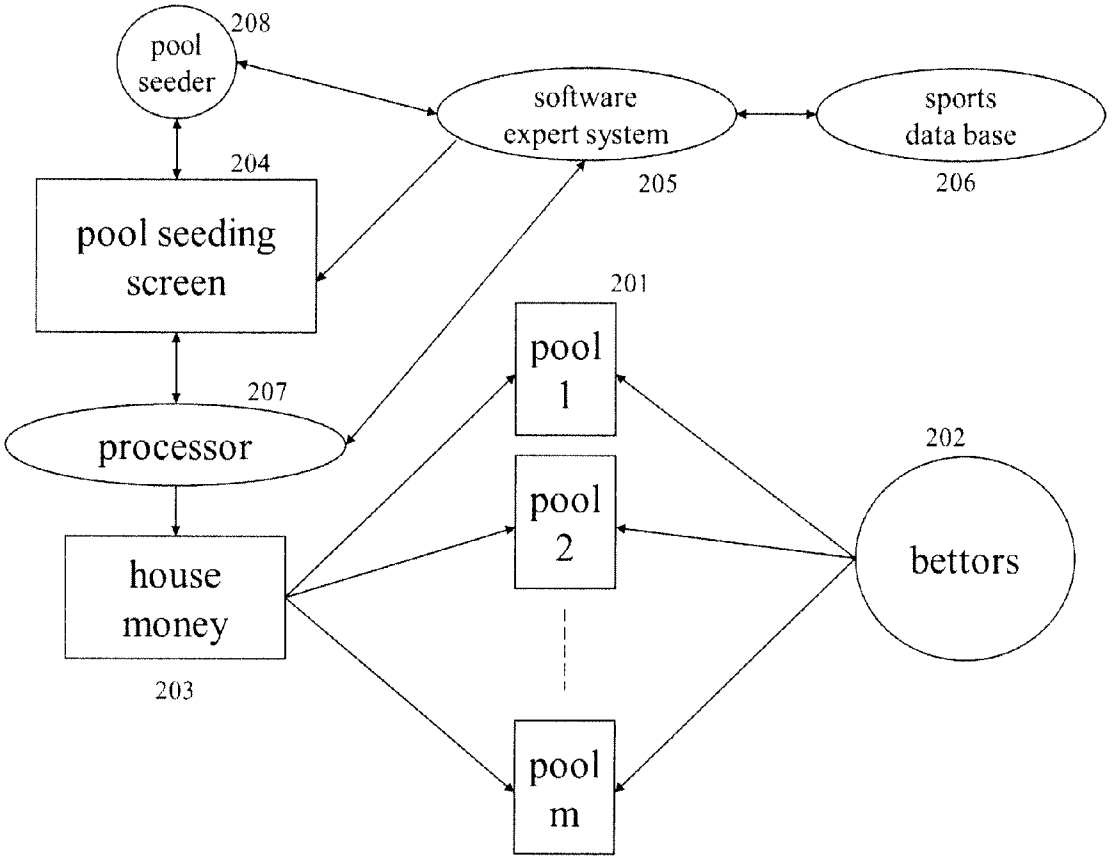
(57) **ABSTRACT**

A method of conducting a parimutuel betting operation that reduces the volatility of the posted odds on the betting choices while the betting line is open by placing one or more seed bets in the betting line. A pool seeder (preferably a trained odds maker) uses a pool seeding screen to control the flow of house money into the pools associated with the betting choices. The pool seeding screen allows the pool seeder to adjust the estimates of the true probabilities of the betting choices in real time. The pool seeder may also use a software expert system based on historical data to help set the estimates of the true probabilities. The house money flows into the pools in a continuous stream at a rate determined by the present settings on the pool seeding screen.



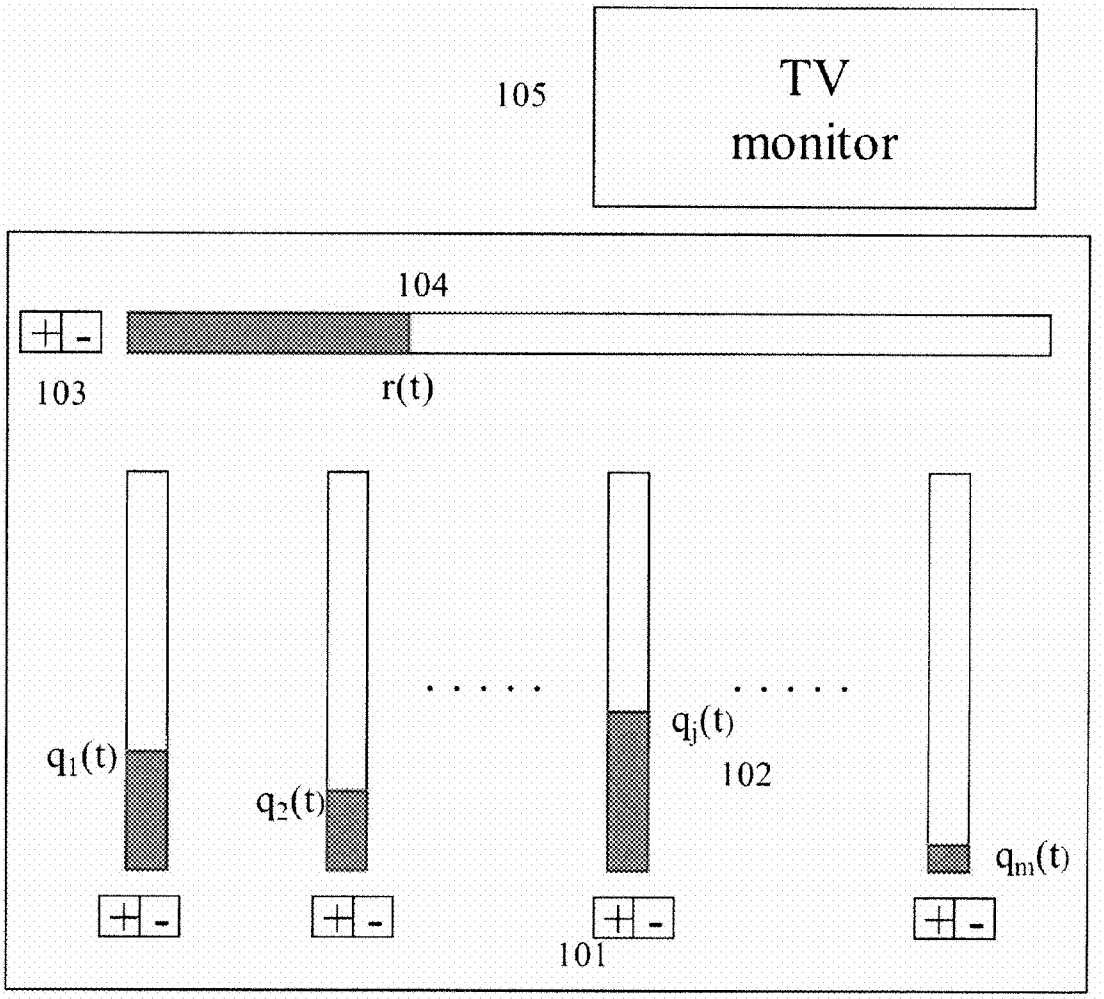
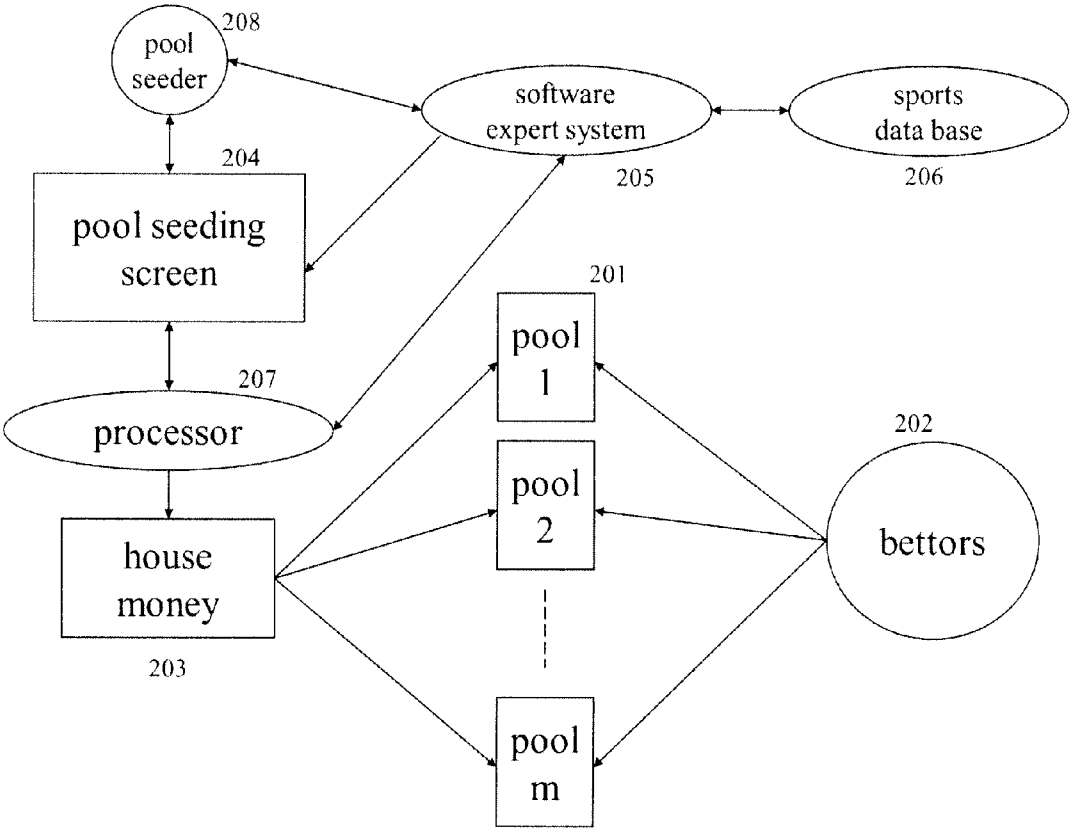


FIGURE 1


pool seeder
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software expert system
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sports data base
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pool seeding screen
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pool 1
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FIGURE 2

POOL SEEDING FOR PARIMUTUEL BETTING OPERATIONS

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to U.S. Provisional Application Ser. No. 61/306,169, filed Feb. 19, 2010, which is hereby incorporated by reference in its entirety to the extent not inconsistent with the disclosure herewith

BACKGROUND OF THE INVENTION

[0002] The present invention relates to betting operations such as at a race track or a sports betting web site, and more particularly to parimutuel or parimutuel-style betting operations.

[0003] Parimutuel betting is a form of gambling in which the winners of a betting line divide the total amount bet on the betting line. The winners split the pot according to the proportion of winning bets each winner places on the winning choice. For example, if a total of $1,000 is bet on a betting line, a total of $100 is bet on the winning outcome of the betting line, and Player X bets $1 on the winning outcome, Player X would receive a parimutuel payoff of 1 percent of the $1000 pot, or $10. In order to cover costs and taxes, gambling establishments that administer parimutuel betting events typically deduct a percentage of the total amount bet before paying off the winners. Thus, in the foregoing example, the gambling establishment might retain 15 percent of the pot, or $150, and Player X would receive only $8.50. Parimutuel betting is not limited to monetary betting, but can also be used where betting is done using tokens or electronic points or credits.

[0004] Horse races and dog races are typical examples of betting events that payoff on a parimutuel basis. However, with the invention of the Internet and other computer network systems, various parimutuel games have been devised that can be provided and administered electronically over computer networks. For example, U.S. Pat. No. 7,740,539 (Simon), U.S. Pat. No. 7,351,149 (Simon et al) and U.S. Pat. No. 7,172,508 (Simon et al) disclose methods of administering parimutuel betting games over computer networks based on live sporting events.

[0005] A variety of other betting games have also been disclosed that utilize computers and computer networks to administer the game. U.S. Pat. No. 6,015,345 (Kail) discloses methods of conducting games of chance using predicted sums of scores in sporting events. A weekly or other regularly scheduled game of chance is conducted in conjunction with a series of seasonal sporting events, such as baseball, football, hockey, U.S. and international basketball and volleyball games, in which a number of specific games are identified on a printed or electronic game card, and the participant marks the game card with the predicted total of points scored by both teams for each of the identified sporting events, which can include one or more alternate events. Data related to predicted scores and the fee paid are entered into a programmed central computer system for eventual processing and matching with data entered for the actual scores when the identified games are completed to identify the winners. The participant receives a receipt and unique transaction code. Participant data entry and payment means can include third-party ATMs and cash machines, and third-party vendors and participants' PCs connected to the central computer via the Internet, with payment made through the participants' credit or debit accounts. In an alternative embodiment, predictions can include the actual number of points scored during subsets of the contests.

[0006] U.S. Pat. No. 5,683,090 (Zeile et al) discloses an apparatus and method for playing a sports chance game that includes means for storing team names, players on each team, and a first group of occurrences which could happen during a sports event contested by the two teams. A computer processor randomly selects a second group of occurrences from the first group of occurrences and randomly arranges each of the second group of possible occurrences into individual locations on a patterned layout on a scorecard for a verified user of the game. The processor determines matches between the second group of possible occurrences on each scorecard with events which actually occurred at the sports event and determines a winning scorecard based on a certain number of matches and/or the location of the matches on each scorecard.

[0007] U.S. Pat. No. 5,772,512 (Chichester) discloses an electronic football game in which a game system is implemented on a digital computer that is connected to a network such as the Internet. The game system enables a user to choose members of a football team and play a game of football against an opponent at a remote location. A copy of all game parameters is stored in two different media-a RAM and a disk memory. The user's graphical and keyboard inputs are fed into the RAM as events initiated by the user. The opponent's inputs are fed into the user's disk memory as write statements. A microprocessor is used periodically and systematically to compare the parameters in the user's RAM to the parameters stored in the user's disk memory. If there is a discrepancy between the RAM parameters and the disk memory parameters, the microprocessor will update any of the parameters on the user's RAM or send write signals to update the opponent's disk memory based upon the type of discrepancy detected.

[0008] U.S. Pat. No. 5,830,069 (Soltesz et al) provides for the transmission and conduct of a bingo game at more than one site, through the use of a private wide area network ("WAN"), on which participants are qualified and controlled. Each site has a PC computer, with peripheral equipment, which communicates on a WAN. This is done by the present invention with considerably less hardware setup cost at each location, and with a lower operating cost, than is found in the prior art. Access to the present invention is more easily controlled than under the video broadcast prior art, and unauthorized participants may be more easily excluded from participation.

[0009] U.S. Pat. No. 5,957,775 (Cherry) discloses a wagering game based on a ranking order of game participants. A wagering game played by a player includes a set of game participants, an identification number assigned to each of the game participants, and a game number. The player places a wager based on the game number, and a ranking order of the game participants is determined, such as by a race. The sum of the identification numbers of a subset of the game participants is calculated, the subset of game participants having a predetermined number of game participants selected on the basis of the ranking order of the game participants. Whether the player's wager is a winning wager is determined by comparing the sum to the game number. The wagering game may be implemented as an electronic game.

[0010] U.S. Pat. No. 6,120,376 (Cherry) also discloses a wagering game based on a ranking order of game partici-

pants. A wagering game for play by a player includes a set of game participants, an identification number assigned to each of the game participants, and a game number. The player places a wager relating to the game number, and a ranking order of the game participants is determined, such as by a race to a finishing point. The sum of the identification numbers of a subset of the game participants may be calculated. The number of lengths by which a first ordered game participant beats another ordered game participant to the finishing point may also be calculated. Whether the player's wager is a winning wager is determined by comparing the sum or the number of lengths to the game number. The wagering game may be implemented as an electronic game.

[0011] U.S. Pat. No. 6,126,543 (Friedman) discloses a method for wagering on multiple sporting events. Each sporting event involves two teams, each team having associated therewith a point spread used in determining whether a wager made on the team is won. The bettor selects a team from each of two or more events upon which to place a wager. The point spreads associated with the selected teams are summed to define a combined point spread wager, and the bettor wagers on the combined point spread. The bettor wins the wager if a sum of point differentials associated with the selected teams as determined from the results of the sporting events covers the combined point spread. Combination bets may also be placed on over/under numbers. Combination betting allows bettors to place an interest on a number of different games while maintaining that interest until all games are completed.

[0012] U.S. Pat. No. 6,152,822 (Herbert) discloses a wagering system and method for betting using the odds from previously completed sporting events such as horse races or dog races. The wagering system assigns a probability value to the outcome of a sporting event that has already been completed. A random number generator is programmed so that when a bet is made on one or more betting machines, the odds of accessing the correct outcome (i.e. winning) correlate to the probability value assigned to the previously completed sporting event. Because the final results of the sporting events have been published, the players can verify the wagering system gave the correct outcome. The wagering system can be easily implemented in a slot machine format connected to a network.

[0013] The use of computers and computer networks has increased the ease and availability of betting games, including parimutuel betting games (PBG). However, despite the increase ease and availability, parimutuel betting is not as widely utilized as other betting games. One issue that makes parimutuel betting less attractive, whether administered electronically or in traditional physical locations, is that when the various betting lines are open, the amounts wagered on each outcome will vary and can change as additional bets are placed. This means that the odds and payoffs on any given outcome are not set when a bet is placed. It is commonly believed that the volatility of the odds and payoffs in parimutuel betting operations is a significant drawback to its popularity.

[0014] What is needed is a method of stabilizing the odds of parimutuel betting operations so as to reduce the uncertainty of the odds and payoffs as bets are placed.

SUMMARY OF THE INVENTION

[0015] Parimutuel betting operations are standard fare at race tracks (e.g., horse racing, and greyhound racing) and at Jai alai frontons. However, parimutuel betting operations are rarely used at other sports betting venues at the present time due to the difficulty of administering parimutuel betting to the particular betting events. The primary purpose of the present invention is to fix the problems of parimutuel betting that presently prevent its use in electronically provided betting games as well as other sports betting venues, including but not limited to football, baseball, golf and soccer.

[0016] It is an object of the invention to provide a parimutuel betting game (PBG) based on events unfolding during a live event, preferably a live sporting event, a principal objective of the game being to acquire the largest number of money, betting tokens, chips or credits by the end of the event, and wherein the players are in direct competition because payoffs are parimutuel style. It is another object of the invention to provide a PBG that can be played by a plurality of players all competing directly against each other for shares of the wagers made on the betting lines. In one embodiment, the present invention provides a PBG that can be played between a plurality of players via a computer network.

[0017] It is also an object of the present invention to conduct a parimutuel betting operation in such a way that individual bets do not cause large changes in the posted odds, so that bettors have a better idea of their likely profits it they win, and so bettors can make larger bets. It would also be desirable to conduct a parimutuel betting operation in such a way that a large number of bettors is not necessary.

[0018] It would also be desirable to conduct a parimutuel betting operation in such a way that the house participates in the betting, and therefore has a stake in the pot. In one aspect of the invention, a parimutuel betting operation is conducted in such a way that the house bets, referred to herein as seed bets, are distributed in the pools so that the seed bets hedge against each other in a way that minimizes the house risk. Preferably, the seed bets are distributed in such a way that the seed bets increase the expected house profits. Optionally, the house bets are made to be public information which can be used by the bettors as they see fit.

[0019] In a further aspect of the invention, a (human) pool seeder controls the relative sizes of the house bets into the various pools, using a pool-seeding screen. Optionally, the pool-seeding screen automatically places house money into the pools as a continuous flow, in ratios controlled by the pool seeder, and at a rate (possibly zero) controlled by the house. It would also be desirable to conduct a parimutuel betting operation in such a way that the pool-seeding screen is controlled by a software expert system, based (in part) on historical data relevant to the betting event. It would be further desirable if said software expert system could be used by a human pool-seeder to help make decisions.

[0020] The present invention provides methods and systems for conducting a PBG that reduces the volatility of the posted odds on the betting choices while the betting line is open. The house, i.e. the entity operating the parimutuel betting game, adds money, tokens, chips or credits in the form of seed bets into the pools associated with the different betting choices according to the perceived probabilities of the outcome of the event and the amount of bets placed for each betting choice. The influx of money, tokens, chips or credits from the house stabilizes the betting pools and reduces the fluctuations in the odds. Accordingly, bettors will have greater confidence that the payoff of the betting event will closely reflect the odds presented at the time the bets are placed. Preferably, the seed money, tokens or credits added to the pools by the house are added according to the perceived

probabilities of the outcome of the event so as to minimize any potential losses by the house.

[0021] The parimutuel betting game is based on events unfolding during a live event, preferably a sporting event, and comprises providing and administering one or more betting events during the live event. One embodiment of the invention provides a method of providing a betting game between a plurality of players, wherein the betting game is based on actions occurring during a live event and the winning payoffs of said betting game are in parimutuel style. The method comprises the steps: a) providing one or more selectable betting events to the players while the live event is in progress, wherein each betting event is based on actions occurring during said live event; b) opening one or more betting lines for each selected betting event before the start or after the start of the live event but before a termination event occurs with regard to the betting event, each betting line comprising two or more choices corresponding to a finite set of possible outcomes of the selected betting event; c) allowing the players an amount of time within which to selectively bet on the betting lines; d) placing one or more seed bets on at least one selected betting line, wherein relative amounts of total bets placed on each choice of the selected betting line are stabilized by the seed bets; e) closing the betting lines after an interval of time such that no further bets may be placed on the line and the odds affecting the payoffs on said line are fixed; f) monitoring the live event until a termination event occurs with regard to the selected betting event; g) terminating the betting event upon occurrence of the termination event; and h) upon termination of the selected betting event, paying off winners of the betting lines in parimutuel style, according to odds fixed at the time each betting line is closed.

[0022] In a further embodiment, placing one or more seed bets comprises the steps of: a) determining a total seed bet amount to be placed on the selected betting line at that time; b) estimating a true probability of each choice occurring in the selected betting line, wherein the true probabilities are estimated at the time the seed bets are placed; and c) determining an amount for each seed bet to be placed on each choice, wherein the ratio of an individual seed bet amount placed on a selected choice to the total seed bet amount is equal to or approximately equal to the true probability for that selected choice. In other words, the relative amounts of the individual seed bets placed on the betting lines correspond to the likelihood of winning outcomes occurring for those betting choices. If the true probabilities or odds of two choices are 0.30 and 0.70 (one having a 30% chance of occurring and the other having a 70% chance of occurring), then the ratios of the individual seed bets to the total amount of seed bets placed for these choices would also be 0.30 and 0.70.

[0023] In a further embodiment, seed bets are placed in multiple betting lines or even in every betting line. Multiple seed bets may also be placed in the same betting lines at different points of time during the course of the live event in order to adjust and stabilize the betting lines as bettors place additional bets. Since the actions in the live event may make the betting choices more or less likely to occur during this time, the true probabilities for the betting lines may be estimated and continuously updated at different points during the live event to ensure that the proper ratios of the individual seed bet amounts in relation to the total seed bet amount are provided. One further embodiment of the invention comprises placing a second set or subsequent sets of seed bets on the selected betting line or multiple selected betting lines at later point of time. In one embodiment, seed bets are placed at distinct points in time. For example, one seed bet is placed at the start of a live sports and a second seed bet is placed at halftime of a sports event. Alternatively, a new seed bet is placed at set time periods, i.e. every ten to thirty minutes. In another embodiment, a seed bet is placed at any time determined by the pool seeder. In another embodiment, seed bets are continuously placed into the betting lines in time-varying ratios and time-varying rates controlled by the house. In another embodiment, seed bets are placed when the betting lines are initially opened for the purpose of setting initial odds.

[0024] In one embodiment of the invention, a PBG is electronically provided to a plurality of players, typically over a computer network such as the Internet. It is yet another object of the invention to provide a PBG that utilizes the services of an administrator in which the administrator can exercise responsibility and judgment in administering the game. In one embodiment, the PBG utilizes a pool seeder to determine the total seed amount, estimate the true probabilities for the betting choices, and place the appropriate seed bets to the betting lines. The pool seeder is a human operator or an automated computer system programmed to administer the seed bets appropriately. Preferably, the pool seeder is a human operator, such as a professional odds maker, who is familiar with the odds associated with the live event. The pool seeder mal also be a human operator who utilizes computer and software systems to assist in the determination and administration of the seed bets. The pool seeder may or may not be the same person as the administrator. In one embodiment, a pool seeder uses a computer processor, preferably connected to a pool seeding screen, to control the flow of house money into the pools associated with the betting choices. The pool seeding screen allows the pool seeder to adjust his estimates of the true probabilities of the betting choices in real time. The pool seeder may also use a software system based on historical data to help set the estimates of the true probabilities. In one embodiment, the house money flows into the pools in a continuous stream at a rate determined by the present settings on the pool seeding screen.

[0025] In one embodiment, the PBG is played in a computerized format, such as over the Internet, and is administered by an administrator. A host processor is provided, the host processor being programmed for analyzing and processing input data and outputting data and information relevant to the parimutuel betting game. In one embodiment, the host processor is programmed to: provide one or more selectable betting events to the players while the live event is in progress, wherein each betting event is based on actions occurring during the live event; open one or more betting lines for each selected betting event before the start or after the start of the live event but before a termination event occurs with regard to the betting event, each betting line comprising two or more betting choices corresponding to a finite set of possible outcomes of the selected betting event; place one or more seed bets in at least one selected betting line, wherein relative amounts of total bets placed on each choice of the selected betting line are stabilized by the seed bets; close the betting lines after an interval of time such that no further bets may be placed on the line and the odds affecting the payoffs on said line are fixed; terminate the betting event upon occurrence of a termination event with regard to said selected betting event;

and upon termination of said selected betting event, pay winners of each betting line, independent of other betting lines in parimutuel style.

[0026] A plurality of player processors is interactively connected to the host processor. The player processors are programmed to allow players to place bets in the PBG. Each player processor has a display means operatively associated therewith for displaying data received from the host processor, such as betting choices, betting pools, betting odds, player ledger, etc., and for entering and sending data, including but not limited to betting choices and amounts, to the host processor. Player screens are updated by the host processor, so the information is always current. An administrative processor is also connected to the host processor. The administrative processor is programmed for administering the parimutuel betting game, which includes but is not limited to opening, closing, pausing, and terminating betting lines. The administrative processor has a display means operatively associated therewith for displaying data (i.e., betting screens and player data) received from the host processor and for entering data and sending data, such as the open, close, pause, and terminate commands, to the host processor. An administrator screen is displayed on the display means of the administrative processor. A player screen is displayed on the display means of each player processor.

[0027] A pool seeder screen is also part of or is connected to the host processor and may or may not be part of the administrative processor. The pool seeder screen displays information regarding the seed bets, such as the betting lines which have received seed bets or are receiving seed bets, past seed bet information and history, the amount of total bets (player bets+seed bets) for any given choice or betting line, the total seed bet amount for each betting line, and the individual seed bets currently being placed and to be made for each choice. The pool seeder screen also displays the information necessary to estimate the true probabilities of the betting choices and can ensure that the estimated true probabilities for the betting choices of a betting line always add up to one. A pool seeder determines the necessary seed bets and places the seed bets through the pool seeder screen. Where the pool seeder continuously places seed bets, the ratios of the seed bet amounts and the rates at which the seed bets are placed are also controlled through the pool seeder screen. This is particularly useful where the ratios and rates are expected to vary with time.

[0028] Bets can be made using actual money, tokens, chips or electronic credits. As described below, the term "tokens" also encompasses money, chips and electronic credits In one embodiment, the host processor also allocates betting tokens to each of the players when they join the game—typically just before the live event begins. The administrator monitors the sporting event for situations calling for an open, close, pause or terminate command. The players and the administrator use their respective screens and the processors to conduct the plurality of betting events. The tokens may or may not have a monetary basis, and can simply be electronic units maintained by the processors. Alternatively, the players can pay money to a gambling establishment in exchange for the allocation of tokens, in which case the gambling establishment can retain a percentage of tokens bet on the betting lines.

[0029] In one embodiment, the administrator uses the administrator screen to open betting lines for the betting event. When the administrator opens a new betting line, the administrative processor sends a betting line identifier for the new line to the host processor. Upon receiving the betting line identifier for the new line, the host processor opens a new betting line. Betting event information for the open betting line is displayed on the player screens. The players are allowed an amount of time within which to use the player screens to selectively bet money, tokens, chips or credits on the possible outcomes of the betting event. For each bet placed by a player on a betting line, data concerning the bet is sent to the host computer for processing. The data includes, but is not limited to player identification, betting line identification, betting choice identification, and an amount bet. Bets placed on the open betting line are frozen such that the frozen bets are not available for further betting until and unless a winning payoff has been made to the player on that betting line. Updated betting information for each betting line is displayed on the player screens. After a selected interval, the administrator closes the betting line such that no further bets may be placed on the line and the odds on the choices are locked in. When the administrator closes the line, the administrative processor sends the line identifier for the new line to the host processor. Upon receiving the betting line identifier, the host closes the new betting line such that no further bets can be placed on the line. The administrator monitors the sporting event until a termination event occurs with regard to the betting event. The administrator terminates the betting event upon occurrence of the termination event for the betting event. When the administrator terminates the betting event, the administrative processor sends the line identifier and a winning choice identification to the host processor. Upon termination of the betting event, winners of each betting line are paid off in parimutuel style, with the payoffs being determined and processed by the host processor. Updates are performed on a periodic basis wherein the host processor sends data to all the player processors and the administrative processor reflecting changes to the browser pages. The process of selectively conducting betting cycles is repeated until the conclusion of the sporting event.

[0030] In one embodiment, a principle objective of the game is to acquire the largest number of betting tokens (or money or credits) by the end of the live event. The players are in direct competition because payoffs are made in parimutuel style. Tokens are allocated to the players prior to commencement of the event or when the player joins the game. Preferably the event is a sporting event, including but limited to football, baseball, tennis, soccer, basketball, hockey, or racing, but the present invention may also be used with other live events including, but not limited to awards shows and election results.

BRIEF DESCRIPTIONS OF THE DRAWINGS

[0031] FIG. **1** shows a pool seeding screen in one embodiment of the present invention.

[0032] FIG. **2** shows the flow of information and money for one embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

Definitions

[0033] As used to describe the present invention, the following terms are defined as follows.

[0034] The "house" is the generic name for the person or entity administering the betting game of the present invention. The house may be a bricks and mortar casino or business, or may be a web site on the internet. A "player" is someone

other than the house who is participating and placing bets in a betting game of the present invention.

[0035] A "live event" refers to a sporting event or any other unpredictable event that that proceeds over time with an unambiguous beginning and end, including but not limited to an election, a stock price during some period of time, trivia game, awards show, and an episode of a reality television show. A "sporting event" is an athletic contest of some sort, including but not limited to a football game, baseball game, basketball game, hockey game, tennis match, golf tournament, race, Olympic event, boxing match, martial art fight, and wrestling match. A "live sporting event" is a sporting event that is occurring in the present. Additionally, a live sporting event can include a prerecorded sporting event where the players do not know anything about the outcome or events that took place during the event.

[0036] A "betting event" is a selectable item provided by the parimutuel betting game corresponding to actions occurring during a live event whereby players of the parimutuel betting game can select the betting event and place bets on the different possible outcomes of the selected betting event.

[0037] A "betting line" is a selectable item corresponding to possible actions and scenarios that can occur in the betting event. "Betting choices" are the possible outcomes of a selected betting line. Each betting line will have two or more betting choices corresponding to a finite set of possible outcomes of the selected betting event. For example, a betting line may have the choices: Team A wins, or Team B wins. By opening a betting line, it meant the players are allowed to bet on the possible outcomes of the selected betting event. By closing a betting line, it is meant that no further bets may be placed on the betting line and the odds affecting the payoffs of the line are fixed. By terminating a betting line it, is meant the outcome of a selected betting line has been determined and it possible to pay the winners of the betting line according to the odds fixed when the betting line closed. Multiple betting lines corresponding to the same choices during the event may be provided, where the different betting lines are opened and closed at different points of time. For example, a betting line for which team wins a football game can be provided before the start of the game, at the end of the first quarter, at halftime, or at the end of the third quarter.

[0038] "Seed bets" refer to the money, tokens, chips or credits placed in a betting line by the house in order to stabilize or the set the odds of the betting line. The seed bets may be placed at a single time during the live event, at multiple times during the live event, or continuously during the live event at a rate determined by a pool seeder. The "total seed bet amount" for a particular betting line refers to the total amount of seed bets placed at any given time. The "amount of total bets" for a betting line or betting choice refers to the total seed bet amount placed by the house plus the total bets placed by the players.

[0039] "True probability" refers to the statistical likelihood, whether estimated or known with absolute certainty, that a particular outcome will occur.

[0040] "Tokens" are generic units of currency for the betting game of the present invention and can include money, chips and electronic credits.

[0041] In the following detailed description, reference is made to the accompanying drawings which form a part hereof, and in which are shown by way of illustration specific embodiments in which the invention may be practiced. It is to be understood that other embodiments may be utilized and structural changes may be made without departing from the scope of the present invention.

Overview

[0042] A parimutuel betting operation is one where there is a betting line associated with a betting event, where the betting line consists of a plurality of betting choices associated with the betting event. Bettors place their bets in pools associated with the betting choices. Bets are accepted while the betting line is open. The betting line closes some time before the betting event terminates. When the betting event terminates, the winning choice is determined, and the bettors that placed bets on the winning choice split the pot in proportion to the fraction of the winning pool they owned.

[0043] More precisely, there are n bettors that place bets on a betting event, and there are m betting choices on the betting line associated with the betting event. b_{kj} is the total amount that a bettor k bets on a specific betting choice j while the betting line is open.

[0044] $p_j=\Sigma b_{kj}$ is the total amount bet on choice j, i.e., the amount in the pool associated with the particular betting choice j, and

[0045] $P=\Sigma p_j$ is the total amount bet on the betting line, i.e., the amount in the pot. If choice w is the winning choice then bettor k receives $P*b_{kw}/p_w$, so his net profit is

$$P*b_{kw}/p_w-\Sigma b_{kj}$$

[0046] Depending on the particular parimutuel betting operation, the odds on choice j is defined as either P/pj, which is the total return per dollar wagered on choice j if it wins, or as P/pj−1, which is the profit per dollar wagered on choice j if it wins. For this discussion, the odds on choice j are defined to be the total return per dollar bet,

[0047] Oj=P/pj. However, the arguments are identical if the odds are defined to be the profit per dollar bet.

[0048] Traditional parimutuel betting operations have the following intrinsic problem. While the betting line is open, the ratios of the amounts in the pools vary, which means that the odds vary, which means that the bettors do not know exactly how much they will win (if they win) when they place their bets. In other words, suppose the betting line opens at time t=0, and closes at time t=T. For $0<t<T$, let $p_j(t)$ be the amount in pool j at time t, let P(t) be the amount in the pot at time t, and let $O_j(t)$ be the odds on choice j at time t. Then the odds on the choices, $O_1(t), O_2(t), \ldots, O_m(t)$, vary in time, so the odds posted when a bettor places his bet is not necessarily the same odds that he gets if he wins. Sometimes the odds that a winning bettor gets are higher than the posted odds at the time of his bet, and sometimes it is lower. Of course, when the odds are more favorable the bettor will not complain; but when they are less favorable, the bettor may feel cheated.

[0049] Furthermore, if bettor k makes a bet of size B on choice j at time t, then the odds on choice j (and all the other choices) suddenly change, and the change can be quite noticeable if P(t) is small or if B is big. In particular, the sudden change to the odds on choice j due to bettor k's bet is in a downward direction, so bettor k is disinclined to make a large bet. In other words,

$$O_j(t+\Delta t)=(P(t)+B)/(p_j(t)+B)<P(t)/p_j(t)=O_j(t).$$

[0050] The present invention is a method for running a parimutuel betting operation in such a way that the problem just described is substantially lessened. The present invention cannot eliminate all the volatility of the odds while the betting

line is open, but the house can use the present invention to lessen the volatility of the odds as much as they want, as long as they are willing to invest enough "seed money" into the pools. For example, if the house puts enough money in the pools so that P(t) is much bigger than B, then the odds will not change much due to the bet. The more seed money the house puts in the pools, the less effect the bettors' bets have on the odds. In other words by putting enough money into the pools, the house eliminates the problem for the bettors. Of course, the house has to make sure that by solving the problem for the bettors, it hasn't created a problem for itself. The present invention is therefore also a method for running a parimutuel betting operation in such a way that the volatility of the odds is lessened for the players, and the house risk is minimized.

[0051] The seed money is money that the house pays into the pools. The seed money in the pools is treated just like any other bet. The seed money on the winning choice wins a fraction of the pot for the house that is proportional to the house's share of the winning pool; just like any other winning bet. The seed money paid into the losing pools goes to the bettors that bet on the winning choice, including the house. The house therefore recoups some or all of its losses from its losing bets from its winning bet. The seed money is turned into bets of varying sizes on the betting choices, and they act as hedges against each other. The present invention solves the crucial problem of how to distribute the seed money optimally for the house.

[0052] The present invention also provides a method for distributing the seed money into the pools so that the house risk is minimized. If the seed money is improperly distributed into the pools, the house could (on the average) lose more than it wins from the seed money. However, if the seed money is distributed into the pools according to the optimal rule, then in the long run the house will not lose, no matter what the bettors do. The house will actually earn a net profit from the seed bets, unless the bettors also know the optimal strategy (in which case the house breaks even on the seed money).

[0053] The optimal pool seeding strategy for the house can be found mathematically as follows. Let S be the total amount of seed money wagered by the house, and let q_j be the fraction the seeding money the house wagers on choice j. For the bettors, let X be the total amount bet, and let x_j be the fraction the bettors wager on choice j. Let

$$\alpha_j=(q_jS)/(q_jS+x_jX)$$

be the fraction of pool j that belongs to the house. Let π_j be the true probability that choice j is the winning choice. Then the expected profit for the house is R−S, where

$$R=(X+S)\Sigma\pi_j\alpha_j.$$

Let $u_j=\text{sqrt}(x_jX+q_jS)$ and $v_j=\text{sqrt}(\pi_j\alpha_j)$, and note that

$$\Sigma u_j^2=X+S,$$

$$(\Sigma u_j^2)*(\Sigma v_j^2)=R, \text{ and}$$

$$v_ju_j=\text{sqrt}(\pi_jq_jS).$$

The Cauchy-Schwarz inequality (a known mathematical proof) implies that

$$R>(\Sigma\text{sqrt}(\pi_jq_jS))^2$$

no matter what x and X are. If $q=\pi$ then the previous equation says R>S, no matter what x and X are. Likewise, if $x=\pi$ then the amount the bettors win is greater than X no matter what the house does. The conclusion is that $q=\pi$ is both the "mini-max" strategy and "maxi-min" strategy for the house, so the pool seeding of the present invention minimizes the risk for the house. In other words, if the house uses the pool seeding strategy of the present invention then over the long term the house will not lose money from the seed bets. However, the house could potentially lose if it does not follow the optimal seeding strategy and if the bettors use the optimal strategy.

[0054] The present invention also provides a method for the house to approximate an optimal pool seeding strategy by utilizing a trained pool seeder using a pool seeding screen (FIG. **1**) and/or a software expert system. A human pool seeder needs the same skills as the traditional odds maker used at a standard fixed-odds betting operation. In other words, the pool seeder must be good at estimating the true probabilities $\{\pi_1(t), \pi_2(t), \ldots, \pi_m(t)\}$ in real time. The pool seeder estimates the true probabilities of the betting choices by $\{q_1(t), q_2(t), \ldots, q_m(t)\}$, and uses the pool seeding screen to input that data to a software device that continuously pumps house money into the pools at rates proportional to those estimates. The total rate that seed money is pumped into the pools is r(t), which is controlled by the house or the pool seeder. Thus, at time t, the rate that seed money flows into pool j is $r(t)q_j(t)$.

[0055] In many situations the true probabilities of the choices on the betting line can be estimated from historical data. For example, suppose the betting event is a drive in a football game, and the choices are {TD, FG, Punt, Turnover}. If the driving team starts on their own 20 yard line, then the probabilities of the four outcomes can be estimated by looking at past games where a team starts a drive at their own 20 yard line. The software expert system calculates the fraction of those drives that end in each choice. If the drive progresses to the 50 yard line then the true probabilities change, so they need to be recalculated by the software expert system. The software expert system calculates the fraction of drives at the 50 yard line that end in each choice. A human pool seeder can use this information to enhance his skills.

[0056] The house does not have to keep its pool seeding hidden from the bettors for it to work. In fact, in a preferred embodiment of the current invention, the house seed money invested in each pool is public information which the bettors can use as they see fit.

[0057] FIG. **1** shows the basic functionality of the pool seeding screen. For a given betting event with choices {1, 2, . . . , m} the pool seeding screen has m adjustable settings for the pool seeder's estimates of the true probabilities of the choices. The pool seeder controls the pool seeding screen via the +/− buttons **101** associated with each betting choice. The +/− button associated with choice j changes the value of $q_j(t)$ **102** which is the pool seeder's estimate of π_j, the true probability (at time t) that betting choice j will be the winning choice. Since $\Sigma q_j(t)=1$ must be true at all times t, the pool seeding screens assist the pool seeder by decreasing all the other settings when the pool seeder increases $q_j(t)$, and by increasing all the other settings when the pool seeder decreases $q_j(t)$, so the total is always one. The algorithm that keeps the sum of the probabilities equal to one is internal software, and is not shown on the figure. There are many ways this algorithm can work. For example, if the pool seeder changes q_j to $q_j+\delta$, then the algorithm can decrease q_k to $q_k-\delta q_k/(1-q_j)$.

[0058] The pool seeding screen also allows the pool seeder (or the house) to adjust the total rate that money flows into the pools via the +/− button **103** that controls r(t) **104**. The pool

seeder will typically watching the sporting event that the betting line is associated with on a TV monitor **105**.

[0059] FIG. **2** shows the flow of information and money for the present invention. In a standard parimutuel betting operation there are only the betting pools **201** and the bettors **202**. In the present invention, house money **203** is also contributed to the pools **201**. The pool seeder **208** controls the pool seeding screen **204** (shown in more detail in FIG. **1**) by continuously adjusting the vector q(t), the estimates of the true probabilities of the choices on the betting line. A software expert system **205**, which uses a sports data base **206**, might be used to assist the pool seeder, or might be used exclusively to set q(t). The processor **207**, which runs the pool seeding screen and software expert system, also controls the flow of house money **203** into the pools **201**. The rate of flow of house money into the pools is determined by the settings on the pool seeding screen **204**.

EXAMPLES

Example 1

[0060] The first example illustrates the advantage of pool seeding in an ideal setting where the true probabilities are known exactly. Suppose the house offers the following parimutuel betting game: the betting event is the roll of two dice, and the betting choices are {2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12}. A betting line opens, and bets are accepted from the bettors for ten minutes. After ten minutes, the betting line closes (no more bets accepted), and then the house rolls the two dice. The sum of the two dice determines the winning choice.

[0061] During the ten minutes of betting, the house pumps money into the eleven pools at a (non-varying) total rate of r(t)=$72/minute, so that at the end of the betting, the house has $720 invested. The true probability that choice j is the winning choice is

$$\pi_j=(6-|7-j|))/36,$$

so $2/minute goes into pool 2 and pool 12, $4/minute goes into pool 3 and pool 11, $6/minute goes into pool 4 and pool 10, $8/minute goes into pool 5 and pool 9, $10/minute goes into pool 6 and pool 8, and $12/minute goes into pool 7.

[0062] After five minutes of betting the house has {$10, $20, $30, $40, $50, $60, $50, $40, $30, $20, $10} in the pools. Suppose that after five minutes of betting, the bettors have (collectively) filled the pools with {$20, $20, $50, $70, $100, $170, $80, $10, $60, $20, $40}. The pool totals after five minutes are therefore {$30, $40, $80, $110, $150, $230, $130, $50, $90, $40, $50}. The pot is the sum of pools, which is $1000. At the five-minute mark, the odds on choice 9 are 1000/50 (or 20:1). If a bettor places a $10 bet on choice 9 at the five-minute mark, the odds on that choice changes to 1010/60, which is about 16.8:1. If there were no pool seeding then the odds on choice 9 at the five-minute mark would be 640/10, or 64:1, and the $10 bet would have changed it to 650/20, which is 32.5:1. The pool seeding therefore brings the odds on choice 9 much closer to what it should be (which is about 9:1), and significantly decreases the effect on the odds of the player's $10 bet. The pool seeding has the same positive effects for all of the betting choices.

[0063] For simplicity, assume that there was in fact no more betting after the five-minute mark. When the betting line closes, the house rolls two dice, and suppose the outcome is 1+1=2. The house has $10 on choice 2, and the players have $20 on choice 2. The house therefore wins ⅓ of the pot, which is about $333. Since the house invested $360 in the pools, it loses about $27 if choice 2 prevails. If choice 3 prevails then the house gets half the pot (20/40), which means it wins $140. If choice 4 prevails then the house gets ⅜ of the pot, which is $375, and wins $15. And so on. The house may win and it may lose, but the amounts are much less that the $360 it invested. The worst case for the house in this example is if choice 12 prevails (since the house only owns only ⅕ of that pool), and in that case the house loses $160. The expected (i.e., average) outcome for the house in this example is a return of about $402, which is a $42 profit.

Example 2

[0064] As a second example, consider a parimutuel betting operation where the betting event is a drive in a football game, and the betting choices are {TD, FG, Punt, Turn Over} (Missed field goals and safeties are considered Turn Overs.) Suppose a drive begins on the driving team's 20-yard line. The pool seeder gives this information (along with other relevant information, like the current score, the time left in the game, etc.) to a software expert system for analysis. The expert system accesses a data base of football statistics from the past twenty seasons, and looks at what happened in analogous situations in previous games. The expert system comes back with something like {0.2, 0.3, 0.4, 0.1}, which are the historical probabilities the four outcomes, in similar circumstances. The pool seeder may use his experience to adjust these numbers slightly, based on intangibles the expert system is insensitive to, and set his pool seeding screen to {0.15, 0.3, 0.5, 0.05}. These four numbers are the pool seeder's estimates of the true probabilities of the four choices for the present game situation. The true probabilities cannot be known exactly, but a skilled pool seeder, with the help of historical data, can estimate the true probabilities quite reliably. The house sets the total rate that money flows into the four pools at $100/minute, so money flows into the TD pool at $15/minute, into the FG pool at $30/minute, into the Punt pool at $50/minute, and into the Turn Over pool at $5/minute.

[0065] On the first play of the drive, the driving team gains 7 yards, so it is 2^{nd} and 3. The driving team is now in a slightly more favorable position than it was when it started, so the true probabilities have changed slightly. The pool seeder therefore adjusts the four numbers to reflect the new situation, for example to {0.18, 0.32, 0.46, 0.04}. The rates that house money flow into the pools therefore change slightly. As the drive progresses, the true probabilities of the four outcomes change. When the changes are significant enough, the house may close the line and open a new one. The odds on the closed line are "locked in" since no more bets (including house pool seeding money) are accepted.

[0066] Suppose the original betting line closes, and a new betting line opens with the driving team at the 50-yard line. The pool seeder, after consulting the expert system, sets the probabilities to {0.26, 0.44, 0.18, 0.12} (a missed FG is considered a Turn Over). The house may believe that at this point in the drive the bettors will make more bets than they did earlier in the drive, so they raise the total rate the seed money is pumped into the pools from $100/minute to $200/minute. This helps to further stabilize the odds, and to increase the house's profits from the pool seeding.

[0067] Having now fully described the present invention in some detail by way of illustration and examples for purposes of clarity of understanding, it will be obvious to one of ordi-

nary skill in the art that the same can be performed by modifying or changing the invention within a wide and equivalent range of conditions, elements and other parameters without affecting the scope of the invention or any specific embodiment thereof, and that such modifications or changes are intended to be encompassed within the scope of the appended claims.

[0068] When a group of materials, compositions or components is disclosed herein, it is understood that all individual members of those groups and all subgroups thereof are disclosed separately. When a Markush group or other grouping is used herein, all individual members of the group and all combinations and subcombinations possible of the group are intended to be individually included in the disclosure. Every combination of components described or exemplified herein can be used to practice the invention, unless otherwise stated. In the disclosure and the claims, "and/or" means additionally or alternatively. Moreover, any use of a term in the singular also encompasses plural forms.

[0069] The terms and expressions which have been employed are used as terms of description and not of limitation, and there is no intention that in the use of such terms and expressions of excluding any equivalents of the features shown and described or portions thereof, but it is recognized that various modifications are possible within the scope of the invention claimed. The invention illustratively described herein suitably may be practiced in the absence of any element or elements, limitation or limitations which is not specifically disclosed herein. All headings used herein are for convenience only.

[0070] All publications referred to herein are incorporated herein to the extent not inconsistent herewith. Some references provided herein are incorporated by reference to provide details of additional uses of the invention. All patents and publications mentioned in the specification are indicative of the levels of skill of those skilled in the art to which the invention pertains. References cited herein are incorporated by reference herein in their entirety to indicate the state of the art as of their filing date and it is intended that this information can be employed herein, if needed, to exclude specific embodiments that are in the prior art.

What is claimed is:

1. A method of providing a betting game between a plurality of players, wherein the betting game is based on actions occurring during a live event and the winning payoffs of said betting game are in parimutuel style, wherein said method comprises:

a) providing one or more selectable betting events to the players while the live event is in progress, wherein each betting event is based on actions occurring during said live event;

b) opening one or more betting lines for each selected betting event before the start or after the start of the live event but before a termination event occurs with regard to the betting event, each betting line comprising two or more betting choices corresponding to a finite set of possible outcomes of the selected betting event;

c) allowing the players an amount of time within which to selectively bet on the betting lines;

d) placing one or more seed bets in at least one selected betting line, wherein relative amounts of total bets placed on each choice of the selected betting line are stabilized by the seed bets;

e) closing the betting lines after an interval of time such that no further bets may be placed on the line and the odds affecting the payoffs on said line are fixed;

f) monitoring the live event until a termination event occurs with regard to the selected betting event;

g) terminating the betting event upon occurrence of the termination event; and

h) upon termination of the selected betting event, paying off winners of the betting lines in parimutuel style, according to odds fixed at the time each betting line is closed.

2. The method of claim **1** wherein placing one or more seed bets comprises the steps of:

a) determining a total seed bet amount to be placed on the selected betting line at that time;

b) estimating a true probability of each choice occurring in the selected betting line, wherein the true probabilities are estimated at the time the seed bets are placed; and

c) determining an amount for each seed bet to be placed on each choice, wherein the ratio of an individual seed bet amount placed on a selected choice to the total seed bet amount is equal to or approximately equal to the true probability for that selected choice.

3. The method of claim **2** further comprising estimating the true probabilities at different points during the live event.

4. The method of claim **3** further comprising continuously placing seed bets into in at least one selected betting line in time-varying ratios.

5. The method of claim **1** further comprising using a computer system to estimate the true probabilities.

6. The method of claim **5** wherein said computer system utilizes historical data relevant to said live event to estimate the true probabilities.

7. The method of claim **1** wherein seed bets are placed on multiple betting lines.

8. The method of claim **1** further comprising placing a second set of seed bets on the selected betting line at later point of time.

9. The method of claim **1** wherein seed bets are placed when the betting lines are open for the purpose of setting initial odds.

10. The method of claim **1** wherein said one or more betting events are provided and selected through a computer network.

11. The method of claim **1**, wherein each of the players can place multiple bets on any open betting line.

12. The method of claim **1** further comprising the step of allocating betting tokens to each of the players prior to or during the commencement of the live event, wherein the players bet on possible outcomes of said selectable betting events using one or more betting tokens.

13. The method of claim **12**, wherein said betting tokens are electronic units maintained on a processor.

14. The method of claim **1** further comprising displaying to the players; amounts bet on each betting choice, seed bet amounts placed on each betting choice, and odds affecting payoff amounts for each betting line opened in the course of said live event.

15. A system for providing a parimutuel betting game between a plurality of players, wherein said betting game is based on actions occurring during a live event and the winning payoffs of said betting game are in parimutuel style,

where said system is under the control of an administrator and comprises:

a) a host processor programmed for analyzing and processing input data, and outputting data and information relevant to the parimutuel game;

said host processor programmed to:

1) provide one or more selectable betting events to the players while the live event is in progress, wherein each betting event is based on actions occurring during said live event;

2) open one or more betting lines for each selected betting event before the start or after the start of the live event but before a termination event occurs with regard to the betting event, each betting line comprising two or more betting choices corresponding to a finite set of possible outcomes of the selected betting event;

3) place one or more seed bets in at least one selected betting line, wherein relative amounts of total bets placed on each choice of the selected betting line are stabilized by the seed bets;

4) close the betting lines after an interval of time such that no further bets may be placed on the line and the odds affecting the payoffs on said line are fixed;

5) terminate said betting event upon occurrence of a termination event with regard to said selected betting event; and

6) upon termination of said selected betting event, pay winners of each betting line in said cycle, independent of other betting lines in parimutuel style;

b) a plurality of player processors interactively connected to said host processor, said player processor able to send and receive data to said host processor;

c) a display and interface device operatively associated with each said player processor, said display and interface device able to display data received from said player processor, and able to send betting instructions entered by the player to said host processor through said player processor;

d) an administrative processor interactively connected to said host processor, said administrative processor able to send commands to said host processor; and

e) an administrative display and interface device operatively associated with said administrative processor, said administrative display and interface device able to display data received from said host processor, and able to send commands entered by the administrator to said host processor;

wherein said commands control when said host processor opens and closes said betting line, and when said host processor terminates said betting line.

16. The system of claim **15** further comprising a pool seeder, wherein said pool seeder:

a) determines a total seed bet amount to be placed on the selected betting line at that time;

b) estimates a true probability of each choice occurring in the selected betting line, wherein the true probabilities are estimated at the time the seed bets are placed; and

c) determines an amount for each seed bet to be placed on each choice, wherein the ratio of an individual seed bet amount placed on a selected choice to the total seed bet amount is equal to or approximately equal to the true probability for that selected choice.

17. The system of claim **16** further comprising a software system assist the estimation of the true probabilities.

18. The system of claim **17** wherein said software system utilizes historical data relevant to said live event.

19. The system of claim **16** wherein said pool seeder estimates the true probabilities at different points during the live event.

20. The system of claim **16** wherein the pool seeder continuously places seed bets into in at least one selected betting line in time-varying ratios and rates.

21. The system of claim **20** further comprising a pool seeding screen, wherein an operator is able to adjust said time-varying ratios and rates through said pool seeding screen.

22. The system of claim **21** wherein said pool seeding screen ensures that the estimated true probabilities for any selected betting line always add up to one.

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