Title: A DEVICE AND METHOD OF TERMINATION FOR OPEN-ENDED COOPERATIVE GAMES

Abstract: A self-contained apparatus for displaying poker tournament information, the apparatus having an operator-input interface, control circuitry and a display. The operator-input interface is dedicated to receiving input relating to the poker tournament from a human operator. The control circuitry is coupled to receive the input relating to the poker tournament from the operator-input interface and to generate, based at least in part on the input, information relating to the poker tournament. The information generated by the control circuitry is displayed to poker tournament players on the display.
A DEVICE AND METHOD OF TERMINATION FOR OPEN-ENDED
COOPERATIVE GAMES

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CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority from, and hereby incorporates by reference, U.S.
Provisional Application No. 60/###,###, filed October 18, 2004 and entitled “A Device and
Method of Termination for Open-Ended Cooperative Games.”

FIELD OF THE INVENTION

[0002] The present invention relates to the field of multi-player gaming. More
particularly to a device that manages and displays information for a poker tournament.

BACKGROUND

[0003] Poker tournaments add additional elements to the game of poker that are not
typically present in casual non-tournament game play. These additional elements include a
series of consecutive playing-rounds ("Rounds") with fixed time duration; a schedule of
typically increasing minimum forced "blind" bets, called a "Small Blind" and a "Big Blind";
and a schedule of typically increasing Antes, a initial bet required of all players participating
in the individual hands of a round. The rules on how these forced bets progress and potential
limitations on player bets may vary based on the type of game being played. For example, in
a 'limit' game, the number of raises and amount of each bet or raise may be fixed to pre-
defined amounts. In a 'No-Limit' game, the number of bets and raises and maximum amount
of each raise is unlimited.

[0004] The total amount and value of chips each player receives at the start of a poker
tournament (buy-in) is typically determined in advance. Tournaments may also allow rebuys,
in which players are allowed to purchase additional chips based on certain tournament rules
after the tournament has started. In a tournament with no 'rebuys' a player is eliminated
when he or she is out of chips. In a Rebuy Tournament, the number of rebuys can be limited
or unlimited. Limited Rebuys can be restricted to a certain rebuy period or to a total number
allowed per player. A tournament may have an 'add-on' whereby all players are eligible to
purchase more chips at the end of the rebuy period.

[0005] Tournament players may be seated at random by table and seat. Throughout a
tournament as players are eliminated, the remaining players may be re-seated to balance the
number of players per table.
Prizes or payouts are typically calculated as a percentage of the total prize purse based on the number of tournament players, the sum value of total buy-ins, rebuys and add-ons, and the players finishing position relative to the other players in the tournament.

Throughout a given Tournament event players should be aware of and conform to the Round time as well as Blind, Ante, and other tournament requirements (determined by various factors, including the type of game being played).

This type of Round and "forced" betting ensures the Tournament does not stall (ensures convergence to the end-state), the players with the smaller amounts of remaining chips are forced to play more aggressive, and the Tournament ends in a reasonable and predictable amount of time.

Because of all the variables available in a given tournament, considerable effort is required by the tournament director to properly setup and track the tournament progression, detracting from the enjoyment of participating in the tournament when, as is often the case, one or more of the tournament players is also the tournament director. Worse, mistakes in tournament setup may lead to various game-play problems ranging from failure to end on schedule (ending too early or too late) to deadlock conditions in which a player cannot change chips as necessary to meet betting requirements.
BRIEF DESCRIPTION OF THE DRAWINGS

[0010] The present invention is illustrated by way of example, and not by way of limitation, in the figures of the accompanying drawings and in which like reference numerals refer to similar elements and in which:

**Figure 1** illustrates a conceptual representation which contains constituent elements of the device under an embodiment;

**Figure 2** illustrates a flow diagram of an alternative setup mode that may be employed within the device of Figure 1 or other embodiments of poker tournament control devices described herein;

**Figure 3** illustrates a instantiation of the device under an embodiment of the present invention; and

**Figure 4** illustrates an alternative implementation of a self-contained device for controlling a poker tournament.
DETAILED DESCRIPTION

[0011] In the following description and in the accompanying drawings, specific terminology and drawing symbols are set forth to provide a thorough understanding of the present invention. In some instances, the terminology and symbols may relate to specific details that are not required to practice the invention, and thus may be omitted without departing from the spirit and scope of the invention.

[0012] Devices and methods for automatically setting up and managing the progression of a poker tournament or other open-ended game are disclosed in various embodiments, including embodiments that track and accommodate changes that may occur during tournament progression. For example, one embodiment of the invention relates to a gaming tournament device and method having changing context that governs play of the game of poker. The device represents both various state and governing data to the user as well allows user interaction to manage that state and governance, both prior to the tournament and while the tournament is in progress.

[0013] In general, open-ended cooperative games such as poker are characterized by having no convergent path to a terminal state. They do not necessarily converge to the end-state and can continue indefinitely. Thus, in embodiments of the invention, a gaming device and method are provided for forcing convergence to an end-state, and thus termination, of and open-ended game (poker). In forcing convergence to an end-state, the device arbitrates certain game play decisions on behalf of a group of players and in doing so may require an additional rule of game arbitration. In forcing convergence, any number of parameters may be selected for arbitration according to algorithms defined specifically for the particular game and the style of required convergence or 'play'. Although embodiments are described below in connection with setup and management of poker tournaments, the systems, devices principles, methods and/or techniques disclosed may alternatively be applied in open-ended cooperative games other than Poker in alternative embodiments.

[0014] Figure 1 illustrates an embodiment of a self-contained device 100 for receiving and displaying poker tournament information, the device 100 including a user interface and control circuitry to present and manage game information based on data provided during a setup period and additional input received while the game is in play. In the specific embodiment shown, the device 100 includes a round time display 102, a tournament status display 104, a betting schedule display 106, an additional tournament information display 108, an on-device input mechanism 110 (also referred to herein as an operator-input interface), an input mechanism 112, and an output mechanism 114. In an alternative
embodiment, the displays 102, 104, 106, 108 or any subset thereof may be incorporated into a single display (e.g., a liquid crystal or other display) with the corresponding display information presented in respective regions thereof. Also, the on-device input mechanism may be implemented by pressure-actuated switch elements incorporated into the display (e.g., a touch-pad display) or disposed elsewhere on the device 100. In one embodiment, the on-device input mechanism is dedicated to receiving input relating to the poker tournament from the tournament director or other human operator and, as such, may include a substantially smaller number of switch elements (e.g., buttons or keys) than might be used in a more general purpose device such as a computer (e.g., fewer switch elements than a so-called ‘qwerty’ keyboard or numeric pad).

[0015] Although not shown, the device also includes a control unit, such as a programmed processor (e.g., one or more microcontrollers, microprocessors, and/or application-specific integrated circuits (ASICs) having program code stored in a nonvolatile semiconductor memory or other type of memory coupled thereto or formed therein). The device may also include non-volatile memory to allow a user to store tournament state or setup information, thereby enabling the tournament state to be recalled after interruption, or allowing a user to reuse the same setup information in a subsequent game or tournament. It is also contemplated that the device 100 may be packaged with other poker related items or a poker tournament kit to facilitate a user in holding a poker game or tournament. These items may include, for example and without limitation, poker chips, playing cards, dealer buttons, poker mats and/or poker tables, and a case having, for example, internal panels molded to receive the tournament management device and other kit items.

[0016] Round time 102 displays the time remaining in the specified tournament round. The specified tournament round may be any current, past or future round depending on the information input to the device 100 at any given time. The device 100 allows a user to view the selected round time without disrupting the tournament clock. The tournament status element 104 relates various information about the tournament. This information may include the type of game being played, the number of players in the game, total duration of the tournament, and the tournament reference number. The betting schedule 106 contains information related to the type of game being played, including for example, the minimum and maximum bids for the blind and the amount of the ante. The additional tournament information display 108 may contain secondary tournament information such as the number of players remaining, statistical data regarding the amount of money remaining in the tournament, upcoming breaks in tournament play, payout schedule, estimated tournament
length, estimated time remaining in tournament, current time, and rebuy or add-on
information. With regard to the amount of money remaining in the tournament, the device
may relate the total chips in play, the average dollar amount each player has, the player with
the maximum number of chips or the highest dollar amount, the minimum number of chips or
dollar amount of a player not yet eliminated from play, and/or the average number of chips
per stack, or any other information useful or desirable in a poker tournament or other open-ended
game.

[0017] The on-device input mechanism 110 allows a user to configure required settings
prior to starting a tournament. During tournament play the mechanism 110 also allows a user
to manage the tournament while in progress. The user may pause and un-pause the timer or
alter the context and state information such as the current round or time left in a given round.

[0018] Input mechanism 112 may be used for external configuration and management of
the device 100. A variety of external sources of input information may be supported by input
mechanism 112 including, without limitation, a personal computer (PC), a remote control, or
one or more similar devices. The input mechanism may also support various types of
communication including, without limitation, infrared (IR) or other wireless connections, a
portable Universal Serial Bus (USB) disk drive, a flash memory interconnect (i.e., to enable
data retrieval from a flash memory card), an Ethernet connection, a universal serial bus or
other connection to personal computer, a home power network via X10 or similar technology,
etc. The input mechanism 112 may be configured to work with both wire and wireless
connections and may be used for less, more, or equal functionality as the on-device input
mechanism 110.

[0019] Output mechanism 114 may be used to deliver information to an external
destination, for example, to display the information to a large crowd, provide the information
to a computer or other data processing system, or archive the information for later retrieval.
The external destination may be, for example and without limitation, a television (e.g., either
closed-circuit television system or single television), a computing device, a storage device, or
any other device capable of displaying, processing and/or recording the output information.
Other receiving entities capable of supporting the output of device 100 over a variety of
communication links are also contemplated. These include USB, radio, IR, X10, Ethernet, or
any other bearer capable of interpreting the device output.

[0020] In the embodiment of Figure 1, the device 100 operates in two distinct phases,
setup mode and play mode. Initially, the user configures the device for a particular
tournament in setup mode. After all input and relevant information is entered into device 100 via the on-device input mechanism 110 or the input mechanism 112 the device is switched to play mode. While in play mode device 100 displays the context information of the tournament on the tournament status screen 104 and on the additional tournament information screen 108. The information may change throughout the tournament as play progresses. As time elapses and the tournament progresses, players will be eliminated and chips will change hands. While in play mode, the user can interact with the device 100 to alter the tournament context. More detailed examples of device operation in setup mode and play mode are discussed below.

SETUP MODE

[0021] The goal of the setup mode is to put the device 100 into a state where it will provide the information required by tournament players and tournament director (i.e., one or more human operators that may also be tournament players) to manage a poker tournament. The information supplied to the device 100 in setup mode may be entered directly to the device by operator manipulation of the device interface 110 (e.g., keying in the information), entered into an external input interface and then delivered to the device 100 via the input mechanism 112, or a combination of the two. Information supplied via input mechanism 112 may be communicated directly to the device 100 or may be communicated via an intermediary that may either relay the information directly to the device 100 or provide an additional layer of processing.

[0022] The game-play elements that may define and govern the tournament may include, for example and without limitation, any or all of the following, each of which is examined in greater detail below: Chip Allocation, which involves dividing all or a subset of the available poker chips evenly among tournament players to establish an initial poker chip allocation; Schedule Definition, which establishes a tournament schedule for blinds, antes, limits, and the like; Time, which establishes, through operator-specification or estimation based on other input parameters, the time elements of the tournament such as total length, round duration, break points and break duration; Player Management, which decides the placement of players in positions to start the tournament, and how players should be reseated as the tournament progresses as various players are eliminated from play; and Payout which determines the prize allocation based on top performers in the tournament.

[0023] To support the game-play elements, the device 100 provides the following tools for the user: a Chip Wizard to assist in the assignment of chips for each player in the tournament, including denominations and quantity of each chip color available; a Schedule
Wizard to assist in the definition of the Schedule that will govern the tournament including blinds, antes, and limits; a Time Wizard to assist in defining the time elements of the tournament, including round length, total tournament length, break points, and break duration; a Player Wizard to assist in the management of players and play table locations throughout the tournament, including initial seating and re-seating as the tournament progresses; and a Payout Wizard to allow the tournament director to manage how the prizes will be allocated. Each of these tools, which may be instantiated by a programmed processor, is discussed in greater detail below.

[0024] The device 100 may also restrict or constrain input information supplied by the human operator (e.g., the tournament director) during setup mode to guide the operator to a successful tournament configuration. Further, the setup mode of the device 100 may be further subdivided into an optional “expert setup” mode and an “auto setup” mode to accommodate, respectively, an expert user’s desire for flexibility and a novice user’s desire for setup guidance.

[0025] Although the component elements and operating principles and methodology of device 100 may be broadly applied to many types of games, including many types of poker games a specific setup implementation is outlined below for Texas Hold ‘em (limit and no limit), Omaha (limit and no limit), and Seven Card Stud (limit and no limit).

CHIP ALLOCATION

[0026] For an effective, enjoyable tournament each user is allocated an equal amount of starting chips at the beginning of the tournament. In one embodiment, the composition of this stack (i.e., initial set of poker chips in particular denominations and quantities of each denomination) is divided such that tournament play is fluid and the governing game-play rules are effective. By this operation, tournament players are not placed in a situation where their chips cannot be totaled to meet a betting requirement, and the blind schedules have the desired effect of not being too harsh or too lax. If the blind schedule is too harsh, the skill aspect of game-play may be reduced. On the other hand, if the blind schedule is too lax, the tournament may not end in a finite or desired period of time, thus frustrating a primary purpose of having such a blind schedule.

[0027] During the setup mode, chips may be allocated by a Pre-Set Allocation which allows the user to select from a list of pre-defined chip sets, the composition of which (with respect to colors and quantities) is stored in the device. The user may also choose an Auto Allocation option which allows the user to enter chip set information (e.g., quantity and denomination of each chip color) that may be used by the device 100 to automatically
determine the initial chip set to be allocated to each tournament player, and to prompt the tournament director to provide each player with a specific number of chips of each denomination. The user may also choose a Custom Allocation which allows the tournament director to determine the initial chip allocation and then provide sum totals per-player to the device 100.

**CHIP WIZARD**

[0028] The Chip Wizard feature of device 100 provides the capabilities to prompt the tournament director to specify (i.e., select or enter) chip information to be applied in any of the three chip allocation methods discussed above. In particular, device 100 may display default values to prompt the tournament director to specify a desired starting amount and denominations of the initial chip set, and then display the number of each denomination of chips to be allocated to each tournament player based on the method selected. If no starting amount or denominations are specified (e.g., no adjustments to the default values are entered), the default values may be used and the tournament director may have the option to adjust the quantities and denominations once chips have been allocated. As a specific example, a default starting amount may be in the range of $500 - $1500, and default denominations selected or otherwise specified to be $5, $25, $100, and $500. The default starting amount and/or default denominations may be adjusted by the tournament director within constraints imposed by the device 100 to promote a fluid tournament.

[0029] In addition to prompting the tournament director to provide information on how the chips should be distributed at the start of the tournament, the Chip Wizard feature of device 100 may also indicate which chips should be used during the course of tournament play so a player may “color up” or exchange smaller denomination chips for larger denomination chips. The device 100 may display or notify the user when to color up specific denominations. By so doing, the device 100 allows the user to promote a fluid tournament and ensure integrity of play.

**PRE-SET ALLOCATION**

[0030] The control circuitry of device 100 may have programmed therein a predetermined definition of a finite number of pre-configured chip sets. These chip sets may correspond to a chip-set key (e.g., a chip-set identifier) known by or available to the tournament director. The device 100 may present the user with the chip-set keys during the setup mode. In response to operator selection one of the available chip-set keys, the device 100 may index a lookup table or other record of chip-set compositions using the specified
chip-set key and thus obtain data that defines the exact composition of the chip set to be used in the poker tournament.

[0031] The chip-set key may be provided to the device 100 in many forms including, without limitation, selection from a list of chip-set identifiers presented on a display of device 100, manual entry of a code into the device 100 via the on device input mechanism 110, or from a remote interface via the input mechanism 112, such as a barcode scan, an RFID code sent by the chip set to the device, or any other input method capable of providing the chip-set key to the device 100.

AUTO ALLOCATION

[0032] In cases where the tournament director is using a chip set that is already known to the device 100 (e.g., in a poker tournament kit that includes a chip set and device 100), the user may enter their chip set information. To enter this information the user may provide the number of different chips in the set as well as the quantities of each chip type. This information may be provided by manually entering the information directly using the on-device input mechanism 110, or into a remote intermediary that may then deliver the information to the device via the input mechanism 112, or a combination of the two. Additionally, chip set information may be acquired by user input or auto-detection using technologies such as barcode-scan or RFID where a unique identification (ID) may be recorded on or within all or some of the chips, or in a case or other package of chips.

[0033] In an alternative embodiment for entering chip set information, the tournament operator or other user is prompted to enter the number of chip colors in their chipset. The acceptable range may be, for example, one to ten colors. The user is then prompted to select values and enter quantities for the number of chip colors selected. In one embodiment, the options for chip values are $.01, .05, .10, .20, .25, .50, 1.00, 2, 2.50, 5, 10, 20, 25, 50, 100, 200, 500, 1000, 5000, 10000, 25000, 50000 and 100000.

[0034] When a chip denomination is selected, the user is then prompted to enter the total chipset quantity of that denomination. The minimum quantity per denomination for chip colors one and two is, in one embodiment, 20 chips; and for chip colors three-ten, the minimum quantity is 10 chips. Other minimum quantities may apply in alternative embodiments.

[0035] After selecting the value of a chip and entering its quantity, the user is prompted to enter the value and quantity of the next chip color. The denomination for the next chip color defaults to a multiple of the previous value, for example, as follows: 5x for values of 01, .05, .10, .20, .50, 1.00, 2, 5, 10, 20, 100, 200, 1000, 10000; 4x for values of .25, 2.50, 25,
2500; 2x for values of 50, 500, 5000, 25000, 50000; NA for values of 100000. Other default values may be used. In one embodiment, the maximum increase from one chip to the next for chip colors three through ten is 5x and for chip colors one and two is up to 10x. Other increase-maximums may be used.

CUSTOM ALLOCATION

[0036] In the Custom Allocation method the user has the added flexibility to specify the denomination of each chip. The Custom Allocation method may be limited by the device 100 by restricting the tournament director to select a first chip denomination that falls within a fixed range of a chip denomination sequence. The device 100 may also constrain the tournament director's selection of chip denominations based on the previous denominations selected.

CHIP WIZARD ALLOCATION

[0037] If the Pre-set or Auto Allocation method is used, the tournament director provides device 100 with the number of tournament players to enable the Chip Wizard feature to determine an allocation of chips. Using the chip information, the Chip Wizard (i.e., instantiated by execution of program code within the control circuitry of device 100) may determine the maximum number of players that can be supported. Once the user specifies the players in the tournament based on this calculation the Chip Wizard may determine the quantity of each color chip to allocate to each player.

[0038] In one embodiment, the default denomination schedule as set by the Chip Wizard is as follows:

<table>
<thead>
<tr>
<th>Denomination</th>
<th>Minimum</th>
<th>Ideal</th>
</tr>
</thead>
<tbody>
<tr>
<td>$5</td>
<td>5</td>
<td>20</td>
</tr>
<tr>
<td>$25</td>
<td>3</td>
<td>12</td>
</tr>
<tr>
<td>$100</td>
<td>No minimum</td>
<td>6</td>
</tr>
<tr>
<td>$500</td>
<td>No minimum</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 1

Additional chip denominations may be added to this schedule as appropriate, on a tournament by tournament basis in the following denominations: $1,000, $5,000 and $25,000. The additional chip denominations added by a user may be constrained based on the default denomination schedule.

[0039] The allocation logic of the Chip Wizard attempts to divide the available chips, based on number of players, in the following chip color ordering priority. Priority 1 (if
defined) – player defined color hierarchy; Priority 2 – default or common color hierarchy; or Priority 3 – color agnostic hierarchy (optimize for maximum players based on chips available).

[0040] Examples of for Priority 1 and Priority 2 approaches to allocating the available chips (or a subset thereof) among tournament players are set forth as follows:

DenominationColorOne / TotalPlayers = ColorOnePerPlayer

If ColorOnePerPlayer is less than ColorOnePerPlayerMinimum; FAIL
If ColorOnePerPlayer is greater than ColorOnePerPlayerIdeal;
ColorOnePerPlayer = ColorOnePerPlayerIdeal

[0041] This approach is repeated by the device 100 for each color of chip in the tournament chip set. The “One” portion of the variable is replaced with the number of denominations as it exists in the color hierarchy.

[0042] With each iteration, a check is performed to determine whether PlayerTotalChips is greater than MaxChipsPerPlayer. If the value true is returned, the difference is calculated and the device 100 determines the best combination of chips to remove so as to come as close as possible to the ideal starting amount without going below the minimum chip allocation per denomination.

[0043] If the iterations are complete and the PlayerTotalChips value has not yet been reached, the Chip Wizard Allocator will determine the delta between PlayerTotalChips and MaxChipsPerPlayer and additional chips are added until either the desired total or a number as close as possible to the desired total is reached. When the algorithm is complete, the Chip Wizard Allocator will display the quantity of each chip denomination to be allocated to each tournament player.

[0044] The Priority 3 approach is set forth as follows. First multiply TotalPlayers by ColorOnePerPlayerIdeal. Determine the chip color that has a total quantity closest to this value, or that is equal to or greater than this number. If no chip colors are found, the ColorOnePerPlayerIdeal is decreased by one until ColorOnePerPlayerIdeal is equal to ColorOnePerPlayerMinimum. If this point is reached and the values are not equal, the chip set is not sufficient for the number of players. This approach is repeated for the remaining chip colors and ideal values.

[0045] With each iteration, a check may be performed to determine whether PlayerTotalChips is greater than MaxChipsPerPlayer. If true is returned, the difference is calculated find the best combination of chips. Some chips may be removed so as to come as
close as possible to the ideal starting amount without going below the minimum chip allocation per denomination. If the iterations are completed and the PlayerTotalChips value has not been reached, the Chip Wizard Allocator may determine the difference between these two values. Additional chips may then be added until either the desired total or a total as close as possible to the desired total is reached. When complete, the device 100 displays the quantity of each chip denomination to be allocated to each tournament player as discussed above.

**Player Wizard**

[0046] Once the device has chipset information entered, including number of chip colors, value of each chip and quantity of each chip, the Player Wizard allows the user to select the number of players in the tournament. The Player Wizard first calculates the maximum number of players the chip set can support then prompts the user to enter a number of players between the minimum of 2 and the maximum number of players the chipset can support.

Below is an example of calculating the maximum number of players a chipset can support:

**Step 1 – calculating the minimum starting amount.**
1-5 Starting Colors
Minimum Starting Amount = Chip 1 x 50. This ensures the small blind will be no more than 2% of a players starting amount.
Example Chip 1 ($5) x 50 = $250 Minimum Starting Amount

**Step 2 – Determining minimum quantities of each chip per player**
Based on 5 Colors
Using chip values and quantities of $5 (150), $25 (150), $100 (100), $500 (50), $1000 (50) for example.
A Chipstack is a collection of same denomination chips, example. ten $5s

Chip 1 Quantity Minimum
Total value of chipstack 1 must be equal to or greater than chip 2 denomination
$5 (5) = $25
Chip 1 Quantity Minimum = 5

Chip 2 Quantity Minimum
Total value of chipstack 1+ chipstack 2 must be = or > chip 3 denomination
$25 + 25x = $100
X = 3
Chip 2 Quantity Minimum = 3

Chip 3 Quantity Minimum
Total value of chipstack 1, 2 and 3 must be = or > chip 4 denomination
$25 + $75 + 100x = 500
x = 4
Chip 3 Quantity Minimum = 4
Chip 4: Quantity Minimum = 0, the minimum starting amount of $500 has been reached.

Chip 5: Quantity Minimum = 0, at this point each player's stack is > or = the minimum starting amount.

If the total starting amount has met or exceeded minimum starting amount per player, all remaining Chip colors have a minimum quantity of 0.

**Step 3 – Determining the minimum chip distribution for each player**
The total value of each player's starting stack must be = or > the minimum established in step 1 ($500)

Begin by allocating the minimum quantities for all the chips established in step 2 until the minimum value of $500 is reached.

5 ($25s) = $500 - $475 (add chip 2)
3 ($25s) = $475 - $400 (add chip 3)
4 ($100s) = $400 = 0 (the minimum starting amount has been reached)

Divide the minimum quantities by the quantities in our chipset:

$5 (150), $25 (150), $100 (100), $500 (50), $1000 (50)

$5s
150/5 required = 30 max players

$25s
150/3 required = 50 max players

$100s
100/4 = 25 max players

The lowest max players above (25), is the max this chipset can support at a $500 starting amount per player.

**STARTING AMOUNT DEFINITION**

[0047] After a user has entered the chipset information and selected the number of players, the user is prompted to select a starting amount per player. In one embodiment, the minimum starting amount allowed = Chip 1 value x 50. This ensures the small blind will be no more than 2% of a players starting amount. In the same embodiment, the maximum starting amount allowed = Chip 1 value x 400 or the maximum starting amount that can be divided evenly among the players considering the value and quantity of the chips. The user can select any value between this minimum and maximum in increments of the chip 1 value.
[0048] The user may also pick any starting amount that is realizable with the selected chip and player info between the determined minimum and maximum starting amounts. The user may select, for example: Quantity of chip 1 / # players (round down to nearest number) times value + ....... chip 6 / # players (round down) times value = Max starting amount per player.

[0049] In one embodiment, two rules are applied to determine the maximum starting amount:

Using our example chipset $5 (150), $25 (150), $100 (100), $500 (50), $1000 (50)
Players selected 25

Divide each chip quantity by the number of players and total their value
150/25 = 6 $5s - $30
150/25 = 6 $25s - $150
100/25 = 4 $100s - $400
50/25 = 2 $500s - $1000
50/25 = 2 $1000s - $2000
sum = $3580

For 25 players, the starting amount range is $500-$3580.

Or, chip 1 value x 400
  o  Example $5 x 400 = 2000

[0050] The above examples provide two starting amounts (3580 and 2000), the lesser of the two is 2000, and therefore the max starting amount is 2000. Other starting amounts may result in other configurations.

SCHEDULE DEFINITION

[0051] The chips per player and the total chips in play have a direct bearing on the tournament betting schedule. The betting schedule is designed to ensure skill in play is balanced with driving the tournament to completion in desired amount of time. Both the pace of play (Round Length) and the rate of increase of the blind bets may be used to define these characteristics.

[0052] In one embodiment, the betting schedule is automatically determined and displayed by device 100 based on the chip information acquired during the Chip Allocation phase and the player information in the Player Setup Phase. Based on this information the device 100 will select either a pre-defined betting schedule or calculate a betting schedule on the fly. This decision will be based on the implementation of the device 100 and other factors, such as how effective a pre-defined betting schedule would be, versus one generated in real-time, for the given chip and player information.
SCHEDULE WIZARD

[0053] If the device 100 is set to auto-determine the betting schedule, the betting schedule will be calculated with no user input. If “expert” mode is selected, the user will have the ability to specify the total number of tournament rounds and the betting schedule information for each round. In addition, the user may specify values for the small blind, big blind, ante, and limit on a per round basis. Whenever the small blind value is altered, the device 100 may automatically calculate the value of the big blind so it is always twice the amount of the small blind.

BETTING SCHEDULE DETERMINATION

[0054] If the betting schedule is to be determined by the device 100, for example in non-expert mode, a Betting Schedule Calculator (i.e., instantiated by program code execution within the control circuitry of device 100) will take as input the total starting chips per player, the total number of players in the tournament, and the game being played and then calculate the betting schedule.

As a specific example, the Betting Schedule Calculator may determine the desired betting schedule as follows:

\[
\text{BigBlind} = 2 \times \text{SmallBlind} \\
\text{StartingSmallBlind} = \text{StartingChipsPerPlayer} \times 0.01 \\
\text{(this value may be rounded to match the available chip denominations)} \\
\text{RoundTwoSmallBlind} = 2 \times \text{StartingSmallBlind}
\]

For each successive round the following formula may be applied repeatedly until the desired number of total rounds in the schedule is reached:

\[
.5 \times \text{PreviousSmallBlind} \\
.33 \times \text{PreviousSmallBlind} \\
.5 \times \text{PreviousSmallBlind} \\
33 \times \text{PreviousSmallBlind} \\
.5 \times \text{PreviousSmallBlind} \\
.33 \times \text{PreviousSmallBlind} \\
.5 \times \text{PreviousSmallBlind} \\
.67 \times \text{PreviousSmallBlind} \\
.5 \times \text{PreviousSmallBlind} \\
.33 \times \text{PreviousSmallBlind} \\
.5 \times \text{PreviousSmallBlind} \\
.33 \times \text{PreviousSmallBlind} \\
.5 \times \text{PreviousSmallBlind} \\
.67 \times \text{PreviousSmallBlind}
\]
[0055] Each resulting SmallBlind determined using the above schedule may be rounded
according to the following algorithm:

```javascript
if(thisBlind < 100) {
    $ceil = ceil(thisBlind /5)*5;
    $floor = floor(thisBlind /5)*5;
    return get_closest($ceil,$floor,$ thisBlind);
} else if(thisBlind < 200) {
    $floor = floor(thisBlind /10)*10;
    $ceil = ceil(thisBlind /10)*10;
    return get_closest($ceil,$floor,$ thisBlind);
} else if(thisBlind < 500) {
    $floor = floor(thisBlind /25)*25;
    $ceil = ceil(thisBlind /25)*25;
    return get_closest($ceil,$floor,$ thisBlind);
} else if(thisBlind < 1000) {
    $floor = floor(thisBlind /50)*50;
    $ceil = ceil(thisBlind /50)*50;
    return get_closest($ceil,$floor,$ thisBlind);
} else if(thisBlind < 1500) {
    $floor = floor(thisBlind /100)*100;
    $ceil = ceil(thisBlind /100)*100;
    return get_closest($ceil,$floor,$ thisBlind);
} else if(value < 10000) {
    $floor = floor(thisBlind /500)*500;
    $ceil = ceil(thisBlind /500)*500;
    return get_closest($ceil,$floor,$ thisBlind);
} else {
    $floor = floor(thisBlind /1000)*1000;
    $ceil = ceil(thisBlind /1000)*1000;
    return get_closest($ceil,$floor,$ thisBlind);
}
```

[0056] In an alternative embodiment, the control circuitry within the poker tournament
control device uses an internal table called the valueTable. The valueTable provides the key
to, and regulation of, the required relationship between the arbitrary denominations allowed
by the user such that the chosen denominations will be effective in a) managing the liquidity
of the tournament and b) managing the specific number of a given denomination at any given
round to avoid denomination shortages, excess and inability to exchange. However, in
addition, an interesting characteristic of this table is that, when suitably composed, it can also
used as the rounding table.

[0057] For rounding, there is an associated, corresponding flagsTable that indicates the
rounding breakpoints in the valueTable. Using the flags table to indicate the rounding ‘break
points’ in the valueTable.
Each resulting Small Blind determined using the described schedule may then be rounded according to the following algorithm:

For a given value, search down the value table for the nearest ‘breakpoint’ value. If the value is greater than or equal to the breakpoint value, scan down the value table for the first ‘realizable’ value. A realizable value is defined to be realizable with the given chipset. If none found, scan up the table and return the first realizable value.

In either embodiment, the first order check determines the correct formula to apply based on the amount of the blind. The second order function calculates an alternate value of the blind rounded based on the value of the “raw” blind. The third order check determines which rounded version is closest to the original and sets that as the actual blind value for the round. Once complete, the round schedule information is set in the device for the tournament.

The device 100 may alternatively have recorded therein a table or other organization of predetermined betting schedules that may be used, with each predetermined betting schedule being optimized for a different starting chip configuration. The approach described above may be used for all cases, or only those cases where the device 100 determines that the run-time betting schedule determination will be more appropriate than the available predetermined betting schedules.

Time

Time is a critical element in managing the pace of a poker tournament and ensuring the tournament play is fluid. The round length or round duration is generally the primary determinant of a tournament’s fluidity. Shorter round lengths allow luck to play a larger role in the outcome of the tournament, while longer round lengths allow skill to play a larger role in the outcome of the tournament. Therefore, tournament round lengths may vary, in one embodiment, from one minute to sixty minutes (other longer or shorter round lengths may be used in alternative embodiments). Furthermore, the total tournament length may be estimated by multiplying the round length by the estimated ending round of the tournament. Accordingly, in one embodiment, the round length may be determined by the device 100 in response to operator specification of a desired tournament duration or, conversely, an estimated tournament duration may be determined and presented to the tournament operator in response to a round-length specification. Additionally, one or more breaks such as pauses in play for restroom use may be factored into the tournament and included in the determination of the tournament duration or round-length determination.
TIME WIZARD

[0062] In one embodiment, device 100 prompts the tournament director to specify the round length, then applies the round-length specification to determine and an estimated tournament length which is displayed in the additional tournament information display 108. The tournament director may provide the necessary information to the device 100. The device 100 also allows the tournament director to specify break points and duration of breaks (i.e., intermissions or other temporary halts in tournament play) which are factored into the determination of the estimated length of the tournament. The device 100 may also present, as part of the prompt to the tournament director, a default round-length value and break schedule determined to be most conducive to a fluid tournament, based in whole or part on setup information provided by the tournament director.

ROUND-TIME, TOURNAMENT-TIME DETERMINATION

[0063] In one embodiment, the approach for calculating the amount of time for each tournament where EndingRound is equal to the round number in the betting schedule is as follows:

\[ \text{BigBlind} + \text{SmallBlind} + \text{Ante} = \text{TotalChipsInPlay} / 10; \]
\[ \text{TournamentLengthOption} = \text{RoundLengthOption} \times \text{EndingRound}; \]

[0064] The length options are calculated by varying the RoundLengthOption from 5 to 60 in increments of 5 units (where units are minutes, though other time units and/or larger or smaller increments may be used in alternative embodiments). For example, if a tournament is determined to end in 10 rounds, the following tournament length options may be presented:

<table>
<thead>
<tr>
<th>Round-Length</th>
<th>Tournament-Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>00:05</td>
<td>00:50</td>
</tr>
<tr>
<td>00:10</td>
<td>01:40</td>
</tr>
<tr>
<td>00:15</td>
<td>02:30</td>
</tr>
<tr>
<td>00:20</td>
<td>03:20</td>
</tr>
<tr>
<td>00:25</td>
<td>04:10</td>
</tr>
<tr>
<td>00:30</td>
<td>05:00</td>
</tr>
<tr>
<td>00:35</td>
<td>05:50</td>
</tr>
<tr>
<td>00:40</td>
<td>06:40</td>
</tr>
<tr>
<td>00:45</td>
<td>07:30</td>
</tr>
<tr>
<td>00:50</td>
<td>08:20</td>
</tr>
<tr>
<td>00:55</td>
<td>09:10</td>
</tr>
<tr>
<td>00:60</td>
<td>10:00</td>
</tr>
</tbody>
</table>

Table 2

Once these variables have been determined the device 100 will have enough information to govern the tournament.
PLAYER MANAGEMENT

[0065] The aspects of player management addressed by device 100 may include, for example and without limitation, the total number of players in the tournament, ensuring there are sufficient chips to support the number of tournament players, determining player seating at the beginning of the tournament, and automatically balancing players and tables as tournament players are eliminated from the tournament (i.e., by losing all their chips).

PLAYER WIZARD

[0066] The device 100 may optionally first perform the Chip Allocation function to determine the maximum number of players the users chips can effectively support. The maximum number of tournament players may be presented to the user as a list of options, giving the user a perspective on the size of tournament the available chips can support.

[0067] For example, in one embodiment, device 100 initially determines the minimum chip requirements to reach a per player total of $500 (larger or smaller per-player totals may be used in alternative embodiments or may be selected by the tournament director). A Maximum Players Calculator (i.e., instantiated by execution of program code within the control circuitry of device 100) then may determine the maximum supportable players as follows:

\[
\text{Apply the quantity rules for Priorities 1, 2 or 3 as described above.}
\]

\[
\frac{\text{ColorOneTotalQuantity}}{\text{ColorOneMinimum}} = \text{ColorOnePlayerChips}
\]

\[
\frac{\text{ColorTwoTotalQuantity}}{\text{ColorTwoMinimum}} = \text{ColorTwoPlayerChips}
\]

\[
\frac{\text{ColorThreeTotalQuantity}}{(500 - ((\text{ColorOnePlayerChips} \times 5) + (\text{ColorTwoPlayerChips} \times 25)))} = \text{ColorThreePlayerChips}
\]

If the sum of the per player chips multiplied by their denomination is not at least $500, the Maximum Players Calculator may determine if the total can be met by adding additional ColorOne or ColorTwo chips (if available). If the denomination is still below the minimum total of $500, chips from the remaining un-allocated chips are taken in sequence and distributed evenly across all the player stacks until the minimum is reached. Once the minimum is reached, the primary max player count has been determined.

[0068] The above operations are repeated with the next highest quantity chip color by replacing ColorOne with the new chip color. This continues until all colors have been distributed and the quantity hierarchy has been completed. Once complete, the device 100 may determine the highest max player count received. This will be the distribution for the
maximum amount of players, and the number of players capable of being serviced with the chip set.

PLAYER SEATING AND BALANCING

[0069] Examples of approaches that may be employed within device 100 for establishing player seating and keeping tables balanced throughout the tournament are described below.

[0070] Initially, a number of players per table may be determined as follows:

\[
\text{PlayersPerTable} = \frac{\text{TotalPlayers}}{\text{SeatsPerTable}}
\]

To establish player seating, each table may be assigned a letter, and each seating position at a given table assigned a number, with player names displayed with corresponding table and seating position designation. The device 100 may then randomly select a letter/number combination for each player, with each selection being determined from the places not yet assigned. While play is in progress, the device 100 may calculate the average number of players per table and may also calculate on a per-table basis the players over or under this average number. This calculation may then be used to determine when players should be moved and tables balanced.

[0071] The statistical information on players and tables can be manually derived and entered by the tournament director as the director notes players that are eliminated from the game and subsequently leave their playing position. Another option allows the information to be automatically entered by various types of sensors. In one embodiment the device 100 may prompt the tournament director to confirm the data the device has processed.

PAYOUT

[0072] If the tournament has prizes, cash or otherwise, the device 100 may be used to assist in calculation payout. This is achieved through the Payout Wizard, another process or thread instantiated through program code execution within the control circuitry of device 100.

PAYOUT WIZARD

[0073] The Payout Wizard prompts the tournament director to enter the total purse if there is a cash payout or individual prize elements if the tournament is prize item based. The device 100 may allow the user to specify a percentage of cash payout based on placement of finishing players. The device 100 may also allow the user to select finishing place number based either on a number or percentages for prize payout. The information may be displayed alternatively using the input mechanism 112 on the device 100 to which any type of device containing the required information (or an interface to input the required information) may be connected.
EXAMPLE SETUP PROCESS

[0074] In one embodiment, device 100 provides an efficient mechanism for the user to configure their tournament by (1) receiving a data selection from the tournament director or other user, (2) imposing restrictions on the range of data that may be selected by the on the tournament director, for example, based on prior data selections, or (3) combining (1) and (2) into a simplified user experience and series of method steps.

USER INPUT

[0075] In order to set up the tournament the user may enter the composition (number of different chip colors, quantity of each color and value associated with each color, the value assigned to each color of chip establishing a chip denomination) of the chip set being used. This enables the device 100 to determine the total number of chips per player according to the total number of players participating in the tournament, and the desired tournament length.

[0076] One implementation method to address a constrained device, where the input and display mechanism limit user input and device feedback would be a series of steps to indicate the phase in the Setup Process as follows: i) enter the chip set information – the user enters the composition of the tournament chipset; ii) select the total number of players -- a number that may be constrained (i.e., limited to a value within an upper and/or lower bound) by chip set information; iii) select the starting amount for each player -- allowing the tournament director to select possible starting amounts based on chip set information and the total number of players; iv) select tournament length, which allows the tournament director to select round length(s) and/or total estimated tournament length; v) allocate chips per player as indicated by the device 100. The device 100 instructs the user how to divide the chip set for the starting amount and number of players specified.

[0077] A simple indicator, such as a discrete LED or pixel group on a display, may be associated with each step to indicate to the user where they are in the Setup Process. A minimal set of display elements, that may be numeric only displays, may be used to display additional context information for each step. Examples may include the denomination of the chip being referenced for chip set quantities or quantities per player. Such a display may also be used to display tournament information during play mode and may serve a second or third purpose by doubling as input and reference displays during the setup process.

[0078] The above approach provides a unique and novel way to setup and manage a poker tournament all on a simple device 100 – solving a problem that has required a complex software application accessed from a rich input and display device such as a PC with a keyboard and mouse.
KEY RESTRICTIONS

[0079] To operate in an optimal manner while simplifying the setup process, the device 100 has certain requirements and makes certain assumptions that translate to restrictions on the user. Chip denominations may conform to a set schedule. For example, chip sets with denominations of $5, $25, $100, $500. A minimum amount of certain chip denominations may be included in each player’s starting chip set. For example each player may be given five $5 chips and three $25 chips. The total amount of chips each player starts with may be within a specified range, for example $500 to $1,500. Finally, a single $500 denomination chip may be used for each player’s starting amount if the per player starting amount will exceed $1,200 after the $500 chip has been included in the total. Thus a certain quantity / total value of chip 1($5), chip 2($25), and chip 3($100) is reached before allowing the tournament director or other user to add a $500 chip. In this particular example, this minimum total amount is $700 (i.e.- the total is at least $1,200 if a $500 chip is used). This ensures smooth, functional play.

ALLOCATING CHIPS

[0080] The tournament director specifies (i.e., enters or selects) the quantities of each chip denomination in the tournament chip set. The device 100 then determines, based at least in part on the chip set information, the maximum number of players that can be supported. The tournament director then selects the number of players in the tournament, within the previously determined maximum number of players determined by the device. The device allocates chips per player based on the number of players in the tournament, the chip set information provided, and the desired ideal starting amount (e.g., a dollar value) per player. The device 100 then displays to the user the information needed to allocate chips as calculated.

DETERMINING CONTEXT

[0081] Based on the provided input and calculations, the device may determine the tournament context as follows:

1.) Choose one of two fixed blind schedules:

Schedule #1 – Starting Chips per Player $500 to $749

SmallBlind
5,10,15,25,35,50,100,100,150,200,300,500,750,1000,1500,2000,3000,5000,7500,10000

Ante
0,0,0,0,0,0,0,25,25,25,50,50,75,100,150,200,300,500,750,1000

-23-
Schedule #2 – Starting Chips per Player $750 to $1,500

SmallBlind
10,15,25,50,75,100,100,200,300,400,600,1000,1500,2000,3000,4000,6000,10000,15000,20000

Ante
0,0,0,0,0,25,25,50,50,75,100,150,200,300,400,600,1000,1500,2000

2.) Calculate estimated ending tournament round

The projected ending round is the round where (SmallBlind + BigBlind + Ante) / (StartingChipsPerPlay * TotalPlayers) = 0.10

3.) Generate the list of tournament length options using the Tournament Length calculator.

4.) Choosing Ending Round

The User will be able to select a Round Length, for example and without limitation, from one minute to sixty minutes.

[0082] Depending on the round length selected, the device will display the estimated duration of the tournament or the user may select the desired round length and tournament duration option.

[0083] In one embodiment, the context of the poker tournament control device is derived from a schedule designed specifically to bring the game to a close in a defined time frame and for adequate chip liquidity during the game.

[0084] There are three types of bets associated with the schedule ante (Ante), small blind (Small) and big blind (Big). In our generated schedule derivation, the big blind is always a specific multiple of the small blind, however it may also be derived from a progression table. The ante is always a specific percentage of the small blind derived from a progression table.

[0085] In this way the whole schedule is derived from the production of the small blind table. The Small blind schedule is calculated from the base data and derived data previously described as follows:

1) First Small Blind = StartingAmount / 100 (rounded to the nearest chip 1 value)

2) Each subsequent round value is derived from a blind progression table. The following shows an example of such a blind progression table:
Each subsequent small blind may be derived from the progressive application of the percentage increments that might be defined by this table. In this example, the Big blind is 2 times the small blind.

[0086] The ending round is that round in which the sum of (Big + Small + Ante) bets is equal to the (Total chips in play / 100) and from this, the tournament length may be derived from the number of rounds multiplied by the round length.

[0087] Figure 2 illustrates a flow diagram of an alternative setup mode that may be employed within the device 100 of Figure 1 or other embodiments of poker tournament control devices described herein. At 141, a user (e.g., tournament director) specifies (e.g., through data entry or selection) the number of chip colors in the available set of chips. At 143, the user specifies the quantity of chips of color n, where n is an index that ranges from one to the number entered in block 141. At 145, the user specifies the value of the chips of color n, thus defining the denomination of the chips of color n. As shown in the comment next to block 145, the initial value for chip n may be constrained, and the values for subsequent chip denominations may be constrained based on the values specified for one or more previously-specified denominations.

[0088] If, at decision block 147, there are more chip colors beyond the present value of n (initially, n = 1), then n is incremented and control loops back to 143 to repeat the operations of 143 and 145 for the next-color chip. If there are no more chip colors at 147 (i.e., n has reached the value specified in block 141), then at 149, the device calculates the maximum number of players possible for the input chip definition (i.e., chip denominations and quantity of chips in each denomination). As shown in the comment relating to block 149, the maximum number of players may be determined based on the chip set information provided previously (i.e., colors, quantities and denominations) and an optimal or desired composition of the starting chip set. At 151, the device prompts the user to specify a number of tournament players within a range determined in block 149. At 153, the device determines the maximum value of the initial set of chips to be allocated to each tournament player. As shown in the related comment field, this maximum value may be determined based on previously specified information. At 155, the device prompts the user to specify a value of the initial set of chips to be allocated to each tournament player within the bounds determined
at 153. At 157, the device determines a blind schedule and estimated ending round based, for example, on the chip set information, the value of the initial set of chips to be allocated to each tournament player, and an ideal or desired blind/ante progression. At 159, the device prompts the user to specify an estimated or desired tournament length and round length. As discussed above and shown in the comment field relating to block 159, the estimated tournament length may be used to determine the round length and vice-versa. In one embodiment, the user may select which value to enter and allow the device to calculate the dependent value (estimated tournament length or round length). At 161, the device determines an optimal or desirable distribution of chips per player and, at 163, instructs the user (e.g., via a display prompt) as to the quantity of each chip color to give to each tournament player. As shown in the comment field relating to block 161, the distribution of chips per player may be determined based on previously specified or determined information. After the operation at block 163 is completed, the device is ready to enter tournament play mode and, for example, may do so, starting the tournament as shown at 165, in response to user input indicating that start of game play is desired.

PLAY MODE

[0089] Once in play mode, the device 100 will display to the user(s) the event context information that governs the poker tournament. In one embodiment, for example, the round clock will decrement in standard time and when a given round ends, the displayed context and state will be updated accordingly. This sequence continues throughout the tournament. An example of information that may be displayed in the play mode of device 100 during a given tournament is illustrated in Figure 3.

[0090] In Figure 3, a device 200 is setup to receive information via the input mechanism 212 by a personal computer 216. Information regarding the tournament can be displayed either on the device 200 or by relaying the information to another medium such as a television screen 218. Although the figure shows a hard wire connection from the device 200 to the television 218 and from the personal computer 216 to the device 200, this is an example only; other arrangements for sending and receiving information may be employed in alternative embodiments. The process of receiving, sending, and updating information may also be handled using a wireless connection such as WiFi or Bluetooth, using the physical electricity wiring to communicate signal such as X10, outputting the signal to a closed circuit TV system, outputting the signal to standard TV input connectors, using a wired network such as a standard Ethernet, or by using a personal computer and having all devices operate in a "Slave" mode.
Other elements of device 200 include the round time 202 which shows the amount of time played in a given round. The device 200 may allow rounds ranging from one minute to sixty minutes, or other ranges and/or increments. The betting schedule of this particular tournament is displayed in the betting schedule window 206. This relates the minimum and maximum blinds of a round as well as the current ante to the tournament participants.

While the tournament is in progress, the device 200 may allow the user to set or override certain tournament information such as current round length or players remaining via the on-device input mechanism 210. This data may be manipulated by using the plus 222 minus 224 and next 226 buttons. For example, the user may change the current tournament level of play. This will override the automatic rate of play administered by the device. Whenever data is manipulated by the user the device automatically adjusts the context and state of the tournament. The user also has the option of pausing using the play / pause button 220 on the device 200 at any time for breaks or other general reasons. In these and similar cases, the device 200 will suspend in time and await an “un-pause” action.

The device may optionally replicate its display on other display devices. This is achieved through output mechanism 214. For example, the device 200 may be connected to one or more televisions 218. This feature allows a larger number of people to have a better view of the information displayed by the device. Where the display is replicated in such a manner, one device 200 will act as a master and signal other devices such as television 218 when information being displayed may be updated.

As stated above, the process of updating information may be handled by hard wiring the devices together, using a wireless connection such as WiFi or Bluetooth for the devices to interact, using the physical electricity wiring to communicate signal such as X10, outputting the signal to a closed circuit TV system, outputting the signal to standard TV input connectors, by using a wired network like a standard Ethernet, or by using a personal computer and having all devices operate in a “Slave” mode.

To track Tournament status information, the device 200 may display various statistics relating to the tournament. The tournament status 204 and additional tournament information 208 screens may display the type of game being played, the total number of players remaining, the current round of the tournament, the elapsed time of the tournament, when the next break is, how many players are left in the tournament, payout positions, and the average high and low chips per player and the chip leader. This may be calculated by periodically polling players while the tournament is in progress or during breaks or by automatically acquiring this information via technology such as RFID, where each chip
communicates a unique ID and each play has a sensor at their place on the table that calculates their chip information.

[0096] The average high and low pot sizes may be calculated, for example, using RFID technology with a sensor in the middle “pot area” of the table. The device will periodically display table rebalancing information. This information may be provided to the tournament director for further action and may also be provided directly to the tournament players. Information may be conveyed in any number of ways, including on the device, via an associated display 208, via notifications to a pager, cell phone, or other device, or via indicators in, around, or on the play surface. RFID areas may optionally be indicated by markings on the table surface, allowing the players and dealers to ensure the chips and other items being analyzed are in the correct position.

[0097] Figure 4 illustrates an alternative implementation of a self-contained device or apparatus 400 that is designed to receive user input via an onboard control mechanism which will then be used to setup the poker tournament process and display tournament management information to the user via the onboard display elements.

[0098] Another element of device 400 is the Round Time display 401 which serves multiple purposes depending on the state of the device. These purposes include: display of the text “CHiP” during the setup process, to indicate poker chip related information is being managed; the editable Round Time defined by the user during the setup process; the time left in a particular round during play mode will the tournament is in progress; the round number when the user is viewing, editing, or changing to a particular round in the schedule.

[0099] Another element of device 400 is the Ante display 403 which serves multiple purposes depending on the state of the device. These purposes include: the chip number during the setup process (based on the particular setup step or action being performed); the Ante value during standard or expert / custom mode, both during game play as well as during configuration.

[0100] Another element of device 400 is the Small Blind 405 which serves multiple purposes depending on the state of the device. These purposes include: allowing the user to define the chip denomination during the setup process; the Small Blind value during standard or expert / custom mode, both during game play as well as during configuration.

[0101] Another element of device 400 is the Big Blind 407 which serves multiple purposes depending on the state of the device. These purposes include: allowing the user to define the quantity of a particular chip color during the setup process; allowing the user to specify the number of players in their tournament during the setup process; present the user
with the estimated tournament duration during the setup process; indicate to the user the quantity of each chip color to distribute to each player during the setup process; the Big Blind value during standard or expert / custom mode, both during game play as well as during configuration.

[00102] Another element of device 400 is the Cancel / Back 409a button which serves multiple purposes depending on the state of the device. These purposes include: allowing the user to go back one step during the setup process; allowing the user to cancel a pending action during the setup or play mode; allow the user to enter expert / custom mode by pressing during power on.

[00103] Another element of device 400 is the Play/ Next 409b button which serves multiple purposes depending on the state of the device. These purposes include: allowing the user to accept a value during the setup process; allowing the user to move to the next step during the setup process; allowing the user to pause the tournament when in play mode; allowing the user to un-pause the tournament when in play mode; allows the user to select a round to change to when in play mode; allow the user to see the software / release version number by press holding on power up.

[00104] Another element of device 400 is the “+” 411a button which serves multiple purposes depending on the state of the device. These purposes include: allowing the user to increase and/or select the next value in sequence during setup mode; allows the user to navigate to a future round in play mode.

[00105] Another element of device 400 is the “-“ 411b button which serves multiple purposes depending on the state of the device. These purposes include: allowing the user to decrease and/or select the previous value in a sequence during setup mode; allows the user to navigate to a previous round in play mode.

[00106] Another element of device 400 are the setup step labels and LED indicators 415. These steps and labels communicate the sequence of steps to setup a tournament and the active setup step during setup mode.

INTERNAL OPERATION

[00107] The system of Figure 3 may employ a number of unique engineering techniques to provide the required utility in a system with very few components. For example, in one embodiment, each LED display is multiplexed by a programmed central processing unit (CPU) or like control circuitry and the individual character displayed at a rate of 200KHz for 400 microseconds. The choice of this frequency and power density allows the LEDs to be driven without the need of current limiting resistors. Further, by using common cathode
LEDs, a current-limited CPU driver may drive eighteen or more LED displays without overloading the current capacity of the CPU and only using one Darlington driver per LED display. Other display frequencies, power densities, display devices and/or display driver circuits may be used in alternative embodiments.

Due to the limited input/output of the basic device, the keys that form the operator-input interface may be overloaded for function (i.e., one or more of the keys serve different functions in different operating modes and in individual operating steps) and there may be a specific key usage sequencing and a specific way the data is displayed to the user for consistency and predictability in usage. In addition, repetitive key input is time-dilated to enable rapid selection from large number domains with limited key presses in a time efficient manner according to the method implemented by following c-code excerpt:

```c
#include <stdio.h>

// only one key active at a time, no key queue
LO(SPKR);
if ((key = (PINB & KEY_ANY)) != KEY_ANY)
{
    if (!(debounce < kDebounceCount))
    {
        // must be hot for kDebounceCount consecutive timeslots
        if (debounce == kDebounceCount || repeat++ == repeatFreq)
        {
            keys[head++] = key;
            if ((head % kKeyQueueSize) == tail)
                head--;
            if (head >= kKeyQueueSize)
                head = kKeyQueueSize - 1;
            debounce = kDebounceCount + 1;

            if (repeatFreq > kRepeatFreqDecrement)
                repeatFreq -= kRepeatFreqDecrement;
            repeat = 0;

            HI(SPKR);
        }
    }
    else
        debounce++;
}
else
{
    repeatFreq = kRepeatFreq;
    repeat =
    debounce = 0;
}
```
In addition to time dilating key input, this method also provides proportional audio feedback. Other techniques for receiving key input may be used in alternative embodiments. Also, specific methods of allocating poker chip denominations to the tournament players is believed to be unique in this context and is may be expressed, for example, by the following C-code excerpt:

```c
    deals5++;
    if (deals5 * nPlayers < chips5)
        {
            if (deals5 > kDefault5s && ((deals5 - kDefault5s) % 5) == 0)
                {
                    deals5 -= 5;
                    deals25++;
                    if (deals25 * nPlayers < chips25)
                        {
                            if (deals25 > kDefault25s && ((deals25 - kDefault25s) % 4) == 0)
                                {
                                    deals25 -= 4;
                                    deals100++;
                                    if (deals100 * nPlayers < chips100)
                                        {
                                            if (deals100 > kDefault100s && ((deals100 - kDefault100s) % 5) == 0)
                                                {
                                                    deals100 -= 5;
                                                    deals500++;
                                                    if (deals500 * nPlayers < chips500)
                                                        {
                                                            // ok
                                                        }
                                                    else
                                                        {
                                                            error();
                                                            deals500--;
                                                            deals100 += 5;
                                                        }
                                                }
                                            else
                                                {
                                                    if (deals100 > kMinDeals100 + 5 && (deals500 + 1) * nPlayers < chips500)
                                                        {
                                                            // exchange up
                                                            deals100 -= 5;
                                                            deals500++;
                                                        }
                                                }
                                    }
                                }
                        }
                    }
            }
        }
    }
```
else
{
    error();
    deals100--;  
    deals25 += 4;
}
}

else
{
    if (deals25 > kMinDeals25 + 4 && (deals100 + 1) * nPlayers <
chips100)
    {
        // exchange up
        deals25 -= 4;  
        deals100++;
    }
    else
    {
        error();
        deals25--;  
        deals5 += 5;
    }
}
else
{
    if (deals5 > kMinDeals5 + 5 && (deals25 + 1) * nPlayers < chips25)
    {
        // exchange up
        deals5 -= 5;  
        deals25++;
    }
    else
    {
        error();
        deals5--;
    }
}

[00110] Other chip allocation techniques may be used in alternative embodiments, and the above code listing should not be construed as limiting the expression of programmed sequences to the C-programming language or any particular programming methodology. In one embodiment, the control circuitry of devices 100, 200 illustrated in Figures 1 and 2 is implemented by a processing entity and a system memory. The processing entity may include one or more processors (e.g., general-purpose processors and/or special-purpose processors such as a digital signal processor), and the system memory may include any
number of component memories including, without limitation, volatile and/or non-volatile memories, removable memory (e.g., flash memory stick and/or various optical or magnetic recording media). The processing entity (e.g., one or more processors) executes one or more sequences of one or more instructions stored in the system memory to perform the operations described above. In alternative embodiments, hard-wired circuitry may be used in place of or in combination with the programmed processing entity to implement the invention. Thus, embodiments of the invention are not limited to any specific combination of hardware circuitry and software.

[00111] The instructions executed by the processing entity to perform the operations described above may be transferred to the system memory from a computer-readable medium. A computer-readable medium may take many forms, including but not limited to, non-volatile media, volatile media, and transmission media. Non-volatile media may include, for example, optical or magnetic media (e.g., disks) and/or non-volatile semiconductor memory (e.g., flash memory or battery-backed memory). Transmission media includes coaxial cables, copper wire and fiber optics and the like. Transmission media can also take the form of acoustic or electromagnetic waves, such as those generated during radio-wave and infra-red data communications.

[00112] Any or all of the various circuitry disclosed herein may be described using computer aided design tools and expressed (or represented), as data and/or instructions embodied in various computer-readable media, in terms of their behavioral, register transfer, logic component, transistor, layout geometries, and/or other characteristics. Formats of files and other objects in which such circuit expressions may be implemented include, but are not limited to, formats supporting behavioral languages such as C, Verilog, and HLDL, formats supporting register level description languages like RTL, and formats supporting geometry description languages such as GDSII, GDSIII, GDSIV, CIF, MEBES and any other suitable formats and languages. Computer-readable media in which such formatted data and/or instructions may be embodied include, but are not limited to, non-volatile storage media in various forms (e.g., optical, magnetic or semiconductor storage media) and carrier waves that may be used to transfer such formatted data and/or instructions through wireless, optical, or wired signaling media or any combination thereof. Examples of transfers of such formatted data and/or instructions by carrier waves include, but are not limited to, transfers (uploads, downloads, e-mail, etc.) over the Internet and/or other computer networks via one or more data transfer protocols (e.g., HTTP, FTP, SMTP, etc.).
[00113] When supplied via one or more computer-readable media to a self-contained apparatus for displaying poker tournament information or to a general-purpose or special-purpose computer system, such data and/or instruction-based expressions of the above described circuits may be processed by a processing entity (e.g., one or more processors) within the computer system in conjunction with execution of one or more other computer programs including, without limitation, net-list generation programs, place and route programs and the like, to generate a representation or image of a physical manifestation of such circuits. Such representation or image may thereafter be used in device fabrication, for example, by enabling generation of one or more masks that are used to form various components of the circuits in a device fabrication process.

[00114] Various aspects of the subject-matter described herein are set out in the following numbered clauses:

1. A self-contained apparatus for displaying poker tournament information, the apparatus comprising:
   
an operator-input interface dedicated to receiving input relating to the poker tournament from a human operator;
   
control circuitry coupled to receive the input relating to the poker tournament from the operator-input interface and to generate, based at least in part on the input, information relating to the poker tournament; and
   
a display to display the information relating to the poker tournament.

2. The apparatus of clause 1 wherein the information relating to the poker tournament comprises a sequence of prompts to prompt the human operator to enter poker tournament setup information.

3. The apparatus of clause 1 wherein the sequence of prompts to prompt the human operator to enter poker tournament setup information comprises prompts to specify, via the operator-input interface, a number of players to participate in the poker tournament and a value of a starting set of poker chips to be provided to each player.
4. The apparatus of clause 1 wherein the control circuitry is configured to limit the specification of the value of the starting set of poker chips according to the number of players and a number poker chips of one or more denominations.

5. The apparatus of clause 1 wherein the control circuitry comprises a processor and a non-volatile semiconductor memory having program code stored therein which, when executed by the processor, causes the processor to generate the information relating to the poker tournament.

6. The apparatus of clause 5 wherein the program code, when executed by the processor, further causes the processor to:

   prompt the human operator to specify setup information in a pre-determined sequence;
   
   and
   
   limit the setup information specified by the human operator at a given point in the sequence to be within a range determined, at least in part, based on the setup information specified at one or more previous points in the sequence.

7. The apparatus of clause 1 wherein the operator-input interface comprises fewer than twenty-six pressure-actuated switch elements.

8. A method of operation within a poker tournament control apparatus, the method comprising:

   receiving operator input indicative of an individual chip value of a first denomination of poker chips available to be distributed among tournament players;

   determining, based at least in part on the individual chip value of the first denomination of poker chips, an upper limit and lower limit of an individual chip value of a second denomination of poker chips to be distributed among the tournament
players; and
prompting an operator to input a value between the upper and lower limit as the
individual chip value of the second denomination of poker chips.

9. The method of clause 8 wherein prompting an operator to input a value between the
upper and lower limit comprises displaying a value between the upper and lower limit
in a manner indicating that the operator may adjust the value.

10. The method of clause 9 wherein prompting an operator to input a value between the
upper and lower limit comprises generating a notification in response to operator input
indicative of a value outside a range defined by the upper limit and lower limit.

11. The method of clause 10 wherein generating a notification comprises generating an
audible and/or visible alert.

12. A method of operation within a poker tournament control apparatus, the method
comprising:
receiving operator input indicative of a number of tournament players;
obtaining information indicative of a total quantity and individual chip value of each of
a plurality of denominations of poker chips available to be distributed among the
tournament players;
determining, based at least in part on the number of tournament players and the total
quantity and individual chip value of each of the denominations of poker chips, an
upper limit and lower limit for the value of an initial set of poker chips to be
allocated to each of the tournament players.

13. The method of clause 12 wherein obtaining information indicative of a total quantity
and individual chip value of each of a plurality of denominations of poker chips
comprises retrieving the information from a non-volatile semiconductor memory within
the poker tournament control apparatus.

14. The method of clause 12 wherein obtaining information indicative of a total quantity
and individual chip value of each of a plurality of denominations of poker chips
comprises receiving operator input indicative of the total quantity and individual chip
value of each of the plurality of denominations of poker chips.

15. The method of clause 12 further comprising limiting the number of poker tournament
players based on the total quantity and individual chip value of each of the plurality of
denominations of poker chips.

16. The method of clause 12 further comprising:
   prompting an operator to input a value between the upper and lower limit as the value
   of the initial set of poker chips allocated to each of the tournament players; and
determining a quantity of each of the denominations of poker chips that are to be
   included in the initial set of poker chips based, at least in part, on the value of the
   initial set of poker chips, the number of tournament players and the total quantity
   and individual chip value of each of the denominations of poker chips.

17. The method of clause 16 wherein determining a quantity of each of the denominations
of poker chips comprises determining the quantity of each of the denominations that are
to be included in the initial set of poker chips such that, at any point in the poker
tournament, sufficient chips are available to allow a poker chip of a first tournament
player to be exchanged for chips of one or more smaller denominations as may be
required for the first tournament player to call a bet by another of the tournament
players.

18. The method of clause 16 further comprising prompting the human operator to distribute
the initial set of poker chips to each of the tournament players, including displaying the
quantity of each of the denominations of poker chips that are to be included in the initial
set of poker chips.

19. A method of operation within a poker tournament control apparatus, the method
comprising:

displaying a sequence of prompts in a predetermined order to prompt an operator to
input information indicative of:

da total quantity and individual chip value of each of a plurality of denominations
of poker chips,
da number of tournament players,
a value of an initial set of the poker chips to be allocated to each of the tournament
players, and

da desired tournament duration;

receiving operator input in response to the prompts; and
determining, based on the operator input, a proposed blind schedule to be applied in
each of a plurality of poker rounds and an initial number of poker chips of each of
the denominations to be allocated to each of the tournament players.

20. The method of clause 19 further comprising operator input indicative of at least one of
the following:

a duration of at least one round of the poker tournament;
an ante value to be applied in at least one round of the poker tournament;
a small blind value to be applied in at least one round of the poker tournament;
a big blind value to be applied in at least one round of the poker tournament; and
placement and duration of at least one intermission between rounds of the poker
tournament.

21. The method of clause 20 further comprising assigning, as a big blind value, a
predetermined multiple of the small blind value indicated by the operator input.

22. A poker tournament kit comprising:
a case;
poker chips disposed within the case; and
an apparatus for displaying poker tournament information disposed within the case, the
apparatus including:
an operator-input interface to receive operator input relating to the poker
tournament including input at least indicative of a number of tournament
players,
control circuitry coupled to receive the operator input and to generate, based at
least in part on the operator input, information relating to the poker
tournament, and
a display to display the information relating to the poker tournament.

23. The poker tournament kit of clause 22 wherein the poker chips comprise a plurality of
groups of poker chips having distinct colors.

24. The poker tournament kit of clause 22 wherein the control circuitry is configured to
prompt the operator to input information relating to the poker tournament including the
input indicative of a number of tournament players and additionally input indicative of
a desired tournament length.
25. A computer-readable medium carrying one or more sequences of instructions which, when executed by one or more processors, causes the one or more processors to:

receive operator input indicative of a number of tournament players;

obtain information indicative of a total quantity and individual chip value of each of a plurality of denominations of poker chips available to be distributed among the tournament players;

determine, based at least in part on the number of tournament players and the total quantity and individual chip value of each of the denominations of poker chips, an upper limit and lower limit for the value of an initial set of poker chips to be allocated to each of the tournament players.

[00115] The section headings provided in this detailed description are for convenience of reference only, and in no way define, limit, construe or describe the scope or extent of such sections. Also, while the invention has been described with reference to specific embodiments thereof, it will be evident that various modifications and changes may be made thereto without departing from the broader spirit and scope of the invention. Accordingly, the specification and drawings are to be regarded in an illustrative rather than a restrictive sense.
CLAIMS

What is claimed is:
1. A self-contained apparatus for displaying poker tournament information, the apparatus comprising:

- an operator-input interface dedicated to receiving input relating to the poker tournament from a human operator;
- control circuitry coupled to receive the input relating to the poker tournament from the operator-input interface and to generate, based at least in part on the input, information relating to the poker tournament; and
- a display to display the information relating to the poker tournament.

2. The apparatus of claim 1 wherein the information relating to the poker tournament comprises a sequence of prompts to prompt the human operator to enter poker tournament setup information.

3. The apparatus of claim 1 wherein the sequence of prompts to prompt the human operator to enter poker tournament setup information comprises prompts to specify, via the operator-input interface, a number of players to participate in the poker tournament and a value of a starting set of poker chips to be provided to each player.

4. The apparatus of claim 1 wherein the control circuitry is configured to limit the specification of the value of the starting set of poker chips according to the number of players and a number poker chips of one or more denominations.

5. The apparatus of claim 1 wherein the control circuitry comprises a processor and a non-volatile semiconductor memory having program code stored therein which, when executed
by the processor, causes the processor to generate the information relating to the poker tournament.

6. The apparatus of claim 5 wherein the program code, when executed by the processor, further causes the processor to:

prompt the human operator to specify setup information in a pre-determined sequence; and

limit the setup information specified by the human operator at a given point in the sequence to be within a range determined, at least in part, based on the setup information specified at one or more previous points in the sequence.

7. The apparatus of claim 1 wherein the operator-input interface comprises fewer than twenty-six pressure-actuated switch elements.

8. A method of operation within a poker tournament control apparatus, the method comprising:

receiving operator input indicative of an individual chip value of a first denomination of poker chips available to be distributed among tournament players;

determining, based at least in part on the individual chip value of the first denomination of poker chips, an upper limit and lower limit of an individual chip value of a second denomination of poker chips to be distributed among the tournament players; and

prompting an operator to input a value between the upper and lower limit as the individual chip value of the second denomination of poker chips.

9. The method of claim 8 wherein prompting an operator to input a value between the upper and lower limit comprises displaying a value between the upper and lower limit in a
manner indicating that the operator may adjust the value.

10. The method of claim 9 wherein prompting an operator to input a value between the upper and lower limit comprises generating a notification in response to operator input indicative of a value outside a range defined by the upper limit and lower limit.

11. The method of claim 10 wherein generating a notification comprises generating an audible alert.

12. A method of operation within a poker tournament control apparatus, the method comprising:

   receiving operator input indicative of a number of tournament players;
   obtaining information indicative of a total quantity and individual chip value of each of a plurality of denominations of poker chips available to be distributed among the tournament players;
   determining, based at least in part on the number of tournament players and the total quantity and individual chip value of each of the denominations of poker chips, an upper limit and lower limit for the value of an initial set of poker chips to be allocated to each of the tournament players.

13. The method of claim 12 wherein obtaining information indicative of a total quantity and individual chip value of each of a plurality of denominations of poker chips comprises retrieving the information from a non-volatile semiconductor memory within the poker tournament control apparatus.
14. The method of claim 12 wherein obtaining information indicative of a total quantity and individual chip value of each of a plurality of denominations of poker chips comprises receiving operator input indicative of the total quantity and individual chip value of each of the plurality of denominations of poker chips.

15. The method of claim 12 further comprising limiting the number of poker tournament players based on the total quantity and individual chip value of each of the plurality of denominations of poker chips.

16. The method of claim 12 further comprising:

prompting an operator to input a value between the upper and lower limit as the value of the initial set of poker chips allocated to each of the tournament players; and determining a quantity of each of the denominations of poker chips that are to be included in the initial set of poker chips based, at least in part, on the value of the initial set of poker chips, the number of tournament players and the total quantity and individual chip value of each of the denominations of poker chips.

17. The method of claim 16 wherein determining a quantity of each of the denominations of poker chips comprises determining the quantity of each of the denominations that are to be included in the initial set of poker chips such that, at any point in the poker tournament, sufficient chips are available to allow a poker chip of a first tournament player to be exchanged for chips of one or more smaller denominations as may be required for the first tournament player to call a bet by another of the tournament players.
18. The method of claim 16 further comprising prompting the human operator to distribute the
initial set of poker chips to each of the tournament players, including displaying the
quantity of each of the denominations of poker chips that are to be included in the initial set
of poker chips.

19. A method of operation within a poker tournament control apparatus, the method
comprising:
displaying a sequence of prompts in a predetermined order to prompt an operator to input
information indicative of:
a total quantity and individual chip value of each of a plurality of denominations of
poker chips,
a number of tournament players,
a value of an initial set of the poker chips to be allocated to each of the tournament
players, and
a desired tournament duration;
receiving operator input in response to the prompts; and
determining, based on the operator input, a proposed blind schedule to be applied in each
of a plurality of poker rounds and an initial number of poker chips of each of the
denominations to be allocated to each of the tournament players.

20. The method of claim 19 further comprising operator input indicative of at least one of the
following:
a duration of at least one round of the poker tournament;
an ante value to be applied in at least one round of the poker tournament;
21. The method of claim 20 further comprising assigning, as a big blind value, a predetermined multiple of the small blind value indicated by the operator input.

22. A poker tournament kit comprising:
   a case;
   poker chips disposed within the case; and
   an apparatus for displaying poker tournament information disposed within the case, the apparatus including:
   an operator-input interface to receive operator input relating to the poker tournament including input at least indicative of a number of tournament players,
   control circuitry coupled to receive the operator input and to generate, based at least in part on the operator input, information relating to the poker tournament, and
   a display to display the information relating to the poker tournament.

23. The poker tournament kit of claim 22 wherein the poker chips comprise a plurality of groups of poker chips having distinct colors.

24. The poker tournament kit of claim 22 wherein the control circuitry is configured to prompt the operator to input information relating to the poker tournament including the input indicative of a number of tournament players and additionally input indicative of a desired
25. A computer-readable medium carrying one or more sequences of instructions which, when executed by one or more processors, causes the one or more processors to:

- receive operator input indicative of a number of tournament players;
- obtain information indicative of a total quantity and individual chip value of each of a plurality of denominations of poker chips available to be distributed among the tournament players;
- determine, based at least in part on the number of tournament players and the total quantity and individual chip value of each of the denominations of poker chips, an upper limit and lower limit for the value of an initial set of poker chips to be allocated to each of the tournament players.
Figure 2

1. Enter # of chip colors in set

2. Enter quantity of color n

3. Enter denomination of chip n

4. Initial value may be constrained. Subsequent values may be constrained based on previous value(s)

5. Calculate max # players possible

6. Select # of players within allowed range

7. Calculate max starting amount per player

8. Select starting amount per player

9. Calculate blind, schedule and estimated ending round

10. Instruct user quantity of each chip color to give each player

11. Start tournament

12. Yes Chip = n + 1

13. No

14. More chip colors

15. Determine based on chip set information provided (colors, quantities, and denominations) and optimal composition of starting set

16. Determine based on chip set information provided (colors, quantities, and denominations), optimal composition of starting set, and number of players

17. Determine based on chip set information (denominations), starting amount per player, and ideal blind/ante progression

18. Estimated length determines Round Length and vice-versa, up to the user which they prefer as primary criteria

19. Determine based on chip set information provided (colors, quantities, and denominations), optimal composition of starting set, and number of players
Figure 4

- Enter chip set information
- Enter number of players
- Select starting amount per player
- Select tournament length
- Divide chips per player as shown