A Case Study

Overview

- Video poker
- Poker.Card & Poker.Hand
- General.dll & game variants

References

- Fergal Grimes, “Microsoft .NET for Programmers”, Manning, 2002
Video Poker

Video Poker is a game that has been developed to increase the profits of casinos. In fact, now it accounts for a greater share of income than traditional slot machines.

The rules:

- You play against the machine, which acts as dealer and you insert money to receive credits.
- Then you make a bet and hit the Deal button.
- The machine displays five cards from the deck.
- The idea is to make the best possible poker hand out of these five cards by holding onto the best cards and drawing replacements for those you wish to discard. (final drawing)
- If you win, you winnings are calculated by multiplying the score for the final (winning) hand by the amount of your bet.
Rule Of Thumb

The casino always wins.

- The game is designed to make a guaranteed profit (say 25%).
- The game uses a “Target Margin”, a “House Margin”, and a “Bias” to adjust the strategy of the poker machine, in case the house margin is smaller than the target margin.
A Windows Forms Version

.NET Video Poker - The Windows Forms Version

File Help

Start Over

CREDITS  .NET Video Poker  BET

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>99</td>
<td>Hold and Draw</td>
<td>1</td>
</tr>
</tbody>
</table>

3  

A

6  

J

J

Hold and Draw

HOLD  HOLD  HOLD  HOLD

DRAW

Payout Table

Royal Flush: 10
Straight Flush: 9
Four of a Kind: 8
Full House: 7
Flush: 6
Straight: 5
Three of a Kind: 4
Two Pair: 3
Jacks or Better: 2

Machine Stats Unavailable

Taken In: 0
Paid Out: 0
Profit: 0
House Margin %: 25.00
Target Margin %: 25.00
Return: 0.00
Bias: 0

Hold cards and click the DRAW button.

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GUI

Help

Statistics
## Winning Poker Hands

<table>
<thead>
<tr>
<th>Hand</th>
<th>Example</th>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Royal Flush</td>
<td>TD J D QD KD AD</td>
<td>10</td>
<td>A straight to the ace in the same suit</td>
</tr>
<tr>
<td>Straight Flush</td>
<td>3H 4H 5H 6H 7H</td>
<td>9</td>
<td>A straight in the same suit</td>
</tr>
<tr>
<td>Four of a Kind</td>
<td>5C 5D 5H 5S QH</td>
<td>8</td>
<td>Four cards of the same number</td>
</tr>
<tr>
<td>Full House</td>
<td>KC KH KD 8C 8S</td>
<td>7</td>
<td>Three of a kind with any pair</td>
</tr>
<tr>
<td>Flush</td>
<td>9S 3S QS TS AS</td>
<td>6</td>
<td>5 cards of the same suit</td>
</tr>
<tr>
<td>Straight</td>
<td>8C 9S TC J C QH</td>
<td>5</td>
<td>5 cards with consecutive numbers</td>
</tr>
<tr>
<td>Three of a Kind</td>
<td>TD 4C 4S 3S 4D</td>
<td>4</td>
<td>Three cards of the same number</td>
</tr>
<tr>
<td>Two Pair</td>
<td>AD QH QD 7C 7D</td>
<td>3</td>
<td>Any pair with any pair</td>
</tr>
<tr>
<td>Jacks or Better</td>
<td>KD 8C 7D KS 5C</td>
<td>2</td>
<td>A pair of jacks, queens, kings, or aces</td>
</tr>
</tbody>
</table>

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## Card Encoding

<table>
<thead>
<tr>
<th>Suits</th>
<th>Encoding</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spades</td>
<td>2S-9S, TS, DS, KS, AS</td>
<td>QS:</td>
</tr>
<tr>
<td>Hearts</td>
<td>2H-9H, TH, QH, KH, AH</td>
<td>5H:</td>
</tr>
<tr>
<td>Diamonds</td>
<td>2D-9D, TD, QD, KD, AD</td>
<td>KD:</td>
</tr>
<tr>
<td>Clubs</td>
<td>2C-9C, TC, QC, KC, AC</td>
<td>TC:</td>
</tr>
</tbody>
</table>
Designing the Card Class

Card objects are immutable. As in a real game cards drawn from the deck cannot be altered.

A card has three public read-only properties:
- int Number: card number 2-14 (2-9, T, Q, K, A)
- int Suit: suit number 0-3 (C, D, H, S)
- string Name: two-character card identifier

The class Card defines one constructor, which uses a card name as parameter.
Designing the Hand Class

- A hand always consists of 5 cards.

- The Video Poker's internal dealer initially shuffles the card set and deals 5 cards. The user can discard none, some, or all of these cards in an attempt to improve the hand’s score.

- The Hand class contains a private array of 5 Card objects and three public getters: Score, Title, and Text.

- The Hand class implements the poker game logic. That is, it defines a (private) method to calculate the score of a given hand.
Designing the Dealer Class

- The Dealer class implements a simple Video Poker machine.
- The Dealer class implements the Singleton pattern. So, only one instance exists at runtime.
- The dealer controls the card set. The dealer shuffles this set each time a new game is started.
- The Dealer class implements three public methods: Deal, ReplaceCards, and ReturnCards.
Design Rationale

- We want to support as many as possible user interfaces / clients.

- Video Poker is a N-tier application. It has a data layer, a logic layer, and an interface layer.

- A string interface supports best all needs!
General.dll

- The General.dll assembly provides the a simple poker machine (a dealer), which can deal and draw cards.

- The first General.dll does not provide any abstractions to record game history or to do profit calculations.

- The final version of General.dll will implement the data layer and the logic layer.
Video Poker

Poker.dll

Data Layer
- Bank

Logic Layer
- Card
- Hand
- Bet
- Dealer

Interface Layer
- SimPok
- COMPok
- RemPok
- QuePok
- WinPok
- MobPok
- IEPok
- ConPok
- SvcPok
- WSPok
- WebPok

History
VideoPoker

Payout Table

<table>
<thead>
<tr>
<th>Royal Flush</th>
<th>Straight Flush</th>
<th>Four of a Kind</th>
<th>Full House</th>
<th>Flush</th>
<th>Straight</th>
<th>Three of a Kind</th>
<th>Two Pair</th>
<th>Jacks or Better</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>20</td>
<td>30</td>
<td>40</td>
<td>50</td>
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<td>10</td>
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<td>2</td>
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<td>9</td>
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<td>14</td>
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<td>28</td>
</tr>
<tr>
<td>8</td>
<td>16</td>
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<td>32</td>
<td>40</td>
<td>6</td>
<td>12</td>
<td>18</td>
<td>30</td>
</tr>
<tr>
<td>7</td>
<td>14</td>
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<td>36</td>
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<tr>
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<td>26</td>
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<td>4</td>
<td>8</td>
<td>12</td>
<td>20</td>
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<td>6</td>
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<td>12</td>
</tr>
<tr>
<td>4</td>
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<td>4</td>
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<td>1</td>
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<td>8</td>
<td>10</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Credit: 95
Bet: 5
Min Bet: 1
Max Bet: 5

(c) ML03

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