

Video Slot Machine

Domain Model, Use Case Model and Environment Model

(10% of final grade)

September 24, 2013

1 Problem Statement

Traditional slot machines (see picture on the left side of Fig. 1) have in recent years been replaced by video slot machines (see picture on the right of Fig. 1). Your task is to elaborate the requirements for a video slot machine, which allows users to gamble credits on spinning reels as described in this document. The requirements described here are taken from a real video slot machine requirements document from industry, but have been shortened to fit the scope of this requirement. In particular, the legislative regulations have been heavily simplified.

2 High-level Game Description

The game is played by wagering credits on the spinning reels. The player can buy credits by inserting coins, bills or tickets in the corresponding acceptors of the Electronic Gaming Machine (EGM) at any time. Credits wagered are subtracted from the player credit meter, and subsequent winnings are added to it. At any time, the current credits meter is displayed on the screen, as well as the credits bet for the current game, the last game outcome, and the credits won in the last game. Before playing, the player can select options such as bet level or which paylines should be active.

When pressing a play button, the game starts and the outcome is decided by a random number generator. This outcome is displayed as spinning reels, that successively stop spinning. Prizes for winning combinations can be looked up on a paytable screen, and some prizes are also displayed in the advertising glass readily visible in the EGM. A special combination awards a host-controlled progressive prize. The player can request to cash his credits out of the machine whenever the reels are not spinning.

If a player ceases to play, i.e., the EGM is idle for a specified amount of time, the machine starts playing an attract animation until a new player inserts a coin or presses one of the buttons.



Figure 1: Mechanical Slot Machine (left) and Video Slot Machine (right)

3 Additional Game Details

3.1 Credits and Promotional Credits

The unit for bets and wins is the “credit”. The credit-to-currency conversion ratio can be configured for each EGMs. Typically, a credit is worth \$0.25, but machines allowing higher wagers, such as \$100 per credit, are not uncommon.

Players can buy credits by inserting coins or bills in the corresponding acceptors of the EGM. A special “ticket slot” also accepts tickets issued by a central casino authority that represent a certain amount of money. To validate a ticket, the EGM needs to communicate with the SAS (Slot Accounting System) host. Tickets are gaining popularity and importance, as more and more modern casinos move towards cashless gaming. To attract customers, some casinos also distribute special tickets that contain “promotional credits” that a player can redeem at an EGM to play. These restricted credits, however, can not be converted to currency (cashed out). They must be used for wagering.

Depending on the installed and configured hardware, the current value of credits may be cashed out by a coin hopper, a ticket printer or be hand paid by an attendant. Again, ticket cash out requires a online connection with the SAS host. Winning a prize larger than a certain value forces the prize to be paid by an attendant, who in turn is obliged to notify the IRS (Internal Revenue Service). Winning such a prize suspends the game and puts the EGC in a handpay lockup. Only after the attendant acknowledged the payout and reset the condition (see subsection 3.6.3 below), the game is playable again.

3.2 Reels

There are typically 5 reels in a slot machine, each one with a fixed number of “slots” (typically 22, but there could be more or less). Each slot displays an icon. The visual appearance of the icons is usually aligned with the theme of the EGM. On each reel, a given icon can appear multiple times.

3.3 Paylines

Mechanical slot machines typically only offer one payline: the icons shown in the center of each reel are used to form one 5-icon combination, and then used to lookup the amount won, if any, in the paytable. Video slot machines offer the player the possibility to activate more than one payline. In the stopped position, each reel shows 5 icons (at index -2, -1, 0, 1, and 2). The standard payline looks at the icons at index (0,0,0,0,0). However, additional paylines include the other 4 lines (e.g., -1,-1,-1,-1,-1), or diagonals (e.g. -2, -1, 0, 1, 2), or even waves (0, -1, 0, 1, 0). Fig. 2 shows an example of 30 possible paylines that are available in the Cops n’ Bandits video slot machine. Of course, when n paylines are active, each game uses n times the selected wager.

3.4 Out of Service

Any hardware malfunction or possible security threat, along with any maintenance operations, may put the EGM in an “Out of Service” state. While out of service, the EGM is not playable. The attendant light on top of the machine is activated to help the attendant locate the machine that needs service, the SAS is notified, and a window is displayed on the main screen that indicates the out of service condition together with the reason of that condition. The list of reasons that may put EGM in this condition is:

- Maintenance Mode: which can be activated by the assistant on the main assistant screen, or activated remotely by the SAS
- SAS communication error
- Any monitored door is open (main door, card cage door, cash box, belly door or slot door).
- Errors in bill validator: Stacker Full, Bill Jam, Counterfeit bill detected, Bill rejected (reason other than counterfeit bill)
- Errors in printer: Out of paper, Paper low, Carriage jammed
- Errors in coin comparator: Coin in tilt

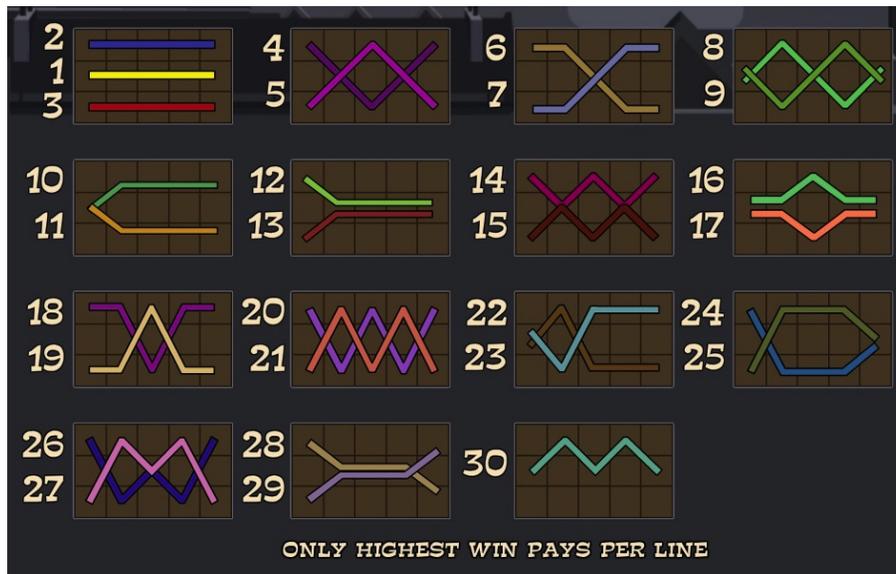


Figure 2: Cops n' Bandits 30 Paylines

Each out of service condition can be reset by fixing the problem (for cases like network error, or door open), or resetting the condition using the option “Return To Service” in the main assistant menu, or resetting it remotely by the SAS. This returns the EGM to normal mode (i.e. the attendant light is switched off and the game is playable again).

3.5 Progressive Jackpot

The EGM can be connected to a progressive prize, i.e., a jackpot shared by a group of EGMs that are connected to the SAS host. If enabled, the EGM transmits upon every bet a fraction of that bet to the SAS host (e.g. 1%), together with the configured group ID for the progressive jackpot, which must match an existing group ID configured in the SAS host and in every other machine contributing to the same jackpot. Periodically, the SAS host communicates the current value of the progressive jackpot to all EGMs, which typically display the current value on screen to stimulate the current player or attract new players.

If a player wins the progressive jackpot, the EGM communicates instantly with the SAS host, which then communicates the final value to the EGM and resets the jackpot.

3.6 Auditing and Configuration

In most countries, stringent laws oversee the construction and use of EGM used for gambling. The following section describes simplified requirements dictated by the Nevada for video slot machines. Access to auditing options is given to casino staff after identifying themselves with attendant or operator keys, both leading the user to the assistant menu screen. If entered using an operator key, a button labeled “Operator” will be displayed, giving the user additional access to a configuration and administrative options screen.

3.6.1 Last Game Events

The main assistant screen gives the auditor access to the last important events that have occurred. Events that are logged are:

- Power on date and time
- Error conditions (see subsection 3.4 above)
- Coins, Bills and Tickets in and out
- Handpays

- Game events with full details (credits bet, paylines selected, reel positions, credits won per payline)

3.6.2 Meters

In addition, the Nevada Technical Standard for Gaming Devices requires the following meters for proper accounting purposes:

- Coin In: The total value of credits bet (corresponds to NV 2.040(a))
- Coin Out: The total value of credits directly paid by the EGM as a result of winning wagers (i.e., excluding hand pays) (corresponds to NV 2.040(b))
- Total Accepted: Total credits inserted into the EGM by any means (coins, bills, tickets). (corresponds to NV 2.040(f) plus NV 2.040(h) plus all accepted tickets)
- Total Jackpot: Total credits paid by an attendant as a result of jackpot handpays (corresponds to NV 2.040(d))
- Total Cancelled: Total value of credits cashed out from the EGM by any means (coins, ticket, handpays not due to a jackpot win) (corresponds to NV 2.040(e) plus NV 2.040(g) plus printed tickets)

You can find details on the meters on the “Proper Accounting for Gaming Devices” document available from the Nevada State Gaming Control Board website: <http://gaming.nv.gov/modules/showdocument.aspx?documentid=2918>

3.6.3 Handpay Lockups

When the player is awarded a prize greater than or equal to the IRS limit set for the EGM, whether the prize is a progressive or a payable jackpot, the SAS is notified and game goes into handpay lockup state, not letting the user play until an assistant resets the handpay. When the assistant enters the EGM auditing menu, the main assistant screen is replaced by the handpay screen, where the jackpot is displayed in accounting and player credits. When the assistant performs the handpay, the handpay is registered and the game becomes playable again. The player credits remain as before winning the jackpot.

3.6.4 Operator Menu

An operator, as opposed to an assistant, has access to the operator menu, which gives access to configuration options of the EGM. For instance, the operator can:

- Select the language used for displaying text on screen
- Set the time span after which an idle machine starts playing an attract animation
- Set the IP address of the SAS
- Set the limits for bets, if any
- Set the monetary value of a credit
- Set the PIN and timeout value for the demo mode (see subsection 3.8)
- Enable the progressive jackpot and set the percentage of wager transmitted to the SAS
- Print and then reset the meter period used for accounting. The ticket printer is used to output all meter values, and then they are reset and the log is cleared.

3.7 Remote Configuration

The SAS can remotely retrieve auditing information on the EGM (such as meters and last events), as well as certain configuration parameters. For instance, the SAS can set the EGM time remotely, thus making it possible to synchronize time on all networked EGMs of a casino. Also, the SAS can reset handpays to credits remotely, which relieves the assistant from intervention. In this case, the jackpot amount is added to the player credits.

3.8 Demo Mode

For game exhibitions, testing and certification purpose, the EGM has a demo mode, which can be activated by flipping a physical switch that can only be reached after opening the doors of the EGM with an operator key. Additionally, a PIN number needs to be entered. While in demo mode, the operator can add extra credits to the current player meter, or force the winning of some prize. If the operator is inactive for a certain amount of time, the PIN code must be reentered before the demo features can be accessed again. None of the actions performed during the demo mode should affect the meters of the EGM (see subsection 3.6.2). Likewise, when the demo mode is disabled, the current player credits, last game outcome and last credits won should be restored to hold the values that they contained before entering the demo mode.

4 Tasks

4.1 Task 1 - Domain Model

Elaborate a domain model for the EGM. Since the scope of a Domain Model is vague by definition, it is possible that you find yourself unsure about whether to include some concept / attribute / association in the domain model or not. To get full marks for this question you must ensure that your model contains *at least* the following:

- All conceptual state (classes and properties) that the EGM must keep in order to provide the behaviour described in this informal requirements document, and in particular the functionality you describe in your use cases that you create for task 2 (see below).
- All the actors that interact directly with the EGM with the properties (attributes and associations) that are relevant for the EGM to provide the behaviour described in the use cases.
- All the actors that interact indirectly with the EGM (with their properties) in case they are relevant for the EGM to provide the functionality described in the use cases.
- All the conceptual state (classes and properties) that the EGM needs to keep in order to be able to determine during execution the outcome of any conditions described in the use cases.

4.2 Task 2 - Use Case Model

Based on the informal requirements detailed above, propose a use case model that covers all goals of the involved stakeholders. In particular, you have to create use cases that:

- Describe how a player uses the EGM to gamble
- Describe how the casino staff services the EGM. Note that in case you are planning to write many very similar use cases, you do not need to write them all. Just provide the detail of one, and then briefly describe the others.

To summarize your model, create a use case diagram that shows all involved actors (with multiplicities), associated to the use cases in which they participate. Don't forget to depict dependencies between use cases, if any.

4.3 Task 3 - Environment Model

Based on the Use Case Model created for task 2, establish an *Environment Model* for the EGM. Here are some additional requirements / tips / decisions:

- State ALL necessary input, output and time-triggered messages that are needed to provide the functionality specified in the problem statement and the use cases. Remember that all system functionality has to be triggered by an input or time-triggered message!
- Don't forget to add multiplicities to the actors.
- You do not have to take into account hardware and communication failures other than the ones stated in the informal requirements. You can safely assume reliable communication.
- Specify message parameters for each message, together with any necessary type declarations.

5 Hand-In

Please hand in a paper copy of your solution until Friday October 18th. Remember that you are allowed to work in teams of 2, but not with a person you worked with for a previous assignment. If you work with someone, please hand in a *single* copy signed by both of you. In case you submit electronically (preferred), please send the files to Omar.Alam@mail.mcgill.ca with the title “COMP-533 Assignment 1 of yournames” and cc me as well (Joerg.Kienzle@mcgill.ca). If you don’t get an acknowledgment for your email within 24 hours, send us another email (without attachment, but putting the hand-in somewhere where we can download it). Late hand-ins are not accepted.