

October 2012

SLOT TECH MAGAZINE

Slot Machine Technology for the International Casino & Gaming Industry

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Slot Tech Magazine

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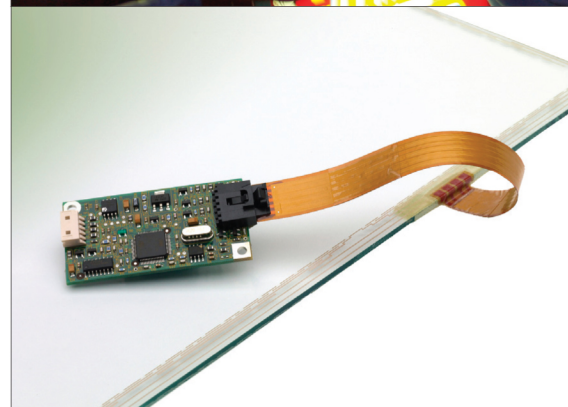
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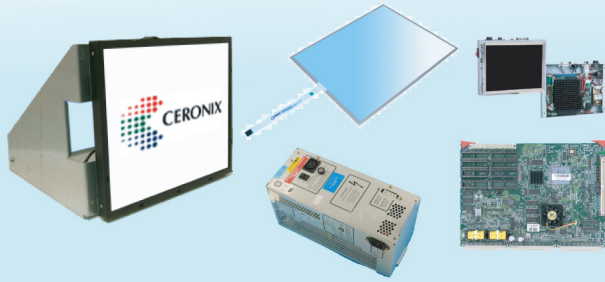
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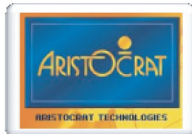


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Slot Tech Magazine

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Simulating Virtual Players
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Anyone who has known me for a while knows that I just love factories. I love taking the factory tour. I have toured everything from power supply factories in Taiwan to pinball factories in Chicago and monitor factories from Indiana to Italy. This time, however, it was our Canadian correspondent, Kevin Noble's turn as he brings us along on his tour of the Spielo slot machine factory. Read **"SPIELO Introduction"** starting on page six.

The international casino business is full of opportunities for advancement. Anyone can work their way up in this business. But there's a mess of stuff to learn about slot math and although we've taken a break for a while (read our archive of articles on slot math, "Slot Math Can Be Fun?" at <http://bit.ly/OY9aHB>), slot math is back with a vengeance this month with the introduction of Slot Tech Magazine's new slot math correspondent, Diana Gruber. Read **"Measuring Slot Machine Volatility by Simulating Virtual Players"** beginning on page 14.

IMPORTANT NOTICE: Registration for TechFest 26 in Detroit, Michigan is now open. Please note the new dates, Wednesday, November 14th through Friday, November 16th. The event will be held at the MotorCity Casino. Many TechFests are sold-out events so please register before October 14th and take advantage of a \$100 Earlybird savings. Visit the website at slot-techs.com for a schedule and to download an enrollment form.

See you at TechFest 26 in Detroit.

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#8610- Protective Mylar sheet W/ copper tape attached for 6.2" Hitachi LCD in IGT NexGen

#8570-6.2 inch Hitachi LCD #TX16D11VM2CAA with 4 wire touch screen for IGT NexGen

FOR BALLY

#8650 - Single cold cathode lamp assembly for Bally IView player tracking system 6.2 inch "IDW" LCD

#8680 -- Single cold cathode lamp assembly for Bally IView player tracking system 6.2 inch "IDW" LCD

#9890 – 5 wire touch screen for Bally IView 6.2 inch Hitachi LCD

#8950- 5 wire touch screen kit for Bally Iview 6.2 inch "IDW" LCD

#1240 – 6.2" Hitachi LCD \$TX16D11VM2CCA

FOR KONAMI

#9780-"L" shape cold cathode lamp assembly for 7 inch AU Optronics LCD

#8550 – "U" shape cold cathode lamp assembly for 7 inch Sharp LCD

#1010 – 7 inch AU Optronics LCD #C070VW02 for bonus screen

#1250 - 7 inch Sharp LCD #LQ070T3AG02 for bonus screen

FOR WMS (Williams)

#8520- Triple cold cathode lamp assembly for WMS slot machine with an 18" LCD monitor

#9300- Single RAW cold cathode lamp for WMS games with 19 inch LCD monitor

#8490 - 6.4" "LG" LCD #LB064V02 for bonus screen (does **NOT** come with touch screen)

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When I was back in Windsor, I had the luxury of having an IGT Field Service Technician living right in town. We grew to be best of friends and most times, I could pick up a phone and call him to discuss any problems we encountered regarding any one of IGT's platforms. Often he was in town and could stop by and lend a hand but a lot of times he was out of town covering one of his many properties.

Now that I am in Moncton, New Brunswick, I have the found that I actually have one of the manufacturers of various games and equipment just a stone's throw away in the form of SPIELO International. On occasions when I've had to call for Tech Support, in a matter of a couple of minutes the Tech Support was in the building helping us troubleshoot any difficulties that we encountered.

This is a first for me to actually have the games manufactured, supported and designed in my home town so I wanted to share with you SPIELO International's support

Spielo Introduction

by Kevin Noble

services offered not just here but across North America and around the world. I pitched this idea when I first arrived here in town and I was invited on a tour of the facilities to see what SPIELO International has brewing for the G2E Gaming show in October (there's a hint on the cover). First I wanted to tell you what I've learned about SPIELO International.

Who is SPIELO International?

So, just who are they? SPIELO International had humble beginnings on the east coast of Canada when they started manufacturing gaming cabinets back in 1990. From the start their employees offered routine machine servicing; it was



part of their job to service their customers. The technical services they offer evolved over the years based on market requirements, technology advances, and customer needs. Many of you may recognize some SPIELO International products under their former name, Atronic. In 2011, the two companies (SPIELO and Atronic) came together under the banner of SPIELO International.

They don't just make machines anymore, though. These days, SPIELO International is a world leader in the design, manufacture and distribution of games,



Michelle Martin works on a wiring harness

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cabinets, central systems and associated software for legal gaming markets around the world. It offers a complete range of end-to-end gaming products for diverse gaming segments, including distributed government-sponsored markets, commercial casino markets, Amusement with Prize markets and interactive and sports betting markets as a result of their integration with GTECH G2. And how far out into the gaming industry do they reach? Well, SPIELO International serves more than 1,650 customers on five continents, has shipped more than 225,000 gaming machines worldwide and holds more than 300 gaming licenses. Of those, it is licensed to sell machines in 25 U.S. States (including Nevada) as well as to 142 Native American casinos. SPIELO International is 100 percent owned by Lottomatica Group, a player in the Italian gaming industry, one of the largest Lottery operators in the world based on total wagers and a leading provider of lottery and gaming technology solutions worldwide. SPIELO International is also an affiliate of GTECH, a leading gaming technology and services company.

If you've worked on any of these machines, then you'll be familiar with SPIELO International's devices: prodiGi Vu®, Vu Slant™, WinWave Vu™, OXYGEN™, and OXYGEN Slant™. These are all built at their Moncton headquarters, where more than 500 professionals are dedicated to the development, deployment and support of Cen-

tral Systems and VLTs for distributed video lottery programs as well as slot machines for casinos. Their manufacturing facility is certified under International Organization for Standardization (ISO) 9001-2008 quality standards.

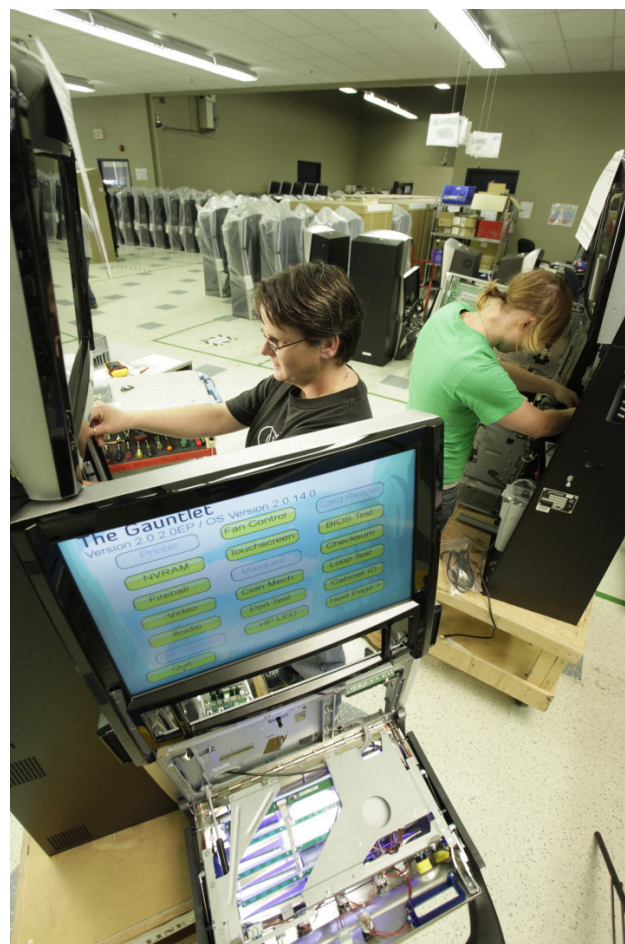
What services do they offer?

After I learned a bit about the company, what I really wanted to know is what services does SPIELO International offer for slot techs like you and me? It turns out to be a lengthy list: machine installs, conversions, and removals, service support for both asset and non-asset machines, software and hardware upgrades (including game changes), phone support for technical problems, parts support and sales, bench repair of machine peripherals, routine and preventive maintenance and troubleshooting. SPIELO International also offers on-site technical training to its customers on new products. And, they don't exclusively service their own machines. Frequently they are contracted to help service other manufacturers' machines, as well.

SPIELO International Gaming Tech Services

(GTS) is a total service solution for gaming customers around North America. They can help by deploying experienced, professional gaming technicians to cover most gaming areas throughout North America. Their expert field service team can assist with projects, respond to service calls, perform routine preventive maintenance, install and service player tracking systems, perform bench level repairs and more but I'll tell you more about that in a future issue.

I was particularly interested in their bench functions so I asked them for a few more details. In select locations, SPIELO International techs will clean and repair machine peripherals like



Tara Nagy performing some sort of unspecified activity



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printers, monitors, LCDs and B/As for their customers, to be used in the exchange or advance replacement process. Logic assemblies are also serviced and upgraded with new software if needed. Most bench locations also provide technical phone support to customers, along with parts sales and service. Through GTS, their team of expert bench technicians are also contracted to provide component level bench repairs for other gaming manufacturer's peripherals and gaming equipment. SPIELO International has invested in bench functions because performing bench repairs is a great hands-on training process for their own technicians and it helps to hone their skills and knowledge of the peripherals.

Where are these services available?

SPIELO International is active in most North American jurisdictions, including the majority of Canadian provinces and American states. They sell to, and service, all types of gaming markets, from small bar venues with a handful of cabinets up to large commercial and government-sponsored operations with thousands of cabinets. And SPIELO International's employees believe every customer, big or small, is important. Accordingly, they have strategically-based service teams throughout North America so they can rapidly respond to customer calls and help get gaming equipment working and in play as quickly as possible. So it is

not surprising that SPIELO International technicians travel constantly to service their huge customer base and they clock an average of 64,000 kilometers (40,000 miles) behind the wheel of their service vehicles each year!

How do I contact my local technician?

The easiest way to contact your nearest SPIELO International service team is to use the searchable online directory found at: www.spielo.com/service/service-teams. Or you can call SPIELO International's toll-free Technical Hotlines, which are staffed 24 hours a day, at 1-800-561-4263 (for VLT / Distributed) or 1-800-559-1391 (for Casino Games).

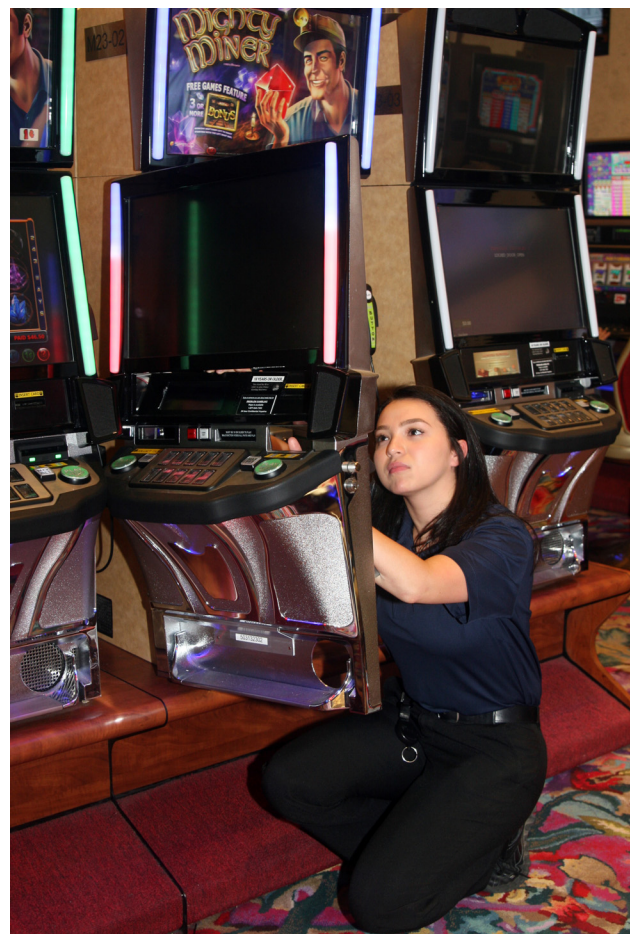
What does SPIELO International look for in their technicians?

SPIELO International takes pride in their technician development program, which turns out some of the most talented techs in the industry. They begin by selecting new hire technicians who have a can-do, customer-focused attitude coupled with a basic technical and/or electronics background. Certification from a technical school or institute is a plus, as is prior

experience with slot repair.

Techs start as a Gaming Services Technician (GST) I level and go through extensive training before working their way up in rank. Product training is provided by training specialists out of Moncton and Las Vegas as well as Adjunct Trainers located throughout North America. On-the-job-training, where technicians have classroom and hands-on instruction on the products they will service, is an important part of a SPIELO International tech's education. The real key to their success is having all junior technicians tutored and mentored by senior technicians.

SPIELO International strongly believes in the professional development of



Ilene Rosario Installing player tracking equipment



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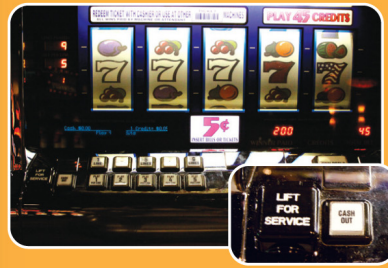
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its technicians. More recently, there has been a significant effort made to get technicians the training they need for their jobs, as well as providing opportunities for professional growth. This includes "Train the Trainer" programs, which develop senior level technicians as part-time trainers (Adjunct Trainers) to help pass on skills and knowledge.

Techs advance to higher levels as they gain and demonstrate their knowledge and skill. The typical progression for a technician is: Gaming Services Technician I GSTII GST III Senior/Specialist Technician GST Supervisor

SPIELO International still has some of the original technicians who have been working in service for more than 20 years – now that's dedication.

What are SPIELO International machines like to work on?

With this kind of rigorous training for their techs, I can understand why they're respected in the field. But what about the machines? How do they stand up to the wear and tear of daily play, and are they easy to work on? SPIELO International has deployed tens of thousands of machines and their cabinets are among the top performers in many of the gaming markets where they are present.

The current cabinets have evolved with a technician perspective included in the design. When a new prod-

uct is prototyped, service technicians are invited to provide feedback from a serviceability point of view. This makes SPIELO International products popular with techs everywhere because of their ease of repair, and functionality in general.

From what I've heard and experienced, SPIELO International machines are viewed as very tech friendly: easy to repair, solid, and reliable hardware with great service and parts support. It's such a solid, mechanically-stable cabinet that the SPIELO International guys who answer the hotline often hear questions that start with "It's been so long since I've had to fix this machine that I can't remember what to do."

Does SPIELO International want to hear from me?

Something that came through loud and clear in my conversations with SPIELO International was how important they consider feedback from customers. They especially want to hear comments from other technicians because techs in the field understand the business and how the product should perform. Their technical expertise and experience means they find the feedback easy to

understand. Most importantly, feedback helps SPIELO International to eliminate any problems and improve their product, not just for the benefit of players and operators, but for the technicians that keep their machines running out in the field.

Feedback is always welcomed and it is passed along to the cabinet designers. Share your thoughts and questions with your local SPIELO International techs or call their technical services hotline on 1-800-561-4263 or visit www.spielointernational.com/service/service-teams for the email address of your nearest technician. They want to hear from you so they can keep making the technician-friendly, bullet-proof machines they're known for.

- Kevin Noble
knoble@slot-techs.com



Jeffrey Noriega working on precision bench repairs



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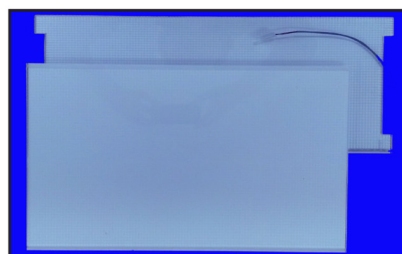
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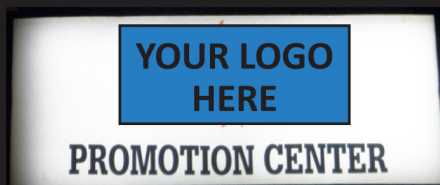
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Measuring Slot Machine Volatility by Simulating Virtual Players

By Diana Gruber

I'm a mathematician. I write par sheets for a living. As a hired gun, I work for many companies, and I've analyzed many games. I am often asked to "match" a popular game. For example, consider the game "Queen of the Nile". That is a popular slot machine that for some reason gaming bosses just love. Sometimes I will get the assignment, "design a game like Queen of the Nile". Obviously, I can't simply clone the game. That is, I probably could, but that isn't the assignment. The assignment is to make a game that plays like Queen of the Nile. What is wanted is the essence of the game. The special magic that attracts people to it. Somehow I am supposed to reproduce that.

Let me start by saying there is only so much a mathematician can do. I can't guarantee the popularity of any game. Even if I clone a game exactly, it may not have anywhere near the popularity of the original. There may be some element

of the original game that made it popular that has nothing to do with the math. It could be the graphics, or the sounds, or the location, or the speed of the spin, or the convenience of the tickets. Or it could be a game was the first to market with a new idea. In the case of Queen of the Nile, it could be that most people had never before seen a game with free spins and symbols that look like face cards. Even if you release a game with exactly the same math (it's been done) you can't recapture that feeling of "finally, a game that speaks to me". There is something special about the first game in a new genre that follow-up games can't quite capture.

Let's assume that Queen of the Nile has something going for it besides market position. Let's assume, as so many bosses do, that it is the math that makes Queen of the Nile great. How can we capture that math, and put it in a totally unrelated game?

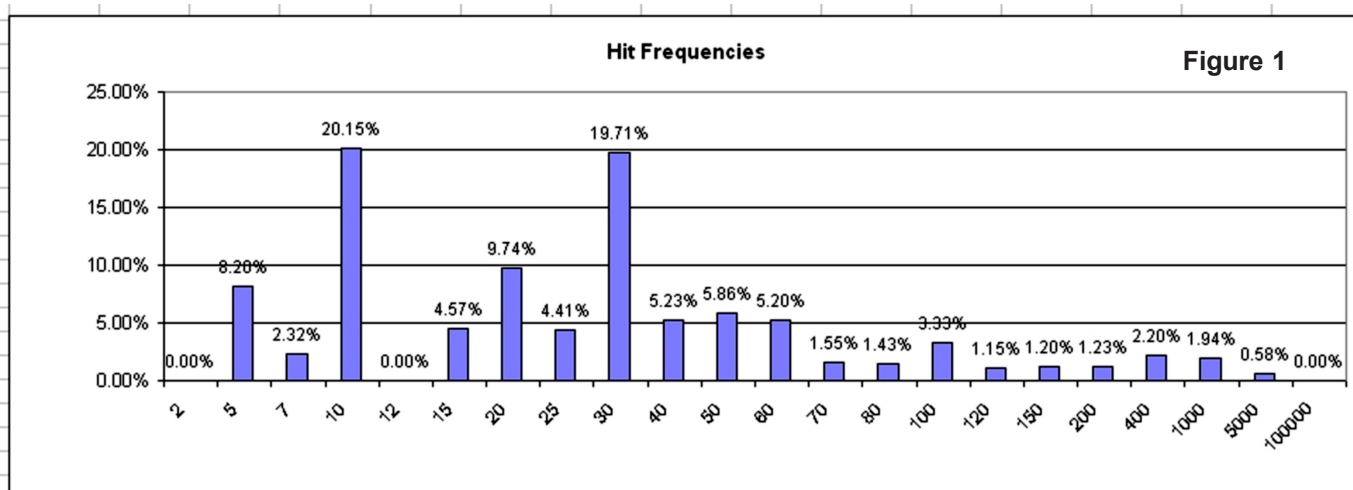
The simple answer is, we need to match the distribution.

The Distribution

A distribution can be thought of as a graph of the hit frequencies. Most people are familiar with a normal distribution, which is shaped like the hump of a camel. Slot machine distributions are not normal distributions. They are bumpy and oddly shaped. A slot machine distribution might look like the graph in figure 1.

The above distribution refers to a 30 line game. About 20% of the hits are worth 10 credits. Another 20% of the hits are worth 30 credits. Only about 2.5% of the hits are worth 1000 credits or more.

If this is all the information you have, then you can't match the distribution. There isn't enough information here to tell you what is really going on. What if you have a similar game, but the awards are slightly



different. What if your game has an award of, say, 12 credits? That is a perfectly valid award, but what do you compare it to? The chart you draw will look completely different than the chart above, and yet the game you design might actually "feel" like the game you are trying to copy. How can you show that?

One way to do it is to use calculus. The way to match a curve is to match the derivatives. If you take the first, second and third derivatives, you will get a measure of the rate of change, the skewness, and the kurtosis. If you match all the derivatives, then you will match the curve. Is that a good idea? I don't think so! You can't explain calculus to a gaming boss. Even if you could, it still doesn't give you very much useful information. Let's try something else.

Simulating Players

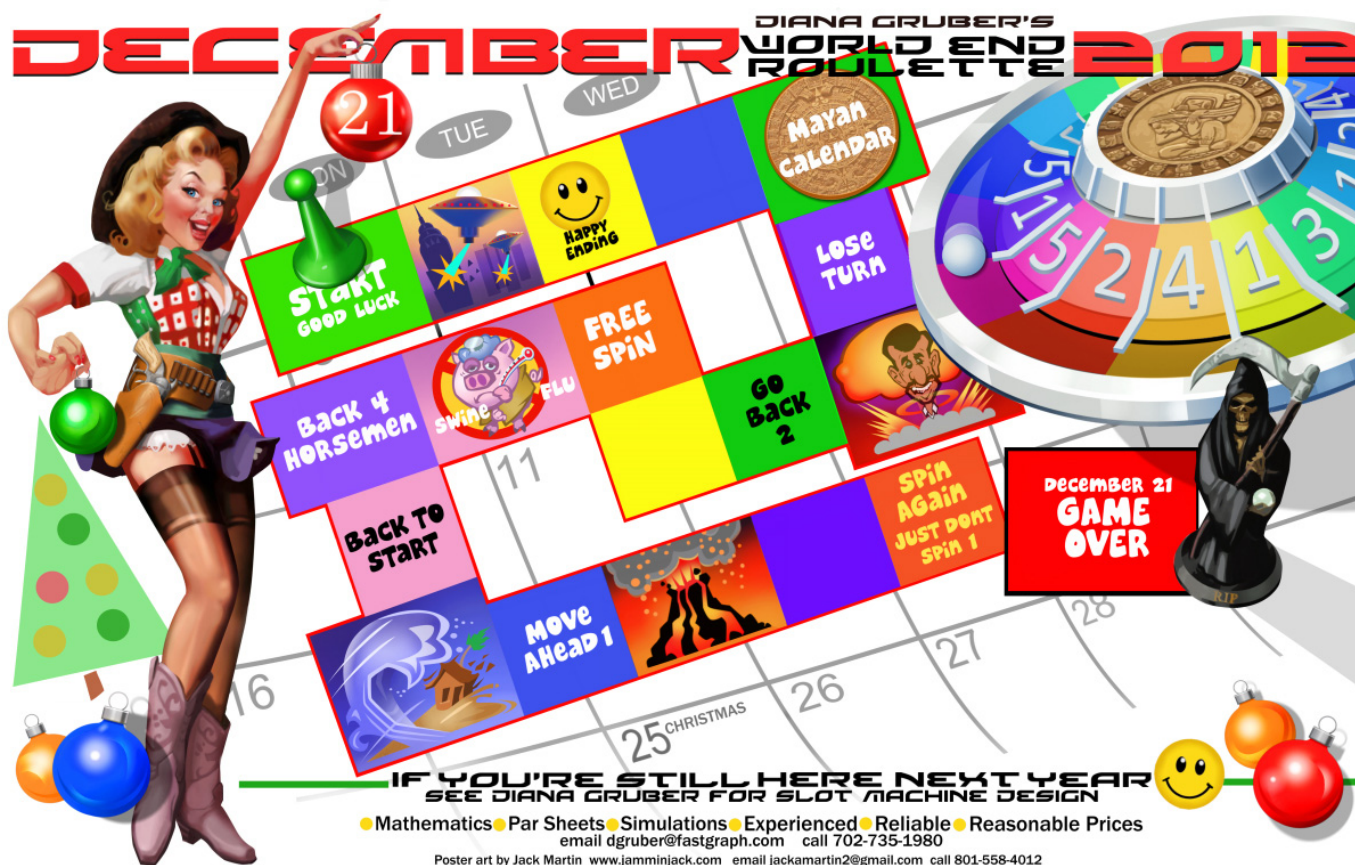
When I evaluate slot machine math, I try to draw a picture of how the game will perform from the player's point of view. What kind of experience will an average player have? Will he buy in, lose consistently, and walk away with nothing? Or will he play for a long time, experiencing no highs and lows, winning 9¢ out of every 10¢ he puts in, until he gets bored and quits? Or will he get some interesting awards, a few big ones, a few small ones, and a feeling of potentially more to come?

In order to give the player a meaningful experience, you need to be able to measure and adjust the player experience. You need to be able to change the reels and the pay table, and compare the results to what you had before. There is a very easy way to do that. You can write a program to simulate players and graph the results.

Here is the way I do it. I take 10,000 virtual players, and give each of them a bankroll equal to 20 times their total bet. So if the bet is 30¢ per spin, I will give each player a bankroll of \$6.00. I give each player an hour, at 10 spins per minute, for a total of 600 spins. Then I set the reels to spinning. Each player keeps playing until his bankroll is exhausted, or his time is up. I keep track of certain elements of each player's experience. For example, I keep track of the average number of games played, the hit frequency, how many players hit a bonus, and the highest award each player wins. Then I generate some graphs to show some highlights of the average player experience.

Time on Device

People sometimes ask me if there is one single number that can describe the volatility of a slot machine. I think they are looking for the standard deviation. In





my opinion, the standard deviation is almost useless. Like the calculus solution discussed earlier, it is technically correct, but it just doesn't give you any useful information. I don't think there is a single number that describes the volatility of a slot machine. I think volatility is described by a combination of numbers.

If you look past the volatility and consider *time on device*, then you have a characteristic of the math that can be described by a single number. This number can be very useful.

Time on device is a term we use to describe how long the average player plays a slot machine before giving up and walking away. It is sort of a nebulous term. Some people think volatility and time on device move in opposite directions. For example, a game with a low time on device has high volatility and vice versa. In my experience that isn't true. More about that in a minute.

Here is how I like to measure time on device. Given the simulation above, I measure how many games, on average, a player can expect to play. The result looks like figure 2.

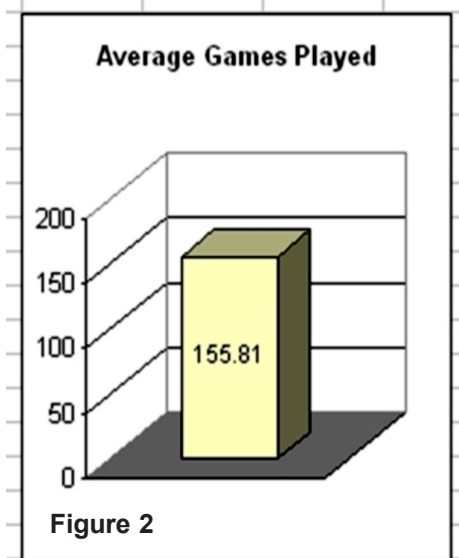
In this case, the average player playing 30¢ per spin would average 155 games before exhausting his entire \$6.00 bankroll. Let's call this value the *AGP* (Average Games Played). I would consider an AGP of 155 to be a high time on device. It is high because this is a 30 line game, also because I designed it to be high. I wanted this game to appeal to a leisure market. I wanted my players to play for a long time, in a leisurely way.

AGP usually ranges between 90 and 160. I would consider a slot machine with an AGP of 130 to be an excellent game. Below 90, you are killing your players off too quickly, and above 160, you are just boring them. So I aim for about 130, and then adjust up or down, depending on the intended audience, and the nature of the game.

Player Top Award

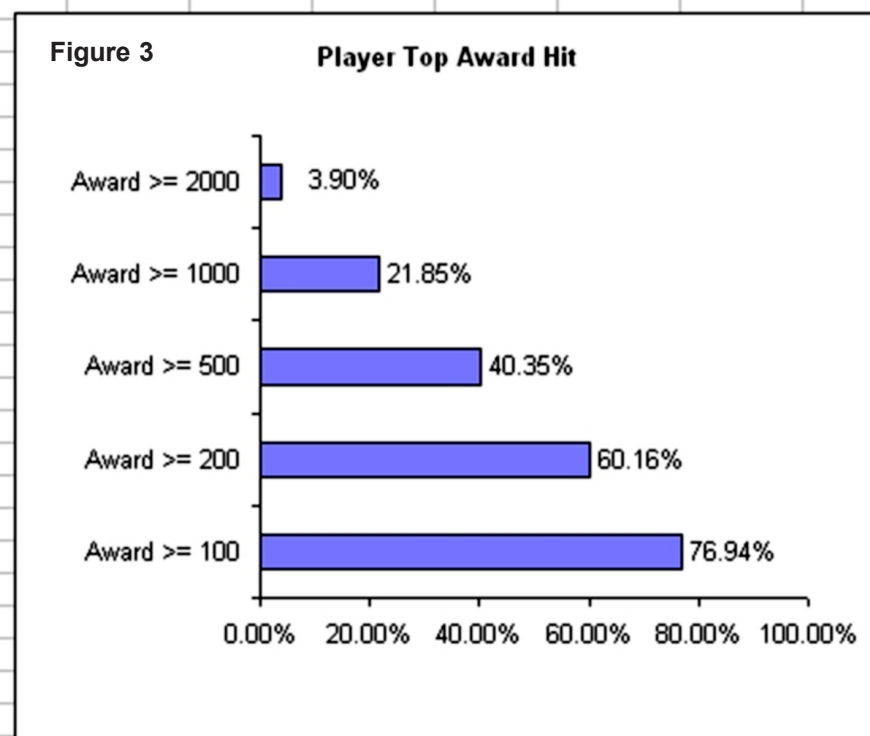
Another way to look at distribution is to consider the chance that a player will get a nice big award. Players don't expect to hit a jackpot every time they play, but they do like to feel that a jackpot is possible. So we need a way to measure the range of top awards a player will hit during a typical playing experience. Using the simulation technique, I like to generate a chart that looks like this:

This chart tells me that one in five players hit an award greater than 1,000 credits, or in other words, a \$10 hit



on a 30¢ buy in. I want lots of players to hit awards like that. Those medium/high awards are fun for the players, and keep a game interesting.

This chart measures volatility in a way. A more volatile game will have more high awards. As I mentioned before, this chart moves with the time on device chart, not opposite it. The more time on device you have, the more likely you are to hit a big award. When you look at it



that way, it turns out time on device is the key element in slot machine design, with volatility being secondary.

Conclusion

Time on device and volatility are just two things to consider when designing a slot machine. When you put them together with hit frequency, frequency of the bonus, and overall return, you start to get a pretty good picture of how the game plays. Even then you haven't fully described the game, but at least you are getting a better picture. The real usefulness of these charts comes from comparing them during development. Suppose you change the pay table and the reel strips. Does that make the time on device better or worse? Do more players or fewer players hit big awards? Without these charts, you are just stumbling around in the dark. The only way to get these charts is with virtual player simulations. If your mathematician is not giving

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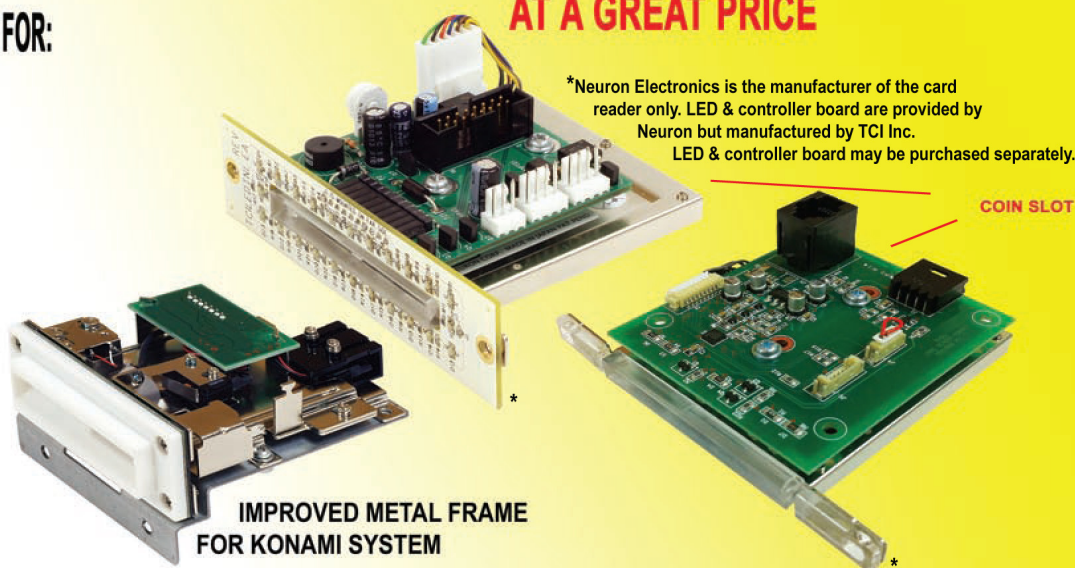
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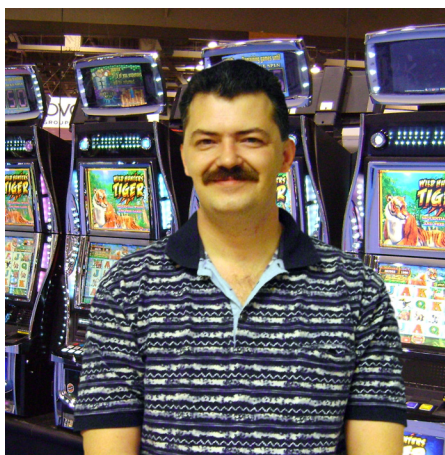
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Atronic e-motion Game, Both LCDs Going Black

I was making a round on the gaming floor, looking at progressive signs to see if they were incrementing, looking at graphics on LCD signs to see that the image wasn't frozen and was scrolling through the advertisement like they should. I was also looking out for anything that didn't look quite right, such as an Atronic e-motion game with only the ticket printer bezel lit up. Both the upper and lower LCDs were black. Sometimes a reboot of the game may bring it back to life, sometimes not. If not, the main game power supply may need to be replaced. On this game it appeared the unit had been replaced recently because it was very clean, not much dust had accumulated on it. A reboot was done and during the process, I started closing the main slot door. Once again both LCDs went black. A second reboot was

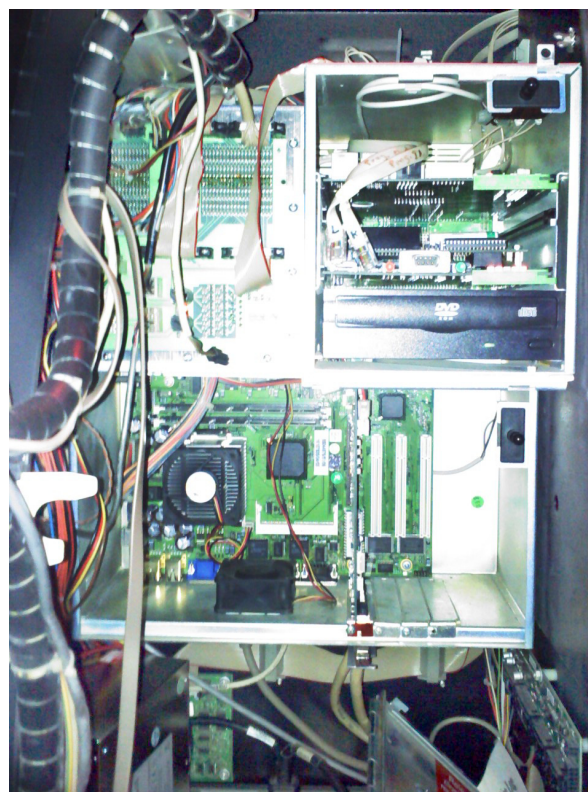
Quick & Simple Repairs #89

By Pat Porath

done. This time, I waited until it booted all the way up. Once again during door closure it happened. As I recalled (learning the hard way, where I was unable to repair an Atronic a couple months back or so) I luckily remembered to make sure the backplane board was nice and snug in place. With game power OFF, I slightly pushed on the board to make sure it was tight. Since power was OFF, both the main processor board along with the game communication board were reseated. This time after the boot up process the game worked perfectly and I hadn't heard of a complaint from it since. Definitely something to keep in mind, if an Atronic e-motion game is "acting weird," turn off power and make sure the backplane board isn't a bit loose.

Ithaca 950 Printer Making Weird Noise

While making a round on the floor, I received a call to an Ithaca 950 printer problem. The attendant stated it was making a very weird noise and the paper wouldn't feed correctly. Maybe a small piece of paper was jammed somewhere within the paper path causing problems? No such luck finding anything jamming up the path. I



reseated the printer and tried to feed the paper once again without success. This was the first time I had ever heard an Ithaca 950 printer make such a terrible noise. For some reason it sounded like gears were grinding. After the printer was removed once again for further inspection, nothing unusual was seen this time too. Now I had my flashlight out when attempting to feed paper. What in the world was moving around the gear area on the left side of the printer head? A darned 7/16ths nut from a lock was screwing up the gears! Luckily, after it was removed the printer was OK; none of the teeth on the gears had gotten damaged too badly. Paper fed fine, along with two good test prints. How could a nut from a lock get into the gears in the first place? Hard to say for sure, maybe it was accidentally dropped when installing the lock for the bill acceptor access door. Who knows?

IGT AVP SBX Game Showing Offline

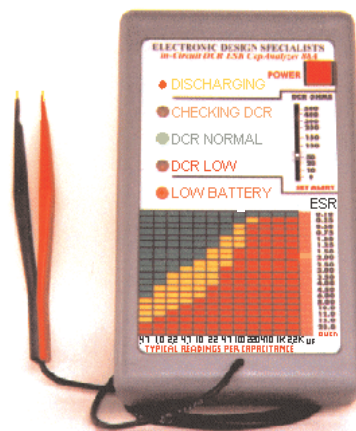
Almost every work day I check our "Island Time" progressive games to see if there are any errors on the main computer screen. "General errors" can also be seen on the VFD of one of the progressive controllers. The device will actually display "42 games online, 0 errors." A way to check all 42 of our IGT AVP 3.5 SBX games in more depth is to

first click "Godzilla Firefox." Next, click "bookmarks" then "IGTSPC." A screen should appear with a "machine status" tab. Click the tab for a view of the 42 game layout along with the status of the games such as coin-in status, online, offline and so on. If a game shows offline, only a reboot of the SIB board may be needed. If not, there may be another issue. On this particular day, two games were showing offline. With a simple click of the "clear errors" button, nothing happened, errors remained. One game I did get to clear by rebooting the SIB, the other wasn't quite so easy. When looking at the "game communication interface board" in which our Oasis cable usually plugs into, the board appeared to be

totally dead. Both the red and green lights on the board were not lit at all. (Note: our Oasis interface cable plugged into a different socket located directly on the game backplane board.) Since the "COM board" was plugged into channel 2 on the game motherboard I checked game software settings to see if channel 2 was even enabled. Sure enough channel 2's address was set at zero, not to 1 like it was supposed to be. As soon as the address was set correctly, the lights on the "COM board" lit up. This indicated the board should now be functioning. Back at the progressive computer the "clear errors" tab was clicked again, twice just to make sure. Now all of the games were online.

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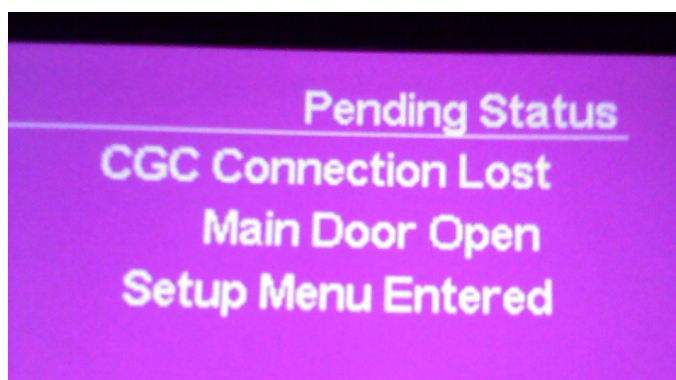
IGT AVP 3.5 Showing All Doors Open on the Screen

A complaint was received that an IGT AVP 3.5 had all of the doors showing open on the screen. Door open M, D, T, L and so on. Why the problem all of the sudden? Within a half hour, another game in the same area had the same errors. What was done to the games recently? For one thing, bill acceptor access door locks had recently been replaced. Maybe that had something to do with the problem? Checking basic items on one of the games didn't resolve any of the "door open issues." We tried reseating boards and rebooting the game. Once the lock cover was removed from the stacker door area, the problem was obvious. One of the wires to the stacker access door switch was cut in two and other had a bare spot in it, possibly shorting on metal. When the cover was put back in place, the wires hadn't been run through the specified notch, therefore when it was put on, it pinched and/or sliced the wires. After the wires were repaired, the wires were run properly and the cover in place, the game was fine. Only the door open F and M appeared. Once they were closed, none showed open as they should and the bill acceptor lit up. Another game online. A simple wire repair fixed the problem.

WMS Bluebird 2, "CGC Connection Lost" Error

A "CGC connection lost" error means the game has lost connection between the "Central Game Controller" and the game, connected by CAT5 cable. One thing that could be seen was the progressive area of the game didn't have any numbers in it, only a blank area. Since I knew what CGC stood for, the game being progressive, I headed in the direction of the game brain box (Some call it the "brain box", CPU, main board, MPU, what ever you want to call it). While looking at the brain box, a CAT5 cable connector didn't look quite right. Only one of the two indicator lights were blinking. One light is for transmit,

the other for receiving data. Then I thought, what would happen if the cable was reseated without powering down the game? The CAT5 cable that was connected to the brain box of the game was disconnected for a few seconds, then seated back into place. After less than a minute, all of the progressive numbers appeared, along with both lights blinking on the CAT5 connector. It appeared the game was repaired. As soon as the main door was closed all errors cleared and the game was ready for play. Re-seating the cable fixed the failure.



Bally Alpha Wouldn't Show a Door OPEN M

Why would someone want a game to show a "door open M" in the first place? Well, without it a tech is unable to access detailed diagnostics and setup menus. Only the attendant menu would be displayed with a turn of the reset key. Pressing the diagnostics button wouldn't work at all. Since the "Bally Alpha" had just been converted, could it be a loose connection somewhere? I checked and rechecked all of the connections on the backplane board, reseated the "brain box," checked the jumper pins on the back plane board to make sure they were in the same positions as the game next door. I even disconnected every connector on the back plane board (with the exception of power) to see if a door open M would appear. Even the ticket printer and bill acceptor were disconnected. Nothing I did would show a door open M. About all that was left, in my opinion, was the processor board. Even though it was replaced during the conversion, maybe it was faulty. A co-worker walked up as I was angrily staring at the game and asked what the deal was. Told the individual about all that was left was the brain box, so we swapped it. A known good one from a game of the same program theme was swapped. Directly after the game fully booted up a door

open M appeared. To me this indicated a possible faulty brain box. Just for the heck of it, the original was put back into the game. After that one fully booted up a door open appeared too. This would be classified as a major FM repair. Possible bad board, swapped them, swapped back, now both work fine. Sometimes a repair for a slot machine makes perfectly logical sense, other times not.

- Pat Porath
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About Randy Fromm: I am the publisher of Slot Tech Magazine. First published in 2001, Slot Tech Magazine is a monthly trade journal focusing on casino slot machine repair. I have been repairing electronics for the gaming industry since 1972. I really enjoy what I do and I love showing others how easy it can be. ***No previous knowledge of electronics is required.***

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