CMP
United Business Media

## POSTMORTEM: REALTIME WORLDS' CRACKDOWN

OCTOBER 2007

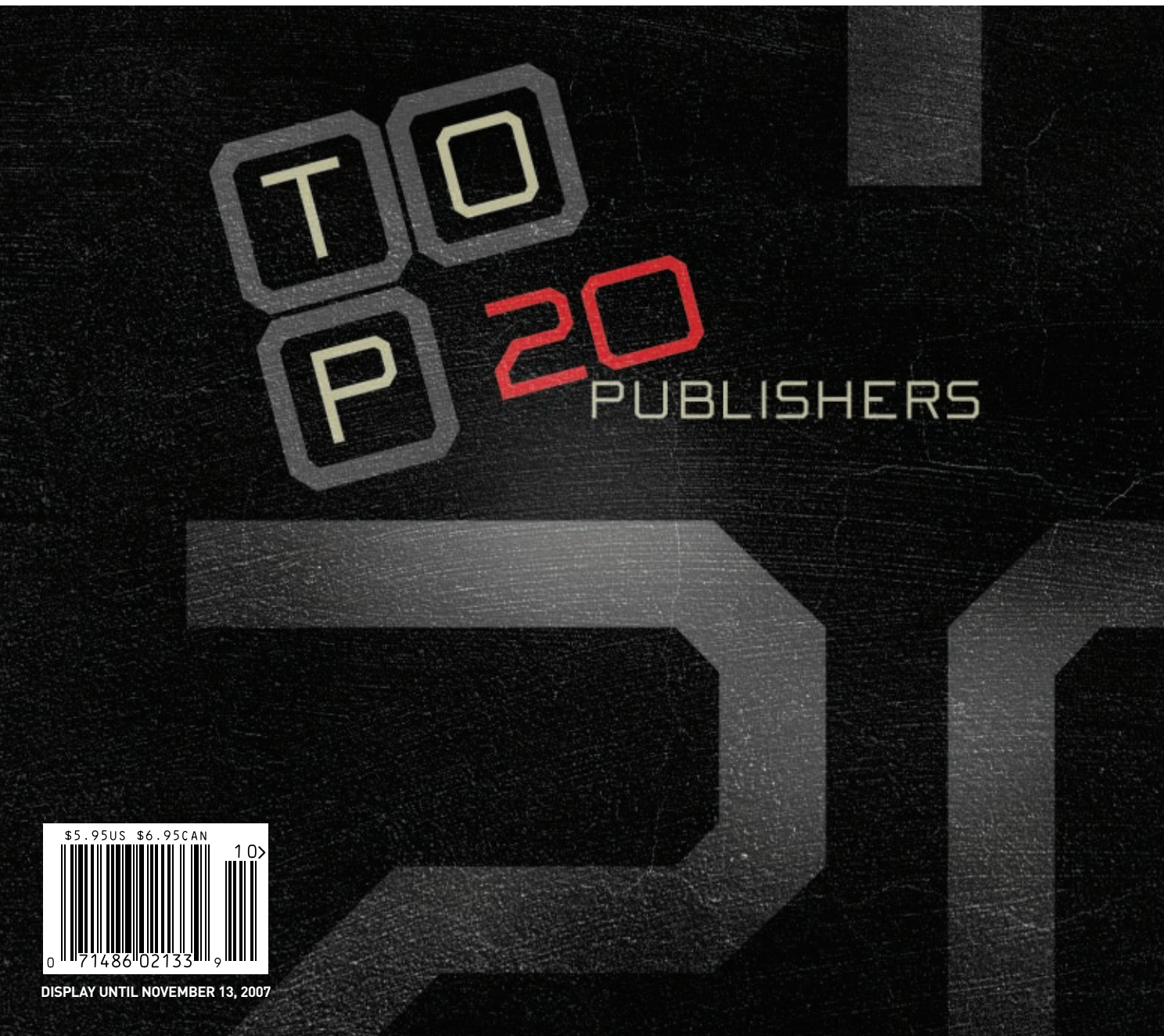
# gamedeveloper

THE LEADING GAME INDUSTRY MAGAZINE

**CRUSHING HEISENBUGS**
EXTERMINATE UNCERTAINTY WITH MENTAL FORTITUDE

**LIFE AFTER AUSTIN**
HARDCORE MMO MEETS CASUAL GAMEPLAY

**UML AND YOU**
DESIGN PATTERNS FOR GAME CODERS



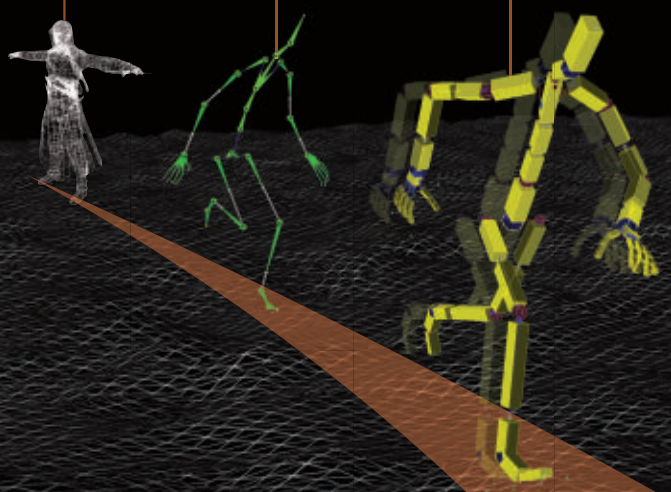

$5.95US $6.95CAN
10
0 71486 02133 9
DISPLAY UNTIL NOVEMBER 13, 2007

Autodesk®

**CREATE**
In *Assassin's Creed*, Ubisoft used Autodesk® 3ds Max® software to create a hero character so real you can almost feel the coarseness of his tunic.

**ANIMATE**
Autodesk® MotionBuilder™ software enabled the assassin to fluidly jump from rooftops to cobblestone streets with ease.

**INTEGRATE**
Using Autodesk® HumanIK® middleware, Ubisoft grounded the assassin in his 12th century boots and his run-time environment.



# HOW UBISOFT GAVE AN ASSASSIN HIS SOUL.

autodesk.com/Games

Image courtesy of Ubisoft

UBISOFT™

gamedeveloper

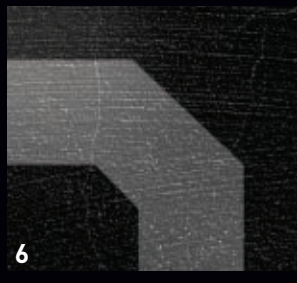
CONTENTS

OCTOBER 2007
VOLUME 14, NUMBER 9

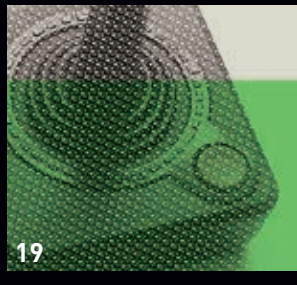
26

## FEATURES





6



19

## POSTMORTEM



## DEPARTMENTS



## COLUMNS



**COVER ART:** CLIFF SCORSO

# LIFE AFTER AUSTIN

**I PERSONALLY DON'T LIKE TO PLAY MMOS. THAT'S** not to say they aren't important, of course, or that they're not the future of our industry. They probably are, but they're just not for me as a player. This was my first Austin GDC, and also the first with the corporate overlord CMP branding stamped upon it. I heard varying postmortem-style reports from all walks of game development life, but the general impression I got was that the professionalism of the show's organization outweighed the 'oh my god they're taking over' feelings.

In spite of my MMO aversion, I met a lot of really smart folks, I thought the event was rather successful meeting of the minds, since it brought together more casual MMO visionaries like Nexon's Minho Kim (MAPLESTORY) and the more hardcore folks like the ubiquitous Mike Morhaime (Blizzard/WORLD OF WARCRAFT)—but Raph Koster rightfully chided attendees for not attending Kim's and Sulka Haro's (HABBO HOTEL) keynote talks in droves. These types of people are pushing the online game industry forward, even if it makes some of us uncomfortable.

The industry is moving further and further away from the hardcore players which used to make the majority of the game audience, in favor of growing the industry. This is all well and good, and important if we want to turn these casual types into hardcore players later—get Nintendo's housewives to play METROID PRIME, and the HABBO HOTEL kids to graduate into WORLD OF WARCRAFT. But as Australian '80s pop band Moving Pictures would say, what about me? I'm a guy who still likes arcade-style fighting games and 2D action platformers more than first-person-anything, and MAPLESTORY is the first MMO I've ever been interested in playing. It's got the right mix of appealing character designs and layered gameplay depth that you can peel as you choose. But is it even important to woo over people like me?

## OFFLINE CULTURE

Games like BIOSHOCK, which attempt to lure you into a compelling universe and keep you there for the duration of a single-player experience are slowly dwindling in number. We're getting better at the art of the single player game over time, but the online multiplayer is increasingly viewed as the 'selling point,' and it's not hard to see why—once you've played a single player game, unless it has multiple endings and paths, you're done with it. But you've had a real, meaningful experience, which is what those of us who try to propose games as art are talking about.

## GUYS WITH MACHINE GUNS

BIOSHOCK, SHADOW OF THE COLOSSUS, BEYOND GOOD AND EVIL and games of their conceptual and structural ilk will continue to be the most compelling to me.

Despite all the backstory, intrigue, and universe building, the first boss in BIOSHOCK amounts to nothing more than another guy with a machine gun. We're on our way to proving to other people what we've known all along, that games can make you feel a very intangible emotion. But we can only do this if we can get people to pick up the controller, and that's what this casual business is so good at. The Wii is moderately less intimidating to people, just as browser-based MMOs have a lower barrier of entry.

I think that as long as we have 'gateway' games between the hardcore and the casual, which something like MAPLESTORY seems to be, we'll successfully channel a small portion of the WII SPORTS-playing soccer moms and social networkers into playing BIOSHOCK. This strikes me as particularly important to our future. We need to not lose sight of the single player experience. YouTube is hugely popular, but it isn't going to make professionally directed, emotionally moving movies go away.

## BALANCE

Creating the YouTube of games seems to be on everyone's lips, with user-created content and social network-style sharing pointed out as some of the sweet spots of perpetual play.

We in the game industry are the best in the world at creating interactive virtual play experiences. If we give all the power to the player, or allow someone else to direct our vision, we do not only ourselves a disservice, but we will stop evolving the single player medium. This—MMO "performance art" aside—is our best shot at getting the world to realize that some of us are actually artists already.

*Brandon Sheffield*
*Senior Editor*

gamedeveloper
www.gdmag.com

CMP Media, 600 Harrison St., 6th Fl.,
San Francisco, CA 94107
t: 415.947.6000 f: 415.947.6090

SUBSCRIPTION SERVICES
FOR INFORMATION, ORDER QUESTIONS, AND ADDRESS CHANGES
t: 800.250.2429 f: 847.763.9606 e: gamedeveloper@halldata.com

EDITORIAL
PUBLISHER
Simon Carless scarless@gdmag.com
MANAGING EDITOR
Jill Duffy jduffy@gdmag.com
SENIOR EDITOR
Brandon Sheffield bsheffield@gdmag.com
ART DIRECTOR
Cliff Scorso cscorso@gdmag.com
ASSISTANT PRODUCTION EDITOR
Jeffrey Fleming
CONTRIBUTING EDITORS
Jesse Harlin jharlin@gdmag.com
Noah Falstein nfalstein@gdmag.com
Steve Theodore stheodore@gdmag.com
Mick West mwest@gdmag.com
ADVISORY BOARD
Hal Barwood Designer-at-Large
Ellen Guon Beeman Microsoft
Brad Bulkley Neversoft
Clinton Keith High Moon Studios
Ryan Lesser Harmonix
Mark DeLoura Ubisoft

ADVERTISING SALES
MEDIA ACCOUNT MANAGER
John Watson e: jmwatson@cmp.com t: 415.947.6224
GLOBAL SALES MANAGER, RECRUITMENT & EDUCATION
Aaron Murawski e: amurawski@cmp.com t: 415.947.6227
SALES REPRESENTATIVE, EDUCATION & RECRUITMENT
Gina Gross e: ggross@cmp.com t: 415.947.6241
DIRECTOR OF SALES
Steve McGill
SR. EVENTS ACCOUNT MANAGER, SOUTHWEST
Jasmin Davé
SR. ACCOUNT MANAGER, EAST COAST, EUROPE & EASTERN CANADA
Cecily Herbst
ACCOUNT MANAGER, WESTERN CANADA, INDIA, AUSTRALIA, & ASIA
Amanda Mae Miller

ADVERTISING PRODUCTION
ADVERTISING PRODUCTION MANAGER Kevin Chanel

REPRINTS
PARS INTERNATIONAL
Joe Nunziata t: 212.221.9595 e: reprints@parsintl.com

MARKETING
MARKETING MANAGER
Hilary McVicker e: hmcvicker@cmp.com t: 415.947.6207

CMP GAME GROUP
SENIOR VP, GAME, DOBB'S, ICMI GROUP Philip Chapnick
GROUP DIRECTOR Kathy Schoback

AUDIENCE DEVELOPMENT
GROUP DIRECTOR Kathy Henry e: khenry@cmp.com
DIRECTOR Kristi Cunningham e: kcunningham@cmp.com
LIST RENTAL Merit Direct LLC t: 914.368.1000

INTERNATIONAL LICENSING INFORMATION
Mario Salinas t: 650.513.4234 f: 650.513.4482
e: msalinas@cmp.com

CMP TECHNOLOGY MANAGEMENT
PRESIDENT AND CEO Steve Weitzner
EXECUTIVE VP AND CFO Adam Marder
PRESIDENT, CMP BUSINESS TECHNOLOGY GROUP Tony Uphoff
PRESIDENT, CMP CHANNEL Robert Faletra
PRESIDENT, CMP ELECTRONICS GROUP Paul Miller
PRESIDENT, CMP GAME, DOBB'S, ICMI GROUP Philip Chapnick
CORPORATE SENIOR VP SALES Anne Marie Miller
SENIOR VP, HUMAN RESOURCES Marvlieu Jolla Hall
SENIOR VP, MANUFACTURING Marie Myers
SENIOR VP, COMMUNICATIONS Alexandra Raine

BPA INTERNATIONAL
Game Developer is BPA approved

CMP United Business Media

gamedeveloper FRONTLINE FINALIST '05

***"ReplayDIRECTOR is one of those tools that you really recognize the value of when you're in crunch.... we were able to get turn-around times down from days, to minutes."***

***John Chowanec**, Lead Producer, Eidos*



# FREEZE.

## RECORD. REPLAY. FIXED.

ReplayDIRECTOR™ gives you **Deep Recording.** This is much **more than just video capture.** Replay records every line of code that you execute and makes certain that it will Replay with the same path of execution through your code. Every time. Instantly Replay any bug you can find. Seriously.

## DEEP RECORDING. NO SOURCE MODS.

***download today at www.replaysolutions.com***
***email us at info@replaysolutions.com***

REPLAY SOLUTIONS
1065 E. Hillsdale Blvd. Suite 307 Foster City, CA, 94404 - Tel: 650-472-2208 Fax: 650-472-2210

CRYSTAL DYNAMICS eidos XBOX 360 NVIDIA. XBOX

# OVERHEARD AT GDC AUSTIN

This year's Austin Game Developers Conference was all about the merging of the casual and the hardcore in the online space. A wide variety of views were presented at the conference, but everyone seemed to agree that times are changing. Here are some choice quotes from the conference floor.

*—By Brandon Sheffield, Brandon Boyer*

## Denis Dyack

**President of Silicon Knights**

on stories in user-created content-enabled games

There's a school of thought in psychology that story is in everything, and everything is story. My identity is my story, and me telling you how I feel. There are stories in RTS games, told in real time. The story there is when you beat your friend, and how you took over his base, or beat him within two minutes. So I think that with these kinds of (user-made content-enabling) creations, the stories are there, they're just being told in different ways.

If you look at Norse mythology as an example of a story, I would imagine that there was no single author. So in a sense if the Norse mythologies were the religion of the time to help justify living conditions and why people died and how societies should run, maybe these stories were generated the same way that this is. So maybe this is just as fine. Maybe this is how mythologies are born.

## Sulka Haro

**Lead concept designer of Sulake (HABBO HOTEL)**

on the definition and appeal of 'gameless' games

I'd really not look at the definition of game so much as the definition of play. If you look at HABBO, nobody can say that people aren't playing in there. People really do play in all of these environments, so I'd use that as the unifying metaphor for discussing these different products: play. It's more clear. Obviously there are products that are more game, with defined gameplay in its algorithms, where the machine actually has a way to compute the thing that's going to happen next, as opposed to purely social play, like in HABBO. But people are still spending time doing something that could be said to be play.

We've been expanding into more complicated stuff that users might really be able to consider a game, like a snowball game, where you throw snowballs. Partially it's good business. People want to play and they're willing to pay money for it. But also at least in my view, if you're looking at a 13 year old guy who's used to playing games, it's easier to communicate that hey, here's this game here as well. You can start off playing that, but then talk to the users and maybe get excited about meeting people and do the other activities as well.

## Raph Koster

**President of Areae**

on the dangers of web innovators taking over the online game space

It matters to the people who make their living from the [game]industry. I don't think it matters to the overall history of the genre. I think as a medium, online games and virtual worlds are going to continue marching forward. But history cares very little for the fate of individual companies. We had this huge inflection point in '95-'96, which coincided with the web. Before that there were lots of people making millions of dollars making online games and MMOs on CompuServe and GEnie and AOL. Then, a bunch of text MUD people who had been doing it as a hobby, who couldn't afford to play on the closed online services, happened to bump up against money from a couple of big publishers, and the MMORPG was born.

And today, Simutronics is the only one of those old companies that used to make millions of dollars that's even around. Mythic used to be one, but they got bought. The others just folded - EA bought about half of them. So it's entirely possible for there to be a whole industry, going along quite happily making tons of money, for the ground to shift out from under them and the barbarians to come in at the gate, do what they were doing but do it in a fresh way, and just put them out of business. I think there is a risk, and I think we're seeing that happen now.

## Warren Spector

**President of Junction Point Studios**

on the constraints of reality

One of the beautiful things about working with Disney is that, actually, you don't have to fight to do things that are a little more daring graphically. You don't have to make something that looks like every other game. You don't have to go for that super realistic sort of look, and no one's pressuring me to do the hyper-violent, guy-with-two-guns-wearing-sunglasses-at-night stuff.

While I have no problem with that, I'm not making judgments about games like that, I'm at a point in my life and my career that it just bores the hell out of me. I don't want to play games where all I do is run around and kill everything that moves any more. I just don't want to do that.

# M-RATED GAMES SELL BEST

**INTERACTIVE ENTERTAINMENT RESEARCH FIRM** Electronic Entertainment Design and Research (EEDAR) has released data measuring to-date success of the latest generation of consoles, analyzing the significance of online functionalities and other market factors, such as the correlation between game review scores and retail success.

The new study, titled "Console Intelligence Brief 2007" examines the PlayStation 3, Wii and Xbox 360 since each consoles' release through June 1, 2007, and comprises some 219 retail and 187 downloadable games made available on the new platforms, examined by genre, ESRB rating, gross sales in the United States, MetaCritic scores, online functionalities, multiplayer capability and other core game features.

The study found that critics' favorite lists and the blockbuster charts have a lot in common, with highly-rated titles selling up to five times better than titles with lower scoring reviews.

Despite online connectivity being a marketing cornerstone for all new consoles, the study concluded that 45 percent of retail games are not utilizing it in any way—98 percent of Nintendo Wii games have no online functionality at all.

Notably, according to the study, mature-rated titles, comprising 10 percent of all US retail games examined, have both the highest average MetaCritic scores and the highest average gross sales in the United States—despite the fact that many younger players lack access to them.

Less than 2 percent of all the titles released achieved a MetaCritic score over 90—and those games grossed sales up to 531 percent more than the industry average, the study says. It also found that 24 percent of all available titles are action games, though the shooter genre has the highest gross sales.

Finally, the study has also found that the Nintendo Wii has seen more than twice the number of retail and downloadable game titles than either the PlayStation 3 or Xbox 360 in the first 7 months after each platform's launch, largely thanks to the Virtual Console.

*—Leigh Alexander*

# EXECS GAMING ON COMPANY TIME

**POPCAP GAMES HAS UNVEILED THE RESULTS OF A** survey targeting "white collar" workers who play casual games—specifically, the 40 percent of the 7,102 consumers surveyed who were identified as such, employed in management, executive management, sales, accounting, medical, technical, consulting or administrative capacities. PopCap says that, based on an estimate of the casual market at about 200 million consumers, as many as 80 million of these white collar workers play casual games.

The survey found that, while white collar workers' consumption of casual games at home mirrored the overall casual gamer audience as PopCap pegged in a broad-ranging survey a year ago, 24 percent of white collar workers play casual games at work, with 35 percent of CEOs, CFOs and other senior executives confessing to casual gaming on office time.

Of those who admitted playing at work, 14 percent said they had played casual games during business meetings or conference calls, with 65 percent of those saying they did so at least once a month. 61 percent said they play during lunch or other official break periods, while 52 percent said they play "during my work day, when I need a short break."

Smaller percentages play either before or after work begins; 19 percent said they play "at the end of my work day, to unwind," and 11 percent said they play "at the beginning of my work day before I get started."

Additionally, those who indicated that they played during work hours said they do so with considerable frequency; 53 percent said they play at work at least once a day, while 79 percent play multiple times a week or more. 84 percent of these play sessions lasted between 15 minutes and an hour on average, while longer sessions were in the minority at 11 percent. Moreover, respondents who identified themselves as "senior executives" (about 8 percent) indicated a slightly higher frequency of play across the board.

Those who play on office time indicated they get a positive boost from the casual playtime; 84 percent said they felt "more relaxed and less stressed out" after a short game break at the office, and 52 percent said they felt more confident, more energetic, more productive and/or more mentally focused.

98 percent said they played casual games at home and 24 percent said they played during work hours. Of all white collar casual gamers, 65 percent indicated they earn $50,000 or more in annual income (compared to 53 percent of casual game players overall), 22 percent said they earned $100,000 or more per year, and 58 percent indicated they had a college degree (compared to 46 percent). 91 percent of white collar gamers are age 30 or older, 68 percent are 40 or older, and 39 percent are 50 or older.

"It's not surprising that today's business professionals are casual video game users," said Carly Drum, an expert on workplace issues and Managing Director of Drum Associates, an executive recruitment firm. "The face of today's executive workforce is definitely changing: we're seeing employees who are much more technologically savvy and familiar with all forms of new media from social networking to blogging and beyond. So, it's natural that some business executives would also look to casual video games that they can play on their PC, mobile phone or BlackBerry during a work break, as a way to quickly relax and recharge their batteries, so to speak."

*—Leigh Alexander*

## CALENDAR

**Casual Games Association Europe: East 2007**
President Hotel
Hospitalna Street 12
Kyiv
Ukraine
October 17-19, 2007
Price: $200-$275 USD
**http://kyiv.casualconnect.org/**

**London Game Career Fair**
The Old Truman Brewery
91 Brick Lane
London
United Kingdom
October 23-24, 2007
Price: Free
**www.gamecareerfair.com**

**GSTAR 2007, Game Show & Trade, All-Round**
KINTEX
Goyang-shi, Ilsan-gu
Seoul
South Korea
November 8-11, 2007
Price: Free admission for international attendees who pre-register.
**www.gstar.or.kr/eng2/main/main.asp**


TOP 20
PUBLISHE

**WELCOME TO THIS YEAR'S GAME DEVELOPER** Top 20 Publishers report. This year, revenues were generally up and review scores were down, as publishers across the board became more familiar with the new generation of consoles and expanded their lineups on portables and in casual-style games—which are often more poorly reviewed by the often 'hardcore' press. There have been some shake-ups and upsets, and one new face (Atlus) to match a familiar face (Atari) that is no longer on the countdown.

This year's ranking was calculated by considering number of releases (by SKU), average review scores (according to MetaCritic.com), and publisher revenue for the period reaching from August of 2006 until July 2007. We've also factored in the results of a survey we conducted to gather opinions on 28 of the major publishers—with other publishers also available for voting if not on the initial form.

Survey respondents—over 300 industry professionals from all parts of the game production process—were asked to first give their opinions on the reputations of each publisher in the survey, or any we had missed. Then the respondents were asked for any specific comments they might have on each of the publishers. Finally, specific feedback on publishers in the form of number scores and comments was gathered from respondents who had direct experience with said publishers (including milestone, marketing, and pay feedback).

Each of these factors was carefully weighted to produce the ranking you see below. The major change to weightings this year has been that reputational rankings were available for the first time through our survey—and thus the company's reputation in the industry has become almost as important to the Top 20 Publishers as their revenues.

*[Please note that a full list of statistics, ratings, and the complete survey feedback are available in the special 'Top 20 Publishers 2007' report from our Game Developer Research division—more information is available at www.gamedevresearch.com.]*

**TREVOR WILSON**
*is a web developer and freelance journalist based in Utah. Email him at twilson@gdmag.com.*

## 1. NINTENDO

**Year formed:** 1933
**Headquarters:** Kyoto, Japan
**Studios:** Intelligent Systems (Kyoto); Nintendo Entertainment Analysis and Development (Tokyo); Nintendo Software Technology Corp. (Redmond, Wash.); Retro Studios (Austin); Systems Research & Development (Kyoto, Osaka); Brownie Brown (Tokyo); NDCUBE (Tokyo)

**THIS WELL-RESPECTED INDUSTRY VETERAN'S** bold new strategy of appealing to audiences outside the sphere of gaming has paid off in spades. Nintendo posted higher revenues thanks to the runaway success of the DS and Wii and also received the highest ratings on our reputational survey, pushing it into the number-one spot this year.

The maker of MARIO also received high review scores all around and favorable detailed survey comments: "Excellent stability and consumate professionalism, plus a deep (previously misunderstood) appreciation of the modern gaming market."

One reputational commenter called Nintendo's first-party titles "the standard for production quality". DS software—especially POKEMON, NEW SUPER MARIO BROS., and BRAIN AGE played the biggest part in this success, but Nintendo's casual-aimed software for their new Wii platform has also proved successful. Perhaps the only question going forward is—will Nintendo's first-party games slow down their dominance enough to allow other publishers to be successful on its platforms?


## 2. ELECTRONIC ARTS

**Year formed:** 1982
**Headquarters:** Redwood City, Calif.
**Studios:** Criterion (Guildford, U.K.); Digital Illusions CE (Stockholm) EA Black Box (Vancouver); EA Canada (Burnaby, British Columbia); EA China (Shanghai); EA Los Angeles (Playa Vista, Calif.); EA Mobile (Hyderabad, India); EA Montreal; EA Mythic (Fairfax, Va.); EA Japan (Roppongi, Japan); EA Redwood Shores (Redwood City, Calif.); EA Singapore; EA U.K. (Chertsey, U.K.); Maxis (Emeryville, Calif.); EA Phenomic (Ingleheim, Ger.); EA Tiburon (Maitland, FL); EA Salt Lake (Bountiful, UT)

**IN THIS YEAR'S BIGGEST UPSET, ELECTRONIC ARTS FALLS TO NUMBER TWO** after four years at the top. EA is still the industry's eight-hundred pound gorilla, though, and it released more titles this year than any other publisher and collected gigantic revenues once again. Above average, but not topnotch reception on our specific survey made the company slip a spot this year, with mixed comments such as: "Overall a good company to work for, but it was hard to feel like I had much impact."

However, reputational feedback was still favorable. EA has maintained its dominance of most of the industry through its proven combination of original and licensed titles. The company's latest HARRY POTTER title sold two million copies in two days, while MADDEN and NEED FOR SPEED continue to lead their respective markets. With its recent reorganization and extra attention to casual games, as well as the imminent debut of SPORE, an absolutely key original IP for the firm, its blend of licensed juggernauts and intriguing organic franchise growth is looking strong.


## 3. ACTIVISION

**Year formed:** 1979
**Headquarters:** Santa Monica, Calif.
**Studios:** Beenox (Quebec City); Infinity Ward (Encino, Calif.); Luxoflux (Santa Monica, Calif.); Neversoft (Encino, Woodland Hills, Calif.); Raven Software (Middleton, WI); RedOctane (Sunnyvale, Calif.); Shaba Games (San Francisco); Toys For Bob (Novato, Calif.); Treyarch (Santa Monica, Calif.); Vicarious Visions (Troy, N.Y.); Z-Axis (Foster City, Calif.)

**WITH NOTABLY HIGHER REVENUES AND INCREASED RELEASE NUMBERS FOR** this year, Activision is in full swing on the new generation of consoles, and holds steady in the number-three spot. The firm continued riding successful outings in its CALL OF DUTY and TONY HAWK series along with key Marvel-related licenses, though critical reception of their titles has edged down, and reputational commenters in our survey were slightly harsh on perceived quality erosion in a couple of the firm's top franchises. "Needs to focus and deliver quality [in addition to] licenses."

However, comments in our detailed survey praised Activision for its working conditions. "They have respect for their employees and treat them like humans", and one commenter pointedly described them as: "A company with a vision and a plan to get there."

The purchase of RedOctane, while picking up the company's IP, has already shown massive payback in terms of GUITAR HERO sales, and may be one of the smartest business moves in Activision's history.

## methodology

**THE *GAME DEVELOPER* TOP 20 RANKS** publishers using a score calculated from each publisher's performance in the following five measures: annual turnover, number of releases, average review score, an anonymous reputation survey, and detailed anonymous feedback from those who had worked directly with the publisher.

Annual turnover figures come from the publishers' annual accounts or, when these are not public, from our own estimates based on the sales of games they release. The number of releases, which counts the publication of the same game on different formats as separate releases, was obtained from information on the publishers' web sites and dedicated gaming web sites. The average review score ratings were based on information from MetaCritic.com. A confidential online survey of developers provided the data for the reputational survey and the detailed comments.

The top 28 publishers were ranked according to each of these five measures. The highest scoring publisher in a category was assigned a figure, and this figure was counted down from in regular intervals for each publisher on the list, in order. The totals were weighted and added to produce a final score, which determined the top 20.

Every effort has been made to ensure the accuracy of the information contained within this article. However, *Game Developer* does not guarantee its accuracy or completeness and does not accept liability for any direct, indirect, or consequential loss arising from its use.

## 4. UBISOFT

**Year formed:** 1986
**Headquarters:** Montreuil-sous-Bois, France
**Studios:** Annecy, France; Barcelona; Blue Byte (Düsseldorf, Germany); Bucharest; Casablanca; Milan; Montpellier, France; Montreal; Montreuil, France; Quebec City; Red Storm (Morrisville, N.C.); Reflections (Newcastle, U.K.); Shanghai

**UBISOFT'S DIVERSIFIED SOFTWARE LINEUP AND STRONG INTERNAL** development structure—with an early, smart DS and Wii concentration—have pushed its revenues up, giving the company a boost into this year's #4 spot. Critical reception has edged down thanks to the enhanced release schedule over the past year though, and the French publisher took some punishment from external partners in our specific study, both over marketing and Q/A. But overall reputational survey comments were much more positive—Ubisoft was described as "powerful, and taking its lumps well", and in even higher praise: "Very willing to publish innovative and different games."

Not to be outdone by Nintendo's mastery of the new casual segment, this year Ubisoft successfully added casual software to its strong licenses and original series—and was rewarded with brisk sales of titles like RAYMAN RAVING RABBIDS on Wii and its DOGZ/CATZ relaunch on DS.

## 5. THQ

**Year formed:** 1989
**Headquarters:** Agoura Hills, Calif.
**Studios:** Blue Tongue Entertainment (Melbourne); Concrete Games (Carlsbad, Calif.); Sandblast (Seattle, WA); Heavy Iron Studios (Los Angeles); Helixe (Burlington, Mass.); Incinerator (Carlsbad, Calif.); Juice Games (Warrington, U.K.), Kaos Studios (New York); Locomotive Games (Santa Carla, Calif.); Paradigm (Dallas); Rainbow Studios (Phoenix); Relic Entertainment (Vancouver); THQ Australia Studios (Spring Hill, Australia); THQ Wireless (Calabasas Hills, Calif.); Vigil Games (Austin); Volition (Champaign, Ill.); Mass Media (Moorpark, CA)

**JUMPING UP TO NUMBER FIVE, THQ POSTED ITS HIGHEST REVENUES EVER THIS** year, and its increasingly diverse stable of licensed titles and original games (formerly thinner on the ground) has provided a healthy balance for the publisher. For every Pixar or Nickelodeon license in its lineup this year, THQ is trying to nurture an original franchise to match—and critical and retail reception of the new IP, from COMPANY OF HEROES to S.T.A.L.K.E.R., has been favorable. Smart management of its development studios and smart licensing decisions have helped to make THQ one of the healthiest publishers this year.

Detailed survey comments praised its management and studio system: "Top-notch business development people and developer support", and also suggested: "Pretty hands off publisher. Good news for studios"—though some commenters noted that over such a large firm, quality of support and games was still a little variable.

## 6. TAKE-TWO INTERACTIVE

**Year formed:** 1993
**Headquarters:** New York
**Studios:** Cat Daddy Games (Bellevue, Wash.); Firaxis Games (Hunt Valley, Md.) 2K Games Boston/2K Games Australia (Quincy, Mass.; Canberra, Australia); Kush Games (Camarillo, Calif.); Rockstar Leeds (Leeds, U.K.); Rockstar North (Edinburgh); Rockstar San Diego; Rockstar Toronto; Rockstar Vancouver; Venom Games (Newcastle, U.K.); Visual Concepts (San Rafael, Calif.)

**ROCKSTAR AND 2K GAMES PARENT TAKE-TWO HAS BEEN IN SHAKY TERRITORY** lately due to delayed titles, a management takeover, and trouble with the ESRB. Even so, the publisher ended up holding even in this year's list, thanks to strong sales of the GRAND THEFT AUTO series, its co-published game THE ELDER SCROLLS IV: OBLIVION, and even good sell-through of the somewhat controversial BULLY. Review scores were marginally lower overall, and Take Two's release schedule was a little slimmer, but the firm powered through on reputation and revenue, and going forward, Irrational Games' (now 2K Games Boston and Australia) BIOSHOCK will be another bright spot providing balance to Rockstar's particular brand of perennial marketability.

Nonetheless, reputational commenters reflected the uncertain air surrounding the company, citing "cool games" but "nervous stockholders", and championed the strengths of its talent, despite its spread across multiple divisions—"The [smaller] divisions of Take-Two seem to work hard to develop their own reputation aside from the parent company itself.".

## 7. SEGA SAMMY HOLDINGS

**Year formed:** 1952 (Sega); 1975 (Sammy)
**Headquarters:** Tokyo
**Studios:** Creative Assembly (West Sussex, U.K., Fortitude Valley, Australia); Racing Studio (Birmingham, U.K.); Secret Level (San Francisco); Sega Shanghai Studios (Shanghai); Sega Studios (Tokyo); Sega Studios USA (San Francisco); Sports Interactive (London)

**RELATIVELY POOR CRITICAL RECEPTION COULDN'T STOP EVERGREEN SONIC** titles from bolstering Sega's revenue and pushing it up a spot this year—vaulting over Sony and Microsoft thanks to multi-SKU releases and good reputational scores.

In addition, Sega of America is experiencing a genuine renaissance, forging ahead in establishing relationships with skilled Western developers for new games based on both licenses and original IPs—with most of the fruits of this, from THE CLUB through UNIVERSE AT WAR, still to come.

The 'new' Sega's relationships with outside developers helped it gain high marks and favorable reputational comments, though its former conservative roots are still showing—one detailed commenter noted that Sega "can sometimes be slow but are generally a good company to work with."

## 8. SONY COMPUTER ENTERTAINMENT

**Year formed:** 1993
**Headquarters:** Tokyo
**Studios:** Bend, Ore.; San Diego, CA; Cambridge, U.K.; Contrail (Tokyo); Foster City, Calif.; Guerrilla Games (Amsterdam); Incognito Entertainment (Salt Lake City); Liverpool, U.K.; London; Polyphony Digital (Tokyo); San Diego; Santa Monica; Seoul; SN Systems (Bristol, U.K.); Tokyo; Zener Works (Tokyo); Zipper Interactive (Redmond, WA)

**A LACK OF SOFTWARE FOR THEIR SLOW-STARTING NEW PLAYSTATION 3** platform, and slight PSP sluggishness has caused Sony to drop a few notches. Sony's sports titles were received well, and GOD OF WAR received a sequel that was just as successful in reviews and sales as the first. The latter contributed to a stable of homegrown IPs that maintained consistent strength this year.

The publisher's reduced lineup generally fared well with critics, and Sony received above-average marks on our survey—it's been in revenue and SKU numbers that the company has lost some ground. Specific reputation feedback had praise for the company: "Sony is honest and truly focused on quality and innovation."

But commenters have also questioned Sony's first-party software line-up to date on next-gen, saying it "Has failed to capitalize on the launch of PS3" - and pointing to a mixed critical reception for some first-party PlayStation 3 titles.

## 9. MICROSOFT GAME STUDIOS

**Year formed:** 1975
**Headquarters:** Redmond, Wash.
**Studios:** ACES; Bungie Studios (Redmond, Wash.); Ensemble Studios (Dallas); Lionhead Studios (Guildford, U.K.); Microsoft Game Studios Japan (Tokyo); Rare (Twycross, U.K.); Turn 10 (Redmond, Wash.)

**STRONG HOMEGROWN RELEASES FOR THE XBOX 360 POWERED ITS PARENT'S** schedule this year, though a few suspect Japan-originating Microsoft-published Xbox 360 titles hurt the publisher's average review scores. GEARS OF WAR proved to be the first megahit for the Xbox 360, and as of this writing has sold over four million copies worldwide.

While not spectacularly high in both revenue and release amount charts, thanks to single-platform releases, Microsoft received a strong overall reputation survey rating. It also garnered praise and criticism in equal parts in responses to the detailed portion of our survey. There was praise for its standards for game quality with one respondent stating "Still the best in terms of developer support, understanding how to make great games, and a strong vision. Their usability is by far the best in the industry." But there was also some criticism over issues such as business managers who originated elsewhere in Microsoft not translating perfectly to the game space.

| Publisher | Rank | | | | | Final Score | Number of Releases | Average Game Review Score |
|---|---|---|---|---|---|---|---|---|
| | 2007 | 2006 | 2005 | 2004 | 2003 | | | |
| Nintendo | 1 | 2 | 4 | 10 | 3 | 341.40 | 32 | 73.94% |
| Electronic Arts | 2 | 1 | 1 | 1 | 1 | 333.49 | 116 | 70.10% |
| Activision | 3 | 3 | 2 | 7 | 4 | 295 | 79 | 62.83% |
| Ubisoft | 4 | 8 | 6 | 5 | 12 | 272.04 | 86 | 63.49% |
| THQ | 5 | 7 | 8 | 4 | 13 | 246.83 | 65 | 62.85% |
| Take Two | 6 | 5 | 10 | 8 | 6 | 246.50 | 56 | 67.33% |
| Sega of America | 7 | 10 | 9 | 14 | 10 | 244.32 | 31 | 63.90% |
| Sony | 8 | 4 | 5 | 3 | 2 | 243.88 | 28 | 74.04% |
| Microsoft | 9 | 6 | 3 | 2 | 9 | 237.63 | 15 | 70.73% |
| SCi/Eidos | 10 | 16 | 16 | 6 | 19 | 231.80 | 47 | 63.36% |
| Square Enix | 11 | 13 | 16 | 16 | 11 | 230.91 | 12 | 75% |
| Namco Bandai Games | 12 | 11 | 11/17 | 20/- | 16/15 | 228.74 | 38 | 60.87% |
| Vivendi Games | 13 | 12 | 12 | 11 | 5 | 226.47 | 35 | 61.79% |
| Capcom | 14 | 14 | 15 | - | 14 | 225.27 | 15 | 75.80% |
| Konami | 15 | 9 | 7 | 15 | 8 | 225.01 | 42 | 61.86% |
| NCSoft | 16 | 15 | - | - | - | 203.01 | 4 | 79.50% |
| Disney Interactive Studios | 17 | 18 | - | - | - | 200.20 | 34 | 66.69% |
| Atlus USA | 18 | - | - | - | - | 196.87 | 18 | 71.47% |
| LucasArts | 19 | 17 | 20 | - | - | 188.67 | 12 | 74.33% |
| Midway | 20 | 20 | 19 | 17 | 20 | 181.64 | 25 | 58.36% |

## 10. SCI/EIDOS

**Year formed:** 1990
**Headquarters:** London
**Studios:** Beautiful Game Studios (London); Crystal Dynamics (Palo Alto, Calif.); IO Interactive (Copenhagen); Pivotal Games (Bath, U.K.)

**THE TURNAROUND OF THE TOMB RAIDER SERIES HAS HERALDED A TURNAROUND** for Eidos as well. Eidos and its parent company SCi shot up our list into slot #10 this year, thanks to the success of TOMB RAIDER: ANNIVERSARY and a healthy release schedule—along with increased revenues.

Eidos also received some of the highest marks in specific feedback survey, implying satisfied employees. Some overall reputation comments were mixed, but some relatively upbeat—one said of Eidos: "Focused on new IP—old Lara Croft IP still a prevalent but positive image."

The past year's releases included a healthy mix of licensed and original titles, with particular moves into the casual front with the Secret Stash Games label, and interesting, if quirky external projects such as TRAXXPAD and NERVOUS BRICKDOWN.

| Reputation Ranking | Detailed Survey | Number of Internal Studios |
|---|---|---|
| 10 | 7.2 | 5 |
| 7.6 | 7.8 | 15 |
| 8.3 | 8.4 | 11 |
| 8.7 | 5.8 | 14 |
| 7.5 | 6.9 | 16 |
| 7.3 | 7.8 | 12 |
| 7.9 | 8.8 | 7 |
| 8.1 | 7.5 | 16 |
| 8.6 | 7.8 | 6 |
| 6.9 | 9.4 | 4 |
| 8.4 | 7.2 | 4 |
| 7.4 | 5.9 | 6 |
| 7.1 | 6.7 | 9 |
| 8.1 | 7.2 | 6 |
| 8 | 5.1 | 4 |
| 5.9 | 9.1 | 3 |
| 6 | 6.8 | 5 |
| 6.2 | 8.8 | - |
| 7.8 | 3.2 | 1 |
| 6.3 | 6.2 | 6 |

## 11. SQUARE ENIX

**Year formed:** Enix (1975);Square (1986)
**Headquarters:** Tokyo
**Studios:** Community Engine (Japan); Taito Corp. (Japan); UIEvolution (Bellevue, Wash.); Square Enix China (Beijing)

**REVENUES AND REVIEW SCORES BOTH FELL SLIGHTLY FOR THE FINAL FANTASY** creator, but high survey scores and praise for its production values with comments like "Square Enix never puts out a poorly polished game" helped the firm rise two spots this year.

This year the publisher continued on its recent path of reliance on FINAL FANTASY-branded spinoffs and remakes, but still kept its focus on being the premiere RPG publisher in the industry. FINAL FANTASY XII and KINGDOM HEARTS II proved strong sellers in the U.S., while DS titles FINAL FANTASY III and DRAGON QUEST MONSTERS: JOKER did well in Japan.

Continued gains in the conglomerate's online gaming division helped offset the difficulties in restructuring its recently-acquired subsidiary Taito. But some commenters suggested that the company's key franchise may be getting a little too over-exploited: "They've gone overboard with FINAL FANTASY spin-offs, remakes, sequels, prequels, movies, and merchandise."

## 12. NAMCO BANDAI

**Year formed:** 1950 (Bandai); 1955 (Namco)
**Headquarters:** Tokyo
**Studios:** Banpresoft (Tokyo); Namco Networks America; Japan Bec Co., Ltd. (Tokyo); San Jose, Calif.; Yokohama; Tokyo

**BANDAI'S ANIME-BASED TITLES (SUCH AS NARUTO) AND NAMCO'S WELL-**established IPs (including the RIDGE RACER series) combined, super-robot-style, to generate higher revenue and more releases in the past year.

Yet lower average review scores and an average showing in both of our surveys caused the publisher to fall two notches this time. Reputation commenters had faint praise for the Japanese duo's move to shift paradigms, even after its merger, saying "Together, they can innovate. But only a little."

But Namco Bandai's strengths are in a strong set of anime licenses, increasingly relevant in the North American market, alongside a set of IPs that still enchant gamers. These range from older classics such as PAC-MAN, marvelously re-invented on Xbox Live Arcade this year, to newer gems such as KATAMARI DAMACY—so their position in the mid-table seems safe for now.


## 13. VIVENDI GAMES

**Year formed:** 2000
**Headquarters:** New York
**Studios:** Blizzard Console (Aliso Viejo, Calif.); Blizzard Entertainment (Irvine, Calif.); Blizzard North (San Mateo, Calif.); High Moon Studios (Carlsbad, Calif.) Massive Entertainment (Malmö, Sweden); Radical Entertainment (Vancouver); Sierra Entertainment (Bellevue, Wash.); Swordfish Studios (Birmingham, U.K.)

**WORLD OF WARCRAFT CONTINUES TO BE THIS FRENCH-OWNED PUBLISHER'S** bread and butter. Blizzard's blinding success in the MMO arena, most recently with the BURNING CRUSADE expansion, helped drive Vivendi Games' revenues majorly higher. However, Vivendi's below average review scores and a mediocre survey showing caused it to drop a notch, this time around.

Despite poor critical reception for many of the publisher's licensed titles, it showed promise this year with titles like F.E.A.R., CAESAR IV, and even the averagely reviewed but major-selling SCARFACE. Comments from our survey revealed that the company lacks a strong public profile thanks to the diversity of brand names within it, from Sierra through Blizzard, with one reputation survey respondent asking, perhaps seriously: "Did they actually publish anything that wasn't made by Blizzard?"


## 14. CAPCOM

**Year formed:** 1979
**Headquarters:** Osaka
**Studios:** Capcom Interactive (Los Angeles); Cosmic Infinity (Burlington, Ont.); Flagship (Tokyo); Team 1 (Osaka); Team 2 (Osaka)

**ONE OF THE FEW MAJOR PUBLISHERS THAT HAS PUT ITS FOCUS SQUARELY ON** original IP titles, Capcom's multiplatform, multi-territory strategy has proven successful, with DEAD RISING and LOST PLANET both selling over a million copies each. The lush OKAMI also sold well in the U.S., and the MONSTER HUNTER series continued to be a reliable and extremely strong asset for the company in Japan.

Capcom was treated well in our reputation survey: "You know you are getting a fun game when you buy a Capcom product." But flat revenues in comparison with other publishers' gains and a tightened release schedule, a reluctance to release titles on the Wii, as well as the lack of a major cross-platform hit—which RESIDENT EVIL 5 may well be next year—have caused Capcom to hold steady at number 14 this year.


## 15. KONAMI

**Year formed:** 1973
**Headquarters:** Tokyo
**Studios:** Blue Label Interactive (Los Angeles); Hudson Soft (Tokyo, Sapporo, San Francisco); Konami Computer Entertainment (Tokyo); Konami Software Shanghai; Kojima Productions

**FALLING A FEW NOTCHES FROM LAST YEAR'S POSITION, KONAMI COMES IN** with higher revenues on slightly lower review scores and fewer releases, this time round. PRO EVOLUTION SOCCER and WINNING ELEVEN titles proved big money-makers overseas, and in the U.S. METAL GEAR SOLID: PORTABLE OPS and DANCE DANCE REVOLUTION were successful.

Konami's overall survey showing was above-average, but commenters were quick to point out the company's increased reliance upon METAL GEAR SOLID, for better or for worse, with one reputation survey commenter adding: "Fantastic performance in Japan, but stagnant offerings stateside. They're due for a resurgence in 2008 with METAL GEAR SOLID 4."

It certainly looks as if a key differentiator going forward will be the company's ability to grow new franchises from scratch—something it's not always executed on in recent years but seems poised to do with titles like DEWY'S ADVENTURE.


## 16. NCSOFT

**Year formed:** 1997
**Headquarters:** Seoul
**Studios:** ArenaNet (Bellevue, Wash.); Austin; Seoul

**THIS KOREAN-HEADQUARTERED MMO PUBLISHER GARNERED USUAL HIGH** review scores, particular for the GUILD WARS series, but had an extremely slim release schedule this year, along with relatively even revenues. While initially they were headed for a very high score on our overall survey, we detected some rather blatant ballot-stuffing, without which the publisher maintained an average mark in this section.

The genuine comments that NCsoft gained in our reputation survey were positive, if guarded: "Being second-best doesn't seem to have hurt their ideas or ability to execute." NCsoft's biggest Western MMO release this year, TABULA RASA, may determine the long-term future of the firm in North America, and it'll be particularly interesting to see how the company adapts to the continued rise of the 'free to play, pay for items' business model.

# Unreal® Technology News

**by Mark Rein, Epic Games, Inc.**

*Canadian-born Mark Rein is Vice President and Co-Founder of Epic Games based in Cary, North Carolina. Epic's Unreal Engine 3 has won Game Developer Magazine's Frontline Award for Best Game Engine for the past three years and Epic was recently awarded Best Studio at the Spike TV Video Game Awards. Epic's Gears of War, won Gamespot's overall Game of the Year and sold over 4,000,000 units on Xbox 360. Epic is currently working on the Unreal Tournament 3 for publisher Midway and a PC version of Gears of War for publisher Microsoft Game Studios.*

**Upcoming Epic Attended Events:**

**Lyon GDC**
**Game Connection**
Le Palais des Congrès de Lyon
December 4-6, 2007

**GDC 2008**
San Francisco, CA
February 18-22, 2008

Please email:
mrein@epicgames.com
for appointments.

POWERED BY UNREAL TECHNOLOGY

## CUSTOMER PROFILE: VIRTUAL HEROES ARE SERIOUS ABOUT GAMES

The Serious Games Initiative (www.seriousgames.org), a Washington based effort that works to develop and track the field of serious games, currently estimates that the market for serious games is $100M and predicts that it will grow to be a billion dollar market within the next decade.

Virtual Heroes recently lured famous videogame creator Takayoshi Sato to their offices in North Carolina from Electronic Arts Los Angeles studio, where he was producing an original game. The creator of Konami classics like Silent Hill said he enjoys working with Unreal Engine 3.

"As the director of visual design, I'm pushing what we can do with art using the Unreal Engine 3," said Sato. "This technology allows a relatively small company like ours to create these types of large projects. It gives us a very solid foundation to build upon. In the past, a small developer would have to create everything from scratch. We'd need an engineer for the particle engine and all those types of details. Now we don't have to worry about that."


Virtual Heroes uses Unreal Engine 3 to teach emergency rescue workers how to react to natural and terrorist-related disasters.

Sato is working on one of Virtual Heroes' premiere initiatives. This project is a new online game, in the same vein as America's Army, that has been commissioned by the United States Department of Homeland Security to teach emergency rescue workers how to react to an assortment of natural and terrorist-related disasters. The game will allow 64 players to work together in any one of five scenarios set across a fictitious U.S. city that's actually an amalgamation of New York, San Francisco and Los Angeles.

"What we're doing has social messages and themes," said Takayoshi. "This could be the closest thing to pure art that a game company has ever done."

Sato said there are similarities between his work in the consumer gaming industry and his new foray into serious games. He said authentic virtual humans are still the focus and serious games still need to be entertaining. What it adds is an emotional element, especially with the disaster scenarios that this game offers, which includes everything from earthquakes to biological incidents and chemical agent releases.

Heneghan said the power of Unreal Engine 3 has allowed his small team of developers, which includes scientists, Hollywood veterans, educators, instructional designers, and game makers, to focus on the other aspects of the game.

"There are a lot of things are going on in this game, including vehicle physics with component damage, ballistics, and voice-over-internet- protocol (VOIP) where we track all the voice channels for up to 64 players in real-time," said Heneghan. "The efficiency and robustness of Unreal allowed us to build all of this on top of it. We have other problems to solve besides rendering, networking, dual core GPU usage, user interface and level scripting. Unreal enables us to focus on linking learning objectives to demonstrable performance parameters in the context of 3D learning scenarios while providing a meaningful assessment on the learner's proficiency.

In addition to its Homeland Security project, which is slated to go live in summer 2008, Virtual Heroes is working with a variety of different health industry clients, including Duke University Medical Center, George Washington University Medical Center, National Institute of Health, Agency for Healthcare Research and Quality, Durham Veteran's Administration Hospital, and nContact Surgical.

For more information on Virtual Heroes visit:
http://www.virtualheroes.com

## FARAMIX ENTERPRISES LICENSES UE3

Up and coming California game developer, Faramix Enterprises, announced last week that it has licensed Unreal Engine 3 in conjunction with the development of their next-generation first-person shooter. The CEO of Faramix stated that Unreal Engine 3 "would enable our development team to effectively produce the ground breaking quality we've always envisioned".

EPIC GAMES

For UE3 licensing inquiries email:
*licensing@epicgames.com*

For Epic job information visit:
*www.epicgames.com/epic_jobs.html*

**WWW.EPICGAMES.COM**


## 17. DISNEY INTERACTIVE

**Year formed:** 1994 (previously Buena Vista Games)
**Headquarters:** Burburbank, Calif.
**Studios:** Avalanche Software (Salt Lake City); Fall Line Studio (Salt Lake City); Propaganda Games (Vancouver, British Columbia); Black Rock Studio (Brighton, UK); Junction Point Studios Inc. (Austin)

**A NAME CHANGE (FROM BUENA VISTA) AND A YEAR LATER, DISNEY'S GAMES** division has blossomed into its own, handling mainly licensed titles related to Disney franchises, but starting to build some major internal studio and original IP strength.

A publishing deal with Tetsuya Mizuguchi's Q Entertainment brought some notable cred, and the acquisition of Warren Spector's Junction Point provides interesting creative possibilities for the company. This courting of auteurs stands in some contrast to its averagely-reviewed, but smartly positioned strong-selling lineup using the many Disney-related IPs.

However, mediocre reputation responses such as "Does what it says on the tin" reflected slightly less well on Disney Interactive this year, with the company's new acquisitions likely to move them beyond the tin in years to come.


## 18. ATLUS U.S.A.

**Year formed:** 1991(as Asuka)
**Headquarters:** Irvine, Calif.
**Studios:** subsidiary of Atlus Co., Ltd., Tokyo

**ALTHOUGH TINY IN TERMS OF REVENUE, ATLUS' CONSISTENTLY STRONG,** consistently niche U.S. division made it onto our list this year, sneaking in at #18. High average review scores and favorable marks from our feedback survey helped the publisher rise, with one commenter claiming: "This year, they surpassed Square-Enix in quality, originality and vastly superior localization."

A diversified schedule including proven genres on proven platforms—along with some forays into more casual styles on the DS has helped Atlus bring over some of the most intriguing niche Japanese RPGs, while still catering to its strong fanbase. One reputation commenter remarked that they are "always out there for the hardcore gamers. Often unloved but never forgotten."


## 19. LUCASARTS

**Year formed:** 1982
**Headquarters:** San Francisco
**Studio:** San Francisco

**LUCASARTS DROPS TWO NOTCHES THIS YEAR FROM ITS FORMER #17 SPOT.** Lucasfilm's games-only subsidiary has maintained a slim, if careful release schedule for several years now—but LEGO STAR WARS II proved a notable mainstay during the past year, with brisk sales across all of its many platforms.

Once again, high average review scores kept LucasArts on the list this year, but unfavorable feedback on our survey contributed to its slip. Detailed survey commenters did not mince words about their experiences with the company, throwing in phrases such as "micromanaged", and respondents in the reputation survey were somewhat harsh—particularly in the lack of strong titles using the company's core franchises.

This ignores the notable success of family titles such as THRILLVILLE, however, as well as other moves to diversity. Going forward, the technology thrust behind key, yet-to-be-launched STAR WARS and INDIANA JONES titles will likely cause a major shift to the publisher's ranking in years to come.


## 20. MIDWAY

**Year formed:** 1988
**Headquarters:** Chicago
**Studios:** Austin; Chicago; Los Angeles; Pitbull Syndicate (Newcastle, U.K.); San Diego; Surreal Software (Seattle)

**HANGING ON ONCE AGAIN AT THE BOTTOM OF OUR RANKING, MIDWAY IS STILL** ramping up for its next-gen splash with soon to be released or just-debuted games such as BLACKSITE: AREA 51 and STRANGLEHOLD—and diversifying to the same kind of balanced portfolio that bigger players maintain.

But few titles and a mixed reception across the board—both original titles and licenses—have kept revenues and review scores low this year. Some of the Top 20 Publishers reputation commenters were notably down on the company, especially given their recent output, but others expect a change in the winds for Midway with this new batch of titles: "Genuinely putting out (or about to put out) some distinct and worthwhile titles at last", and: "They seem to be refocusing, their new games are promising."

# TESTING SUPERSTAR!

Seapine

## TestTrack® TCM

### The ultimate tool for test case planning, execution, and tracking.

How can you ship with confidence if you don't have the tools in place to document, repeat, and quantify your testing effort? The fact is, you can't. **TestTrack TCM can help.**

In TestTrack TCM you have the tool you need to write and manage thousands of test cases, select sets of tests to run against builds, and process the pass/fail results using your development workflow.

With TestTrack TCM driving your QA process, you'll know what has been tested, what hasn't, and how much effort remains to ship a quality product. Deliver with confidence—be a testing superstar!

- Ensure all steps are executed, and in the same order, for more consistent testing.
- Know instantly which test cases have been executed, what your coverage is, and how much testing remains.
- Track test case execution times to calculate how much time is required to test your applications.
- Streamline the QA > Fix > Re-test cycle by pushing test failures immediately into the defect management workflow.
- Cost-effectively implement an auditable quality assurance program.

**Seapine ALM Solutions:**

**TestTrack Pro**
Issue & Defect Management

**TestTrack TCM**
Test Case Planning & Tracking

**Surround SCM**
Configuration Management

**QA Wizard Pro**
Automated Functional Testing

Download your **FREE** fully functional evaluation software now at **www.seapine.com/gametcm** or call 1-888-683-6456.

Seapine Software™

>> ed pechorro

# UML AND YOU

## HELPING GAME CODER COMMUNICATION THROUGH UML

**A COMMON CHALLENGE IN GAME DEVELOPMENT IS CODERS** collaborating on and communicating technical design in a practical way; that is, working together on what and how they're going to code. This challenge is increasingly difficult in our industry as the technical demands and complexities involved in game development grow and the number of participants in game development teams increases. Both these factors call for greater and better technical communication during the project lifecycle.

Looking beyond the game industry to other sectors, a widely used mature software engineering tool exists which can help coders with this challenge: Unified Modeling Language (UML), the de facto industry standard for modeling object-oriented systems. UML is defined, specified, and maintained by the Object Management Group (OMG), a not-for-profit industry consortium comprised of IBM, Oracle, Unisys, Borland, Sun, Lockheed Martin, Fujitsu, Hewlett-Packard, DaimlerChrysler, Motorola, Ericsson, France Telecom, and many other companies.

Formal modeling-languages have helped architects, business modelers, project managers, coders, and other project stakeholders to model, roadmap, communicate, and document the constituents of software development. A formal medium is used here because natural-language, although powerful, is not really built for this type of work—perhaps, for pre-historic humans the need to engineer software wasn't quite up there with harnessing fire, hunter-gathering, etc. In contrast to natural-language, UML is a modeling-language with a useful diagrammatic notation. UML is also standard, which is important since, generally, communication is based on a common understanding between its participants, that they share a common set of rules, regulations and vocabulary.

Although not widely adopted in the game industry, UML has already proved to be a valid and useful tool for some game developers and has been touched on in some game industry literature.

**ED PECHORRO** *is a programmer at Eidos, with internal team Beautiful Game Studios. He has used UML in other commercial sectors prior to joining the games industry, and is an OMG Certified UML Professional. He also has a Ph.D in Natural Language Processing. Contact him at* **epechorro@gdmag.com**.

# UML AND YOU

This article focuses on the what, why, and how of UML, including its role as a communicative vehicle for design patterns. (Like UML, design patterns are part of the common vocabulary for object-oriented design.) We'll also explore some documented pitfalls of UML use.

## BUT, REALLY, WHY BOTHER WITH UML?

There's nothing necessarily wrong with or stopping me from doodling an object-oriented design and making up an informal notation for it on the fly—let's call it MyOwnSquigglesOnTheFlyML. After all, the ultimate objective of my task is to satisfy its requirements with timely code of sufficient quality and along the way I wouldn't want any design creativity to be constrained by use of another language for modeling and the constraints that may go with that language. I may just want to doodle something if I need to with lines, boxes, and arrows. Therefore, sketching a design using MyOwnSquigglesOnTheFlyML may suffice.

That's perfectly fine if it's the most productive path to successfully satisfy the task objective. On balance though, I will usually choose UML over MyOwnSquigglesOnTheFlyML for a number of reasons:

- UML saves me a lot of time trying to think up my own language and notation for design.
- The UML specification, having been developed and used over many man-hours by many engineers over many projects in the software industry, is likely to be more robust and to have had more issues ironed out than MyOwnSquigglesOnTheFlyML.
- UML is a standard language, and therefore is more likely to be understood in my development community.
- I'm able to glance at UML sketches I've made on previous days and know exactly what they mean, which MyOwnSquigglesOnTheFlyML hasn't always guaranteed due to its non-existing specification.
- Since UML is standard and is used widely in software development, many tools exist if you wish to describe your object-oriented design via software rather than just pen-and-paper. These software tools are powerful and facilitate design. Googling for MyOwnSquigglesOnTheFlyML tools hasn't proved to be particularly successful so far.
- UML is flexible and simple enough to easily pick up, though also has enough depth to describe very complex object oriented systems, including the nuances of code-level matters and big-picture architectural designs.

Proper use of UML, as with any other tool, needs an appropriate context. Let's take a look at several practical scenarios of UML use, and the sorts of associated tools that can help us.

## PRACTICAL USE OF UML

For game coders, certain styles of collaborative work on object-oriented design—technical design meetings, discussion of code constraints for implementing new game design, impromptu chats on refactoring, team brainstorming—call for a fluid, flexible, and immediate medium. In assisting natural language, UML is a good communicative vehicle here as it welcomes simplicity but not informality. Also, its ease of use can introduce new opportunities for individuals on a team to collaborate which may not have existed previously.

In these scenarios, UML novices often immediately jump straight to UML software, when a humble and underrated technology is often more warranted and practical: pen and paper. Sure, as is commonly the case with most technologies, earlier iterations had issues (chisel-and-stone-block had cost concerns, and shredding was particularly troublesome) but that was some time before UML existed.

In more structured scenarios, say those relating to technical specification or any other type of document which roadmaps the software development process, UML tools offer benefits. These constrain the user to allow only what the modeling language allows, thus helping maintain integrity of the model. Such tools offer easy model maintainability, and exhibit the advantages traditionally associated with documentation tools.

## WHAT TOOLS TO USE?

There are many UML tools out there of varying cost and functionality, and this is not the place to review them all. Rather, let's consider some of the criteria to use when deciding which tool a team should adopt.

*Modeling or diagramming?* UML is a modeling language with a useful diagrammatic notation. In adhering to the language, a UML tool will guide and constrain the modeling process in order to maintain model integrity. Pure diagramming tools offer the diagramming experience via the icons and symbols of UML without conformance to the underlying UML language.

*Does the tool allow for XMI import and export?* XML Metadata Interchange (XMI) is the commonly used format for exchanging UML models between tools. If you don't want to be tied down to a particular UML tool by having to adhere to its proprietary save format, investigate whether the prospective tool offers XMI functionality. You may also find novel opportunities to parse and process the XML-ized UML model in your game development pipeline.

*Forward- and reverse-engineering.* Many UML tools don't offer a mapping either to or from code. Those that do might not offer the service for your programming language of interest, nor allow the extensibility of UML required.

*Is the loading of design-pattern snippets needed?* Some tools allow for the easy loading of architectural snippets. This may not be as useful as it first sounds, considering design patterns only make full sense in the context of the issues they tackle.

*UML 2 versus UML 1.* As UML has matured, it has undergone a major version change, with the advent of UML 2; the current UML specification is version 2.1.1. Some tools adhere only to UML 1, whilst others adhere to UML 2. Appreciating which version of UML specification a tool observes could be useful.

*Conformity to full UML specification.* Many UML tools don't offer the full suite of diagrams offered by the UML specification. Consider which UML diagrams your development process may call on. Otherwise, you could find yourself inconveniently changing UML tools mid-project. This might involve investigating whether non-coders in your studio, say game designers, might need the tool as part of their development process.

## BEST PRACTICES

Having chosen your UML tool, some recognized UML best practices are in order. The following are apt in a game development environment.

*Less is sometimes more.* If the system you're modeling has a widget that's irrelevant to the particular diagram you're constructing, don't include it in the diagram. This clarifies the intention of the diagram and doesn't necessarily imply that it's

# learn network inspire

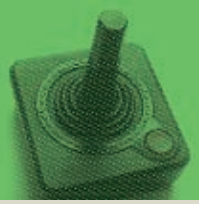
GameDevelopers Conference 08

February 18-22, 2008
San Francisco

Visit gdconf.com for more information & event updates

**www.gdconf.com**

2008



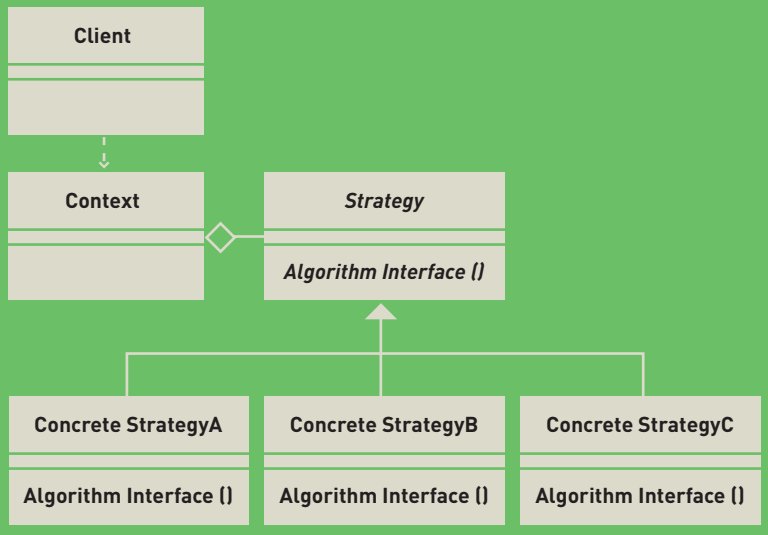



FIGURE 1 **An overview of a shoot 'em up design snippet via UML.**

incomplete. For instance, class diagrams need not display operations or attributes of a displayed class unless they're intrinsic to the motivation behind the diagram.

*Be clear in scope.* Be clear about the scope of your diagram ahead of time so that it doesn't become unnecessarily complicated and unclear. For instance, a good Sequence diagram will display a specific scenario of interaction, rather than a complete and exhaustive picture of viable interaction between the diagrammed connectable elements.

*Annotate diagrams.* UML comments are a powerful utility to furthering diagram readability. If comments happen to clutter a diagram, just replace them with a simple reference comment which points elsewhere in technical documentation. Notes may offer an informal semantic description to class diagrams in the form of pre- and post-conditions, code, pseudocode, Object Constraint Language (OMG's formal language for logic and constraints), or proprietary game-script.

*Choose the right diagram for the job.* UML offers a broad portfolio of diagram types. Understanding the UML diagram ontology will help you find the right type for the task.

*Build a team document on UML guidelines.* This is akin to a coding standard, and serves a number of purposes. First, it gets new team members up to speed on local UML practice. Second, it helps maintain UML style consistency across the team. And third, it communicates the team's policy on mapping between UML and code. This clearly conveys the team's interpretation of UML in the context of its mapping to code.

## EXTENDING UML

UML was designed to be independent of any particular programming language, while still keeping programming languages in mind. There's a lot of direct and easy correspondence between C++ and UML. Tools need an exact mapping between the UML and code if they're to produce code from UML. We programmers like to know this mapping, too, as it helps us appreciate what UML elements ultimately become.

Some correspondence, however, is not so clear, since some areas of the UML specification are open to interpretation as to how they might map practically to C++. For example, different coders could have different interpretations of how the flavors of UML aggregation should be realized in code. Here, UML guidelines can clarify the studio's interpretation of the mapping between UML and code, maintaining a consistent local UML dialect.

There's also C++ which has no correspondence at all in UML. For instance, UML primitive data types are limited to Integer, Boolean, UnlimitedNatural, and String, and UML cannot represent references, pointers, structs, and other C++ stuff. Only by extending UML can the correspondence exist here. UML has a built-in mechanism, in the form of profiles, tagged-values and constraints, to allow language extension. The absorption of C++ widgets into UML is necessary in UML tools which offer forward-engineering to code.

UML extension may also help other game development specialists, such as tools developers, online system architects, and game designers, to mold UML in a consistent manner within their team for their specialized domain. For instance, a front-end team could all work on the same specialized extension of UML, with added semantics and symbols to suit their particular work on representing user-interface flow via Activity Diagrams.

## UML AND DESIGN PATTERNS

UML is also a useful medium for noting interesting and useful architectural snippets during your project. Indeed, in the software development community, the formal cataloging of good reusable code design has been a significant activity in promoting productivity. Known widely as software Design Patterns, these are cataloged snippets of good object-oriented design that have been found to work well, many times by many coders on many projects.

The definitive text for software Design Patterns is *Design Patterns: Elements of Reusable Object-Oriented Software*, by Gamma et al., commonly referred to as the Gang of Four (GoF). The cataloging of patterns includes adherence to a set format per pattern, describing the scenarios to which the pattern is best suited, the object-oriented constituents involved, how it may be implemented, and the "consequences," both good and bad, of using the pattern.

Do not be shy about using GoF pattern names to help label your methods and classes, where possible. This helps to clarify the intention of the code for others on your team. Like UML, these patterns, with their identifying names, can be considered part of our common object-oriented vocabulary, facilitating communication between coders on object-oriented design, saving time and promoting productivity. The use of GoF pattern names in code also helps when faced with a new code base, by helping to arrange an understanding of the strange system into constituent patterns.

Let's look at an example of a GoF design pattern in use. This example is pretty simplistic and does not go into particular coding issues, though it illustrates the usefulness of having cataloged patterns and labels.

## THE STRATEGY PATTERN

Let's make up a game from the ever-so-popular space shoot 'em up genre. The game features aliens swarming downscreen at a constant speed and direction, weapons blazing. Let's pick one simple behavioral difference across the aliens: their firing style. All aliens fire the same weapon, though some fire randomly and others aggressively in short bursts between pauses, while others fire only when they're shot at. To make the game more interesting, let's say we also

INDEPENDENT
GAMES FESTIVAL

THE 10TH ANNUAL

# INDEPENDENT GAMES FESTIVAL

FEBRUARY 20-22, 2008 • SAN FRANCISCO, CA

## CALL FOR ENTRIES DEADLINES:

- MAIN COMPETITION OCTOBER 1, 2007
- STUDENT SHOWCASE OCTOBER 15, 2007

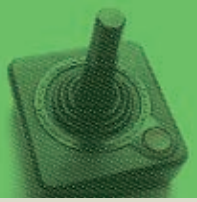
## WWW.IGF.COM

### PLAY THE BEST INDIE GAMES OF THE YEAR

THE IGF PAVILION AT GDC 2008
FEBRUARY 18-22, 2008
SAN FRANCISCO, CA

## WWW.GDCONF.COM

CMP



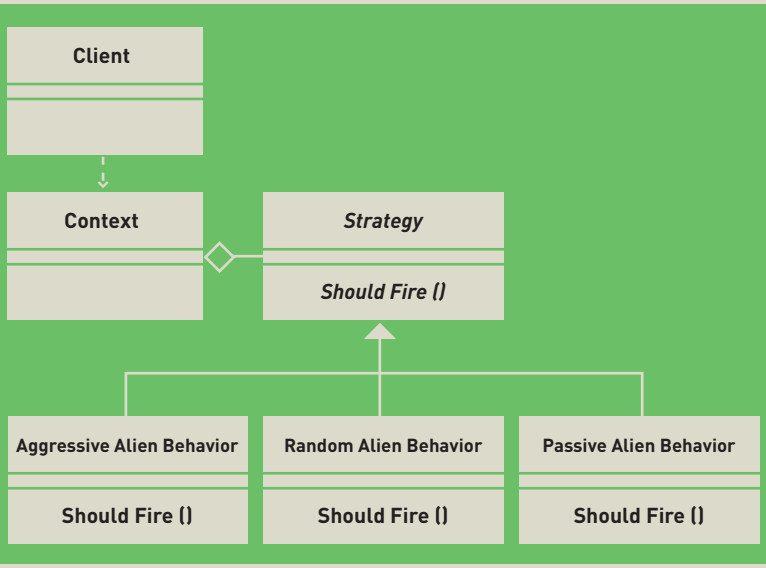



FIGURE 2 **The strategy pattern as applied to the same shoot 'em up.**

want the aliens to switch behaviors every so often, depending on particular game events.

To this end, there happens to be a particular GoF pattern which helps satisfy our design needs, the Strategy pattern. Figure 1 gives an overview of the design snippet via UML, using the same labels as adopted by GoF.

The classifier Strategy, which in a C++ implementation would materialize as an abstract base class, is the parent type for all classes implementing AlgorithmInterface. The Context holds a group of algorithm implementations of type Strategy—let's call them strategies—and delegates to the appropriate sub-class when the algorithm is demanded by a client. This setup serves our current needs and has at least three benefits.

*1. Strategies are encapsulated and hidden behind Strategy.* Each algorithm is nicely encapsulated in its own class, avoiding the logic for algorithm variants being scattered and organized via difficult-to-maintain condition statements. Also, having the family of strategies behind Strategy is tantamount to having sub-system information hiding.

*2. Client and algorithms decoupled.* The introduction of a new strategy involves introducing one new sub-class rather than changing plenty of existing client code entwined with algorithms. Changing a lot of existing code means more time needed for testing, the potential for more things going wrong, and other software-engineering nastiness.

*3. Run-time switching of strategies.* A client need not always be mapped to the same concrete strategy by the Context, since the appropriate strategy is delegated at run-time.

Figure 2 displays the pattern as applied to our game. When called by a Client, which needs to know whether to fire in its given scenario, Context delegates an appropriate concrete firing behavior. The behavior delegated to a particular alien may be consistent through its lifetime or may change at run-time depending on the situation.

If you're thinking that you've seen this sort of design all before, then good. When collaborating in a team or when going through someone else's code, you can just refer to this whole snippet by the name, "Strategy." You knew that, too? Even better. The more of us who recognize and use the common vocabulary of object-oriented design in our community, the easier the communication becomes.

## UML PITFALLS

A tool is only of value if used correctly in an appropriate context. Integration of UML into a software development process necessitates an understanding of UML's limitations as well as its benefits, plus an appreciation that it will not remedy poor process.

No one more eloquently described this than Alex E. Bell, who describes each UML harm as a fever and posits an ontology containing four "metafevers" within which each finer-grained fever is arranged; there are 18 in total. This setup is used to describe the different scenarios by which ill-used UML may appear during a software project.

For example, under the Delusional metafever lies the Abracadabra fever whose victims have an unrealistic expectation of how much information can be interpreted from a UML model. As if magically, certain project qualities are expected to be interpreted from a model. This is particularly susceptible to UML novices. Those struck by 42 fever believe that, in a Douglas Adams-esque sort of a way, UML is the answer to any and all software engineering issues and victims try to use UML accordingly—this is not, however, the motivation behind UML.

The Emotional metafever includes Comfort Zone fever, which sees its victims constructing models, though too many and of too high a detail to justify the (easier-than-implementation) effort. Project over-optimism is one trait of the Pollyanna metafever, and victims of its Square Peg fever exercise their belief that specialized UML tool users, which could be for example game designers and technical architects, are easily interchangeable since they both happen to be able to use the same tool.

Procedural metafever focuses on ill executed software development processes. Open loop fever is in recognition of scenarios where UML diagrams are created for their own sake with no clear aim or stakeholder for the modeling.

Teams considering integrating UML into their process, even if on a very limited basis, would be wise to understand the complete set of fevers.

## HINDSIGHT FROM OTHER SECTORS

Game coders have the benefit of hindsight. Through a significant collaborative effort in other commercial sectors, a standard modeling language aimed at object-oriented systems has developed and matured, and has already been used by large teams on large and complex projects, bringing about recognized best practices. A ready set of tools also exists from this endeavor.

This alone does not warrant the use of UML. As with much software engineering practice, there's a tipping point where the required effort will bring about a sufficient enough economic return. For UML, reaching this point is increasingly likely in the game industry as development teams and their work become larger and more complex.

*Please see* **www.gdmag.com** *for additional code references.*

jobs.ea.com

POSTMORTEM

# REALTIME WORLDS' CRACKDOWN

**PHIL WILSON**, is a producer at Realtime Worlds and oversaw development of CRACKDOWN. He was formerly a project lead at Blitz Games, Yeti Studios, and Rage Games, as well as a design lead at Infogrames and Gremlin Interactive. Email him at **pwilson@gdmag.com**.

**CRACKDOWN IS THE FIRST TITLE RELEASED BY** Realtime Worlds, an independent developer based in Scotland. Over the course of the game's turbulent development, the company grew from a small team of former DMA Design staff headed by Dave Jones, to an award-winning studio of 170 employees housed in a 30,000 square foot office. In addition to this main studio in the heart of Dundee, Scotland, two more have been setup in Seoul and Colorado.

I was producer of CRACKDOWN from almost-but-not-quite the very beginning. Like many projects, the development cycle was a rollercoaster of highs and lows, but despite some truly gut-wrenching sensations, it was a fantastic experience.

## WHAT WENT RIGHT

1 **ART VISION.** The most immediately striking element of CRACKDOWN is certainly its visuals. The project was blessed from the outset with a highly focused and creative art director who defined the perfect style to frame a dialed-up world of intense superhero action from a very early stage. His goal was to create a rich color palette, unique and stylized ambient shadowing, crisp and strong real-time shadows, exaggerated assets, and bold outlines on all the geometry.

We used various reference materials to collectively encapsulate this vision, but the most significant one was a none-too-mainstream Manga title: *Blood: The Last Vampire*.

The Microsoft marketing team was initially quite nervous about the visual direction. It wasn't "safe" and was sure to consume valuable PR cycles explaining the game's style rather than substance. Microsoft at least wanted a catchy handle to hang it all on, but we didn't take them seriously enough, belligerently referring to the concepts as having a graphic novel style. We eventually paid the price when even the specialist press heathenishly branded our lovingly crafted form as cel shaded!

Though we established the visual direction early, creating it was a far more arduous process. The few graphics programmers we had were preoccupied with relatively rudimentary rendering requirements for far too long. By the time we reached the production phase, our vision was still a fragmented series of tech prototypes. The actual game, as the then-Microsoft art lead delicately put it, "still looked like ass." Everyone, not just the publisher, became worried that we wouldn't hit that all-important visual bar.

Then came the X05 event in Amsterdam. Microsoft wanted to tease second-wave titles at its pre-launch event. We weren't ready, and everyone knew it.

The run up to the show was highly charged at all levels and ultimately, despite producing a relatively solid and promising demo, the wrong decision was made in taking the game to the event. Not surprisingly, CRACKDOWN was announced to lukewarm reception; but then it was on the media's radar, and from that point onward, we were subject to repeated requests for screenshots that served only to hang around on the net like a bad smell.

Behind the scenes though, the rendering tech was at last on track. The unsung hero feature was ambient occlusion, an ambient shadowing system embracing the principles of radiosity lighting in a proprietary 3DS Max tool (see the August 2006 Pixel Pusher column for more). The ability to sample millions upon millions of photons in the scene at a fraction of standard radiosity calculation time resulted in an unprecedented level of environmental solidity, with darkness forced into corners for increased dramatic effect.

We made some last minute sacrifices in the pursuit of performance, such as heavily simplifying water reflections, but the result was still stunning and the massive sea change in opinion for the finished product was everything we had hoped for. In fact, shortly after CRACKDOWN shipped, Microsoft conducted a thorough consumer survey that finally vindicated everyone's efforts with one simple fact: Graphics were rated as the number one aspect of the game.

2 **MARKETPLACE DEMO.** "The CRACKDOWN demo is like crack!" This comment came from the Microsoft user test lead, and no statement could motivate a team more.

Whatever you might think of the general quality of content, Xbox 360 Marketplace is a great piece of design. For a game like CRACKDOWN, which we knew most gamers would enjoy if they'd just pick


**DEVELOPER**
Realtime Worlds

**PUBLISHER**
Microsoft Game Studios

**PLATFORM**
Xbox 360

**TEAM SIZE**
71 at peak

**DEVELOPMENT TIME**
4 years

**OUTSOURCING**
Character LODs: Nikitova, Kiev; 60% of gang vehicles: Valkyrie, Seattle; 40% of props: Ketsujin, Kiev; Cut scenes: Realtime U.K., Blackpool; Motion capture: House of Moves, Los Angeles

**RELEASE DATES**
Feb. 20, 2007: box copy
May 11, 2007: downloadable content

# CRACKDOWN

it up, the opportunity to freely distribute the demo to everyone with a broadband connection was a golden opportunity.

We began working on the CRACKDOWN demo roughly five months before the game's completion. This early work mostly consisted of creating an infrastructure to support an alternative build and data configuration, meaning creating a special demo-only code branch could be deferred for as long as necessary.

We heatedly debated how much of the CRACKDOWN experience we should present for free in the demo. Until we heard some reassuring user test feedback, many of us were concerned that Realtime Worlds might only be remembered as those crazy guys who gave away the farm. In this case "the farm" consisted of roughly a quarter of the total game environment, one-third of the game missions, and a generous 30 minute time limit that only kicked in when the player reached a certain level of progression.

Conversely, the decision to include hugely accelerated skill levelling was unanimous because we all accepted that the biggest hook came from just a taste of a fully evolved agent's capabilities.

CRACKDOWN consists of only one level, but unfortunately, it eats up more than 4Gb. Not wishing our demo download's girth to scare away potential players, we cited our maximum as that of previous demo heavyweight—PROJECT GOTHAM RACING 3, which clocked in at an impressive 1.4Gb. By cutting all the audio, video, vehicles, and high LOD environment blocks that we knew couldn't be triggered without leaving the demo district (and then painstakingly replacing those we were wrong about) we eventually hit comfortably below this target.

To the knee-jerk outrage at the news of HALO 3's Beta attachment to CRACKDOWN, the demo was the perfect antidote. Instantly well received and exploding to top honors in the 'most downloaded and played 360 demos ever' list, it was clear that CRACKDOWN was going to enjoy the success we all reckoned it deserved. The gravy came when the team's aspirations for 'Warthog' style fan videos were also realized as hundreds of spectacular sandboxing stunts vied for space on YouTube.

3 **TRUST.** As you'll see in "What Went Wrong," CRACKDOWN was in many ways dealt a poor hand and was forced to play badly until at the last moment, it threw down a Royal Flush. In other words, there was an enormous strain on the publisher-developer relationship until just at the eleventh hour, belatedly, we delivered the game in full and on the initial promise.

At the same time, it would be misleading of me not to say that the relationship between Microsoft Game Studios and Realtime Worlds was simultaneously and paradoxically strong. There were certainly some individuals within Microsoft's production team who were passionate, driven, and great to work with. Additionally, the wider first-party family (traditionally our competitors) were only too happy to help out whenever the need arose. But without one key element, CRACKDOWN might not even have been conceived—and that's trust, albeit the anxious sort, like the trust a parent gives a child when handing over the car keys for the first time.

I've learned the hard way that projects become exponentially less predictable the more unique, groundbreaking features they take onboard. Despite enormous potential for CRACKDOWN to be a shipwreck, senior management on either side of the Atlantic imbued their teams with enough freedom for the project to push back the boundaries of an urban action environment, creating a home to an incredibly engaging sandbox experience. Without belief at all levels, games like CRACKDOWN simply don't wind up on a store shelf.

4 **PASSION.** A good development team is much more than a group of talented people. There needs to be a palpable sense of drive, healthy competition, and synergy such that the sum effect is greater than the individual parts could ever achieve. The CRACKDOWN team had a reassuring buzz about it. People regularly congregated to see what recent progress was causing a stir before dispersing with an increased sense of combined purpose and accomplishment.

Even during the inevitable crunch, when particularly pooped and still facing an overambitious product scope, our indefatigable heroes pressed on, concealing content from the axe man by providing refuge in special extra-curricular projects (strictly speaking not always to be encouraged). If there were a single source of fuel for this teamwide thrust, it was the knowledge that the initial prototype (and subsequent first-playable demo) was a belter.

Video games are creative art, and the best developers are inherently passionate about crafting them. However, there's a difference between developers who willingly give overtime, and managers who demand it.

I admit that at key points in the project, I did strongly urge the team to invest more than their contracted hours. Under the circumstances, and with predominantly the best interests of the project at heart, there was no other option. Unfortunately, this kind of demand subtly degrades the team dynamic and causes resentment. CRACKDOWN's total crunch period varies depending on the definition, but is widely agreed to have lasted far too long. The situation flew directly in the face of Realtime Worlds' first commandment—Thou Shalt Not Abuse Thine Most Valuable Assets—which is actually a doctrine we're better positioned to adhere to more religiously since CRACKDOWN's success.

Toward the end of the main project, the crunches became

steadily more pronounced and, though we reached the mess hall just in time for Christmas brandy and cigars, it also allowed everyone to forget the commitment, professionalism and, above all, passion that came before.

5 **DOWNLOADABLE CONTENT.** We tried to plan the additional downloadable content before we finished the main game, but ultimately the pressure to focus on the project at hand meant it never progressed beyond a few conceptual discussions. Even in the final release phase, where managers could do little more than buy pizza and mop brows, the key architects of a solid plan for new content were lost to an intense program of promotional video production.

In early February, after extensive and undeniably well deserved holidays, and with a thorough plan in hand, work finally began on the new content with roughly half the original team. Just three months later, the package was submitted to certification. In the shadow of a monumental four-year project, 12 weeks sounds almost inconsequential. The reality, though, was that we finally had a stable technology base, and we all had experience working both with it and each other. Not only that, but a sudden boost in efficiency reminded us that check-in logjams were just one reason why we had regularly been pining for the halcyon days of smaller teams.

The greatest key to success for the downloadable content was that the team drove the scope. Naturally, there was some input and guidance from the stakeholders, but the targeted features and content were ultimately derived by the only people who really knew what was possible and worthwhile within the timeframe.

## WHAT WENT WRONG

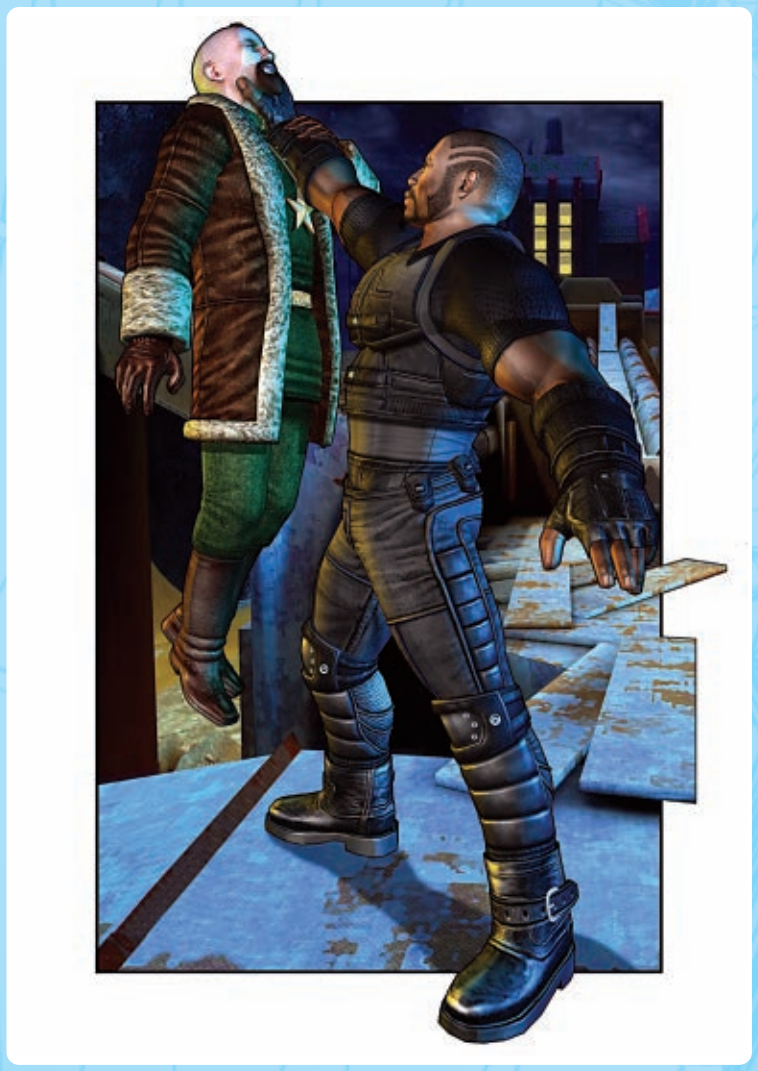
1 **SCOPE AND CHANGE CONTROL.** We got a couple of milestones past our first playable demo (which went down really well but was held together with paperclips and sticking plasters) before feeling the sinking sensation that the project was out of control.

In the face of a great deal of pressure to continue making incremental progress, the production team agreed to immediately derail the entire team from chasing short-term disconnected goals and instead embark on a full-scale project audit. Much of the team was tasked with breaking down the complete design with implementation information so that it could be processed and converted into a simple and solid plan. A multi-disciplinary panel was charged with reviewing the extensive detail of each component in turn so there could be no more complaints that, for example, audio wasn't being given due and timely consideration.

With a pass to add development estimates, resource groups, and stakeholder priorities, the resulting project scope spreadsheet was incredibly cumbersome. The team at large resented it bitterly. Unwieldy as it was, it was still an invaluable tool for at last conducting a meaningful triage of work against available time and resources.

Another shocking reality was that the number of coders yet to be hired was expressed in the order of tens. In a pragmatic development environment there would have been three choices: 1) increase the budget, 2) lower our ambitions, or 3) pull the plug. Unfortunately, the stakeholders were far from pragmatic, and rather than moving to jettison anything that wasn't in direct support of the clearly defined "project pillars," they used the scope discussions as a forum to add yet more ideas.

Several deep cuts were eventually approved (some creeping back in over the remainder of the project), but it still wasn't enough. At least we finally had a handle on the stakeholders' definition of "minimum content."



2 **RENDERWARE GRAPHICS AND CHANGING HARDWARE.** Changing the target platform caused serious problems for CRACKDOWN. Over the course of its four-year development, CRACKDOWN moved from PC (where it was prototyped), to Xbox (where it was initially intended to stay), back to PC (in preparation for move to Xbox 360), to Xenon Alpha, then Xenon Beta, and at last to Xenon/360 Final. Even on the final hardware, we continued to take hits from significant system software updates every few months. When at last the platform stabilized during the last year of development (post hardware launch), development efficiency increased massively.

With a relatively small development team to begin with and difficulty in recruiting experienced staff, the policy was to bring in middleware solutions wherever possible in an effort to reduce development time. By far the most significant of these was Criterion's Renderware Graphics and Studio.

However, we hit the wall full speed when the project shifted


from Xbox to Xenon. Criterion opted not to support Renderware Graphics 3.7 in the transition, forcing us to move to an early beta version of 4.0. Not only was version 4 an unfinished product, but some features that we had come to rely on were not (and would not be) present at all (though in some cases Criterion did provide special code). Since the middleware was suddenly a work in progress, each update came with a whole new set of bugs, transforming us overnight into hapless beta testers. Technical documentation was insufficient and in some cases inaccurate.

In hindsight, we realize that we simply did not adequately investigate the suitability and potential pitfalls of this new version of Renderware. Had we done so, we would have known that the correct decision would have been to back out and replace it all with our own technology. Yet with mounting pressure from the publisher to get on Xenon Alpha hardware (in itself a mistake given its tenuous relationship to the Xbox 360 proper), I'm not convinced the politics would have allowed it anyway.

CRACKDOWN was already in development hell when it was blindsided by Electronic Arts' acquisition of Criterion. Initially, the EA takeover was transparent, but before long the well of excellent onsite support dried up, and we had no option other than to become the world's leading experts in the middleware.

Throughout the Xenon development phase, we had to take new versions of Renderware 4 in support of latest system software releases, which were never backward compatible. Eventually, we stopped taking new versions and rebuilt it ourselves. At long last we had a stable platform.

3 **RENDERWARE STUDIO AND DATA PIPELINE.** Not to dance too lively a jig on Renderware's grave (if only because the people at Criterion were nothing but professional and courteous at all times), but the CRACKDOWN asset pipeline issues began and ended with Renderware Studio.

The initial evaluation of Renderware Studio's capabilities via the available demos was very promising. Unfortunately, we learned too late that these did not scale nearly so well to major next-gen game development. A lot of data that might otherwise have been part of the source code or simple text files was stored in the XML database. As the project grew larger, the task of synchronizing Renderware Studio data with source code became more difficult, with changes to source code often requiring corresponding changes to Renderware Studio data. Worse, a dependency between the structure of the XML data and the contents of the source code header files meant that code changes would regularly break the development environment for the artists and designers.

We were forced to introduce a more onerous check-in system that attempted to reduce the risk of one person single-handedly screwing over what became a very large team, again radically impacting efficiency.

The start-up time and general performance of Renderware Studio suffered heavily as the volume of game data steadily increased. Data sorting and searching was also inadequate so, as the structure became increasingly more complex, changes became correspondingly more dangerous. The inherent design of the system made it impossible to fix this.

When we started porting the game to Renderware 4, it emerged that the matching new version of Studio would not be ready in time. We opted to stay with the old version of Studio by means of some judicious hacking. We were then stuck with old unsupported software and a halfway-house build pipeline. We wasted a great deal of time making two Criterion products work together.

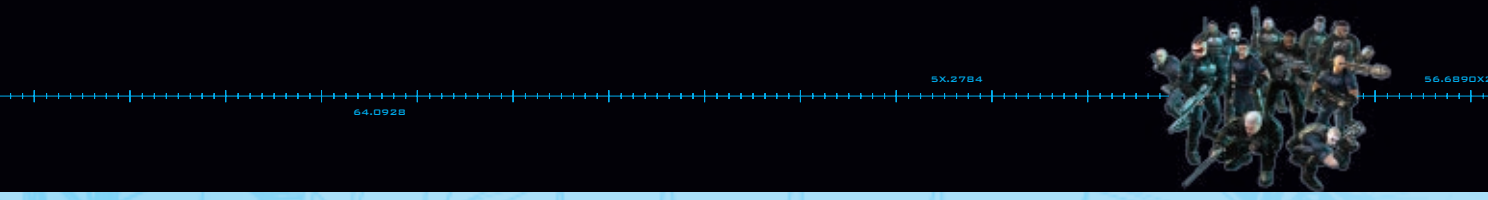
Renderware dominated our tool chain. The testing of a single asset could take upward of an hour, directly impacting productivity and indirectly impacting quality since it naturally discouraged regular testing. One ongoing frustration was that the 3ds Max exporter source was never made available to us, preventing any modification and ultimately leaving us to write an alternative exporter.

Internally, we made various pipeline improvements, largely focusing on the automation of batch asset exports and subsequent error checking. Despite this, our final workflow was massively slower than the comparable environment of Unreal Engine 3. The required pipeline improvements were well understood, but the scope of overhaul and inevitable teamwide disruption made them completely non viable mid-project. We had no choice but to limp on to the finish line.

4 **COOPERATIVE MODE.** Co-op mode certainly wasn't something that we did wrong, far from it. The implementation was spot on and the result was phenomenal. Unfortunately co-op mode was something that, during development, went wrong, repeatedly.

CRACKDOWN was always designed to be a multiplayer experience. The plan was to make arena games running client/server for 8 to 16 players. The first playable demo delivered on Xbox featured a crude four-player version of Stockpile (a competitive game mode that was eventually shipped in the downloadable content pack). Though the game was great fun, the number of NPCs and interactive objects within even a limited arena were sub par for the intended CRACKDOWN experience.

Then came a big push from Microsoft to include co-op in every title. After some fervent head scratching, we concluded that a traditional lock-step solution would be ideal for CRACKDOWN, provided the number of players did not exceed two. Transmitting



only player data meant that the bandwidth requirement would be low and the potential for maintaining an experience that felt pretty close to the solo game was very appealing. The only potential stumbling block was that the game had to be tolerant of roundtrip latencies of up to 200ms. In this worst case scenario, the game's response to control input would be lagged for that same amount of time. The situation was mocked up and although noticeable, was acceptable.

Central to this method was a fully deterministic implementation of all game code. Initially progress was good with only the occasional bug, but soon the mounting pressure caused a knock on of programmer errors (un-initialized data, linking game logic to render data, random number issues). All sync bugs were Severity 1 but needed to be tracked sequentially with no way of knowing how many lay in wait. For a long time, the soul-crushing task of tracking these down fell to just one person whom nobody envied.

Mass scale sync-locked development will always be difficult, but we should have planned to share the burden of identifying the bugs, if not to improve understanding of the key contributing issues, then at least to maintain coder sanity!

5 **UNREALISTIC TARGETS.** Initially, Xbox CRACKDOWN was slated for spring 2005, and this always looked tight. In early 2004, when it was first proposed that we aim to get the game on the next Xbox, we reasoned that our team size would be about 15 to 20 people short. The concern from the Microsoft people with whom we were dealing was that the game did not yet demonstrate adequate progress to warrant an increase; in fact it risked being canned as a result. Thus we soldiered on toward a revised spring 2006 deadline that was determined by virtue of the fact that "adding another platform would surely take roughly another year."

During 2004, the project audit took place, and then we ran headlong into the issues of destabilizing our core middleware. It was certainly a bleak time, and if anything we were drifting away from the kind of demonstrable progress that would leverage the budget to staff up and minimize what was already a guaranteed slip.

In 2005, we at last transitioned to Xenon, and by March, when a new and more bullish Microsoft producer was brought in, we were already starting to make real progress. The new external producer was still a blessing though because he finally managed to kick open the door to new resources, albeit predominantly via contractors.

Under the circumstances, new recruits came on board pretty quickly, but it still takes time to find quality employees (and we refused to lower our standards to fill vacancies faster). As the hiring wore on, we compensated for the shortfall by attempting to find more people and ultimately suffered from having too many cooks in the kitchen and saw diminishing returns.

After the X05 event, the project was public and thus far less susceptible to being knocked down by a business decision. The game's profile was subsequently raised within Microsoft, and additional resources became far easier to appropriate. However, Realtime Worlds could not put itself in the position of having too many employees after the game was released and so refused to staff up any more than was planned at that time.

Microsoft has a policy of reviewing all its titles one year out (OYO). CRACKDOWN's OYO was in October 2005. In our view, progress and control was sufficient to agree that we were indeed looking at a completion date approximately one year later. Microsoft, on the other hand, "preferred" that the title hit before financial year end: We were faced with the unenviable task of driving toward a fairly hopeless May 2006 deadline. As May approached, the spotlight moved to August, and when that evaporated, the sights were set on a tight but realistic October deadline. Eventually we slipped past our original OYO estimate by two months.

## THIS LITTLE PIGGY WENT TO MARKET

Even after so many fires, CRACKDOWN enjoyed the critical and commercial success that we all hoped it would. We like to think that a recent Develop Industry Excellence award for Innovation cements the job as being well done.

The finished product is cast firmly in the sandbox mould. There's no denying it lacked a little in directed content, but where it excelled was in handing over the 'Keys to the City', or, to use Dave Jones' favorite analogy, "providing a giant chemistry set."

# DVD PRODUCT NEWS

TOM CARROLL

### HOLLYWOOD CAMERA WORK

Per Holmes

Six DVDs, nine hours of instruction, and region free operation are only the basics of why anyone involved with creating video game cinematics needs to order and use Hollywood Camera Work. Consider this: the skills required to produce high-end cinematics for video games are no different than those that feature film and television directors and cinematographers use every day. For approximately $400 (obtain a 30% discount on that price by mentioning *Game Developer* in your order) you can immerse yourself in this Master Course that covers the language of camera work and scores of different blocking strategies. Everything is illustrated using simple, but extremely effective 3D models. Hollywood Camera Work is a must for anyone who wants to find their dramatic voice through film making and editing.

*www.hollywoodcamerawork.us*

### HOUDINI: RIGID BODY DYNAMICS COMPREHENSIVE OVERVIEW WITH CRAIG ZEROUNI

The Gnomon Workshop

Zerouni has written animation and rendering software, helped build a motion control rig, animated sequences for zillions of commercials and feature film shots, and even directed a few commercials. His feature film credits include *Daredevil* and *First Knight*. Now he's contributing to the general understanding of Houdini, a software package that put the punch in *Poseidon*, the munch in *Monster House*, and the crunch in *X-Men 3*. Zerouni takes the viewer through the intricacies of rigid body dynamics (RBDs) that start simple (a row of dominoes is simple, right?) and become complex in a hurry (collapse a building). While this DVD is chock full of extremely valuable information, potential buyers should be aware that it doesn't cover cloth or hair simulations.

*www.thegnomonworkshop.com*

### INTRODUCTION TO MACROMEDIA FLASH 8

Digital Tutors

Powerful as Flash 8 is, it isn't really for the faint of heart. That's why it's great to have a basic, getting started-style DVD from Digital Tutors, and what makes it even better is that the DVD contains almost six hours of information about everything from customizing your toolbar (and is there anything more basic than that?) to using scripting to automate repetitive tasks. What I find most satisfying about Digital Tutors' products is that they are more concerned with getting you right into the process and much less concerned with what your process actually yields. You can simply repeat their tutorials, or you can speed the process up by substituting artwork of your own creation. The DVD also works very much like a classroom syllabus where the student receives instruction and then there is a pause for practicing. Highly recommended!

*www.digital-tutors.com*

**The Gnomon Workshop's *Creating a Faery Figure with Wendy Froud***

### PHOTOSHOP CS3 FOR 3D AND VIDEO

Lynda.com

Now that Photoshop CS3 has allowed 3D objects into the 2D club, what can you do with them and just how far can they be pushed? The instructor, Chad Perkins, is basically certified in everything that Adobe makes (as well as a few things it doesn't), so he is well suited to lead the course. Over six hours of instruction, Chad lets the fur fly, delving into manipulating 3D objects on special layers, working with video layers, setting keyframes, animating Photoshop layers, rotoscoping video, and exporting video and animation directly from Photoshop. All of Chad's files are available to viewers, so no one has to start from scratch.

*www.lynda.com*

### MODELING THE FEMALE HEAD (USING BLENDER 3D)

Jonathan Williamson

As Williamson himself says, "One of the most challenging things in the realm of 3D is to create a realistic human head." Luckily Williamson took it upon himself to create a DVD-based video showing himself doing that with Blender 3D. During the approximately 2 1/2 hours of run time, Williamson covers general proportions, specific anatomy, subsurface modeling, and edge loop creation. Through ample demonstration of each step, the complex process is boiled down into an easy to follow structure that will enable anyone conversant with 3D modeling to create a head of their own and to then push their own modeling techniques even further.

*http://montagestudio.org/Site/DVDs.html*

### CREATING A FAERY FIGURE WITH WENDY FROUD

The Gnomon Workshop

Okay ... you're saying the author has lost his mind (and maybe you're right), but there are times when the best way to create a 3D model is to actually create a 3D model, not the kind you make with Maya, Max, or Softimage. This is especially so when defining a new character. If you lack modeling skills, Wendy Froud helps you get started with a quick armature, then provides you with techniques on how to model facial features quickly and easily, and then to even clothe the finished figure. What this lady doesn't know about modeling isn't worth knowing, so feel safe putting yourself in her very capable hands for the 240 minutes it takes to view the two disks.

*www.thegnomonworkshop.com*

**TOM CARROLL** *is a video game artist currently with Rockstar San Diego. He is also a contributor to Twonks and Plonkers, an online comic gallery. Email him at* ***tcarroll@gdmag.com***

# product news

### FALCON 3D TOUCH DEVICE SDK

Novint

Novint Technologies has announced that it will be releasing a free non-commercial software development kit for its Novint Falcon 3D touch feedback device that it says lets "users feel weight, shape, texture, dimension, dynamics and force effects when playing enabled games."

The company hopes that the newly released SDK will let developers incorporate the device into new and existing games and applications and expand the content available for the controller.

*http://home.novint.com*

### SOFTIMAGE XSI 6 MOD TOOL

Softimage

Softimage has released SOFTIMAGE XSI 6 Mod Tool, a free 3D modeling and animation software package for indie and aspiring game developers to create new or modify existing games, with full XNA Game Studio integration.

The package contains the SOFTIMAGE XSI 6 engine, Microsoft XNA support to integrate natively with the XNA Framework Content Pipeline, HALF-LIFE 2 mod support to export 3D characters and assets that can be used in Valve's HALF-LIFE 2: EPISODE TWO, and the enhanced interface built specifically for first-time 3D users. The package is restricted to non-commercial usage, and mod tool files cannot be used with the commercial XSI packages. It has a 64,000 triangle export limit per mesh, and no rendering capabilities, as its assets are designed specifically for use in a game engine.

*www.softimage.com/products/modtool/*

### 3DCONNEXION ADDS BLENDER SUPPORT

3DConnexion

3DConnexion has announced the public beta release of new plugins designed to allow the company's line of 3D navigation devices to work with Blender, a free, open-source tool for 3D modeling and animation. The new plugins include support for Windows, Mac OS X, and Linux versions of Blender. Using the plugins, Blender artists and designers can use 3DConnexion's line of peripherals, including the recently released SpaceNavigator 3D mouse.

3Dconnexion's devices are used as companions to the mouse and keyboard and are held in the alternate hand to simultaneously pan, zoom and rotate camera views as well as 3D objects.

*www.3dconnexion.com*

**Trinigy**
Arbachtalstr. 6
72800 Eningen – Germany
Phone: +49-7121-986 993
Phone: +49-7121-986 994

US Office:
Austin, TX - USA by Nov 2007

www.trinigy.net
Email: sales@trinigy.net

*"Possesses everything necessary to create an ambitious multi-platform next-gen title."*
**Simon Bradbury, Founder & Director at Firefly Studios**

*"Trinigy's Vision Engine has proven to be a reliable and powerful technology."*
**Jan Wagner, Development Supervisor at Take 2 Interactive**

*"Outstanding support."*
**Andreas Speer, Studio Manager at Spellbound AG**

TRINIGY

## Dedicated to Middleware Development since 1999

Trinigy is an internationally oriented, independent company dedicated to game middleware development since 1999. In the field of 3D Game Engines, Trinigy is one of the world's leading companies.

Our Vision Game Engine is one of the industry's most advanced technologies for professional game development and has proven its versatility and reliability in more than 70 commercial game productions all over the world - including Firefly's new multi-platform blockbuster.

## Offering the Perfect Solution for Advanced Game Development

Trinigy's cutting-edge technology powers numerous game titles in Europe, Asia and America. Well-known game companies like FIREFLY, TAKE 2, NEOWIZ, SPROING, THREEWAVE and SPELLBOUND rely on the Vision Engine for developing their games - be they first person shooters, strategy, sports and role-playing titles or massively multiplayer online games.

We offer attractive licensing models specifically tailored to the varying needs of today's game development projects, including full-price A to AAA titles, Value Games and online-distributed console productions.

## Vision Engine 6 at a Glance

- Powerful and proven technology
- Next-Gen multiplatform rendering engine
- Convenient WYSIWYG composing framework
- Easily accessible and customizable, fully genre-independent technology
- Out of the box integrations with leading third-party middleware (AI, physics, UI, foliage rendering)
- Extensive samples, tutorials and documentation
- First-class support and continuous updates
- Multiplatform support: PC, Xbox360™, and Playstation®3
- Special licensing models for Value Games, XBLA™ and Sony® Network titles
- Powering 70+ commercial game productions in Europe, Asia, and America

## Trinigy, Inc. — US Developer Support on-site

Trinigy is known for excellent technical support and customer services. In order to further improve our services on the American market, **Trinigy, Inc.** has been set up in **Austin, TX**. Daniel Conradie, one of the firm's founders and its current Director of Development, will be relocating and heading the office by Nov 2007. Trinigy US will be dedicated to provide highly competent, immediate support as well as customization services to American-based game developers and publishers.

**Welcome to Trinigy - we're looking forward to hearing from you.**

**TRINIGY® VISION ENGINE** – www.trinigy.net

# REPLAY SOLUTIONS

## Deep Recording, No Source Code Mods.

### Instantly Replay Any Bug You Can Find. Seriously.

ReplayDIRECTOR™ gives you **Deep Recording**. This is much **more than just video capture**. Replay makes certain that every line of code that you execute while recording will Replay with the same path of execution through your code. Every time.

Replay works **without source code changes**, and has almost no effect on your frame rate, so you can always have Replay silently recording in the background. You don't need to do anything except turn it on. You can use Replay at any point in your dev cycle. It takes 5 minutes to install, and it won't affect your workflow at all.

### USE CASE: Multi-Player Bugs, 'Project: Snowblind'

**Crunch Time.** Every team knows it. Eidos did, and Replay helped them through it. Multi-player testing is tough enough, but when your developers are in Europe, and your test team is in California, it's tougher. Eidos used Replay to send 16-player game crashes overseas in minutes. Developers pressed 'Play', saw the crash, and fixed it. A new build was out within hours.

"*Because Replay data is so small and reliable, we were able to get the turn-around time down from days, to **minutes**.*"

**— John Chowanec, Lead Producer, Eidos**

### What Does Replay Record?

Replay records **everything, without source code**. Use Replay on your entire game including 3rd party binaries. Here's a short list of the tougher stuff:

1. Multi-thread context switches
2. All User Input
3. Timers & Random Sources
4. Uninitialized Stack & Heap Memory Access
5. Async File, Network, XboxLIVE, Callbacks
6. Assembly Instructions (like RDTSC)

Replay is applied to **compiled-binaries** only. You can always Replay your recordings in any debugger, set breakpoints, single-step and inspect data.

### USE CASE: Memory Corruption Sucks.

Crystal Dynamics had a really tough bug caused by accessing uninitialized memory. Replay records all access to uninitialized stack and heap memory, so if you find that bug once, just press play and see watch it happen again!

"*Replay *__rocks__*. I doubt we'd have found it otherwise. It turned out to be an occasional array overwrite that would cause random memory corruption.*"

**— Meilin Wong, Developer, Crystal Dynamics**

### Do You Have Your Own Replay System?

Maybe you've built your own Replay system for your title already. Maybe it works pretty well. Ask yourself these questions:

A. Does it always work when you need it?
B. Can you replay async IO and multi-thread race conditions?
C. Does it replay uninitialized stack and heap access crashes?
D. Can you add 3rd party libraries and new code without breaking it?
E. Do you spend resources keeping it working during the dev cycle?

Wouldn't it be great to get back all the time you spent tracking down those hard-to-reproduce bugs?

ReplayDIRECTOR can be dropped into your project at any point. You don't need to learn any new tools, or change any source code. It won't affect your game's performance, and records only 800kb/min. Replay will simply help you fix your bugs in up to **half the time**.

**Replay Solutions is a certified Microsoft XBOX 360 tool provider.**


**Replay Solutions, Inc.**
1600 Seaport Blvd., Suite 310
Redwood City, CA, 94063
877-400-7444
650-472-2208

www.replaysolutions.com
Email: info@replaysolutions.com

WHY USE REPLAYDIRECTOR?

- Requires No Source Code Mods
- Applied to compiled-binaries only
- High-Performance
- Records only ~800kb/min
- Patent Pending Technology
- Available now on Windows XP, Vista and XBOX 360
- Ask us about PS3 support!

DOLBY®

**Dolby Laboratories**
100 Potrero Ave.
San Francisco, CA 94103
Phone: (415) 558-0200
Fax: (415) 863-1373

www.dolby.com
Email: game@dolby.com

## You've Heard the Dolby Difference. Now See it!

For years, game developers have striven to deliver vivid, dynamic visuals through high-dynamic-range (HDR) imaging techniques. Though these techniques have improved the visual experience for gamers, the dynamic range limitations of existing consumer display devices prevented the realization of a true HDR experience.

Dolby is introducing display technologies that address LCD display limitations through proprietary technologies using locally modulated LED backlighting rather than fluorescent tubes. The result is a striking image that matches the full dynamic range of what the human eye can see—true black, pure white, and all the shades in between.

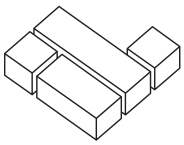
For games, Dolby® HDR is a breakthrough that equals the introduction of high-definition graphics.

With Dolby technologies, developers will be able to deliver visual experiences with unparalleled realism, detail, and richness. From the bright flash of an explosion to the deepest shadow detail—all within the same scene—games will look better than they ever have.

Dolby invites interested developers to sign up for our mailing list by contacting us at game@dolby.com.

### WHY DOLBY HDR?

- Dolby technologies address LCD display limitations through proprietary technologies that use locally modulated LED backlighting rather than fluorescent tubes.
- Images match the full dynamic range of what the human eye can see.
- Brightness levels are precise for each portion of the image.
- Dimming technology enables gamers to experience games in true HDR—with true blacks, pure white, and all the shades in between.
- Delivers a visual experience that is more real than ever before possible.



# ILLUMINATE LABS

## Lighting the Next Generation of Games

Based on the proprietary LiquidLight® technology, Illuminate Labs develops and markets rendering and baking technology especially tailored to satisfy the needs of next-gen games developers. Reference clients include Bioware, EA, Guerrilla, Ninja Theory and Sony.

## Turtle

Turtle is Illuminate Labs' product for Autodesk Maya and the only product on the market that combines advanced rendering technology with sophisticated baking functionality in a single integrated toolset. Turtle's speed, ease-of-use, and other advanced features have won many fans among game developers, and Turtle is currently being used for example for the upcoming Heavenly Sword and for the highly-anticipated Killzone 2.

## Beast

Beast is Illuminate Labs' platform-independent pipeline product, allowing its users to add global illumination and extremely powerful baking functionality to their internal tools. Beast is today used by EA Digital Illusions (the studio behind the Battlefield series), who has made an integration with Unreal Engine for the lighting of their new title Mirror's Edge.

## Free trial

Wanna know what all the fuss is about? Why the big game studios are using Illuminate Labs' tech for lighting and baking? Don't take our word for it, try it out for yourself. Log on to www.illuminatelabs.com for a free evaluation copy of Turtle and more info on Beast.

*"Turtle delivers on every level of performance that we need it to. It just works! All this, coupled with awesome support, makes this product invaluable in our pipeline."*

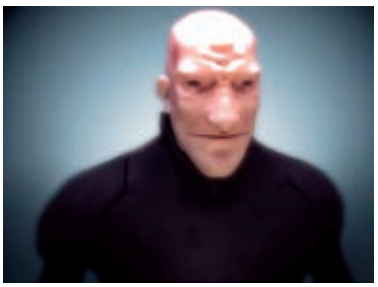
**Roderick van der Steen, Senior Specialist Artist, Guerrilla**

*"The fact that you can use all the rendering power and functionality in the baking and combine it with things like PTMs makes Turtle truly a one of a kind tool for next-gen development."*

**Jason Smith, CG Supervisor, Burnout Electronic Arts**

*"Turtle has proven by far to be the best option in our pipeline and I'm really happy that we're using it now. I'm also really pleased with the clear and concise responses we've received from Illuminate Labs' tech support."*

**Damon Iannuzzelli, Lead Character Artist, Insomniac Games**



**Illuminate Labs AB**
Forsta Langgatan 20
SE-413 28 Gothenburg
Sweden

www.illuminatelabs.com

### CORE TECHNOLOGY OVERVIEW

- Advanced Global Illumination
- Micropolygon Displacement Mapping
- Ambient and Reflection Occlusion
- HDRI and Image Based Lighting
- Anti-aliasing with advanced edge tracing
- LUA script shaders
- Radiosity Normal Mapping
- Spherical Harmonics
- Polynominal Texture Maps
- Programmable baking

MICK WEST



# THE ELUSIVE HEISENBUG

## How to uncover the indiscoverable

**A HEISENBUG IS A TYPE OF BUG THAT** disappears or alters its behavior when you attempt to debug it. The word "Heisenbug" is a slight misnomer, referencing Heisenberg's uncertainty principle, which describes how, in quantum physics, it's impossible to know both where something is and how fast it is. A related phenomenon is the observer effect, which says you cannot observe something without altering it; this observer effect is what causes the problems we call Heisenbugs.

Heisenbugs are common in game development, most frequently in lower level code. A programmer may encounter several such bugs in the course of development, and a failure to appropriately handle them can seriously derail development, as it may take many days to track down the elusive bug.

This article discusses some of the causes of Heisenbugs, and gives some guidelines for avoiding them and tracking them down.

### RANDOM CAUSES

The causes of Heisenbugs are as varied as the causes of regular bugs. But some types of cause are more likely to result in a Heisenbug. Typically, those bugs are highly dependent on what are essentially random factors that lie outside the programmer's control.

The most literal example of this would be a bug that's caused by the generation of random numbers. Perhaps a table overflow bug might only occur when two particular random numbers are generated in sequence. Random number generation is really not random; you're usually just generating deterministic but random-looking numbers in sequence. But because the amount of numbers generated can be affected by the game state, which is in turn affected by the user input, then these pseudo-random numbers quickly become unpredictable.

To remove this possibility, try making the random number generator return the same number, and see if the bug still occurs.

Other essentially random factors could be the addresses of dangling pointers, the order of data processing in multi-threaded algorithms, the contents of an unflushed cache that's underwritten by DMA, the contents of uninitialized memory (discussed later), the assumed state of a GPU register, user input (especially analog), read and write times for persistent storage, or the persistence of values in improperly synchronized memory (volatile variables). The key diagnostic technique here is to try to eliminate all sources of randomness or indeterminism.

### UNINITIALIZED MEMORY

Often when memory is allocated, or variables are instantiated, they are not set to any particular value. Generally, this is not a problem, as the code that uses that memory should initialize it to some meaningful value. However, badly designed code, or code that's extended without fully understanding the full implications of the extension can introduce code pathways which result in memory being used before it's been initialized. This will result in a Heisenbug if the uninitialized value is generally the same value, but under certain circumstances, the value changes because of changes in the flow of unrelated logic.

That's a fundamental problem with Heisenbugs: They often appear to be related to some kind of game function that is in fact basically unrelated. For example, "The game glitches when I open a box." This can result in a wild goose chase, where you focus your efforts on what seems to be the cause of the bug (code related to opening boxes) and the real problem is in something entirely unrelated.

This can cause problems with assigning bugs to the correct programmers. If a bug is assigned to the game object programmer simply because the glitch happens when boxes are opened, then you may have a programmer fruitlessly spending several days trying to track down a bug that has nothing to do with him or her.

This can be highly problematic if the assigned programmer is a junior programmer and is unfamiliar with such problems. For this reason it's important that such imprecise bugs be evaluated by a more experienced programmer, allowing junior programmers to ask for help if their hunt for the bug leads them out of their domain.

Uninitialized memory Heisenbugs can be tracked down by initializing memory to a known value, but one that's more likely to cause a problem than zeroing the memory, such as 0x55555555.

Uninitialized variables can be nipped in the bud by having your compiler not allow them. This may be a language default, such as in C#, or a warning, such as in C++. If it's an available compiler warning, then it's highly advisable to make this be an error so the code will not compile with this warning. While this solution may require a few minor annoying code changes to get around the warnings, it's generally preferable to the problem of last minute debugging of a Heisenbug, lost in a stream of compiler warnings.

### MEMORY CORRUPTION

One of the hardest types of Heisenbug to track down is random memory corruption. In this bug, with random frequency and at a random point in time, a random location in memory has a random value written to it. The less randomness involved, the better for the debugger.

If it happens at a particular time, you can try to determine what exactly is

**MICK WEST** *was a co-founder of Neversoft Entertainment. He's been in the game industry for 17 years and currently works as a technical consultant. Email him at* ***mwest@gdmag.com****.*

going at that time. If it's at a particular location, you can trap the write or look into what code or data has pointers to that location. If the value written is always the same, then that might hold a clue. If it's always 0x3fe80000, then that's 1.0f in floating point, so ask what might be storing a 1 in memory.

If it's totally random (but reasonably frequent) that's actually fine too, as writing to random locations can usually be caught in the debugger. It will eventually write to an illegal location, and you can set a write access breakpoint on read-only data.

The worst problem occurs when the memory being corrupted is randomly within a narrower range of memory that's constantly being written to by legal processes, such as the stack (used for local variable), or a dynamic heap, where memory locations are constantly being used and reused. In this situation, unless you can narrow down the precise point in time that the bug occurs, you won't be able to observe the corruption happening, or set a breakpoint, as all the other writes in that memory area will obscure the moment of corruption.

If it's difficult to see what's being corrupted and how much, and if you can see the corrupt values after the fact, then again you can try to characterize the corruption from the nature of the data. If a block of three or four words is corrupted—perhaps with values that start (in hex) with 3 then are followed by a bunch of very random digits—then that might be a clue.

In Figure 1A, the corruption isn't immediately apparent in the hex view. But looking at the ASCII data, you can see where things are going wrong. Then looking back at the hex, we see the first three words on the second line are actually very different. They look like they might be floating point values (two of them start with 3), so we switch to floating point view (Figure 1B) and we see that yes, they are very sensible floats—most floats in games are small, usually less than one. Looking closer, we can see they actually form a unit vector.

These are all clues. They don't tell you where the corruption is coming from, but they do tell you a little about it. In this case, something is writing a solitary unit vector to memory and not corrupting the memory on either side. Perhaps you already have some suspects, and this might help whittle them down. Or perhaps this is your first clue, in which case it's a valuable first step, which can help you mostly eliminate many other possibilities (all the code that could not be writing unit vectors).

## TRACKING THE UNTRACKABLE

But how do you find something that vanishes when you look at it? A Heisenbug in a game will come up with a certain frequency. The more frequently it occurs, the easier it is to track down. Even a bug that occurs as infrequently as once a week can eventually be tracked down (although hopefully you would have a few weeks left on the project).

If a bug can't be isolated by normal means, then you must look at circumstantial evidence. What's happening when the bug occurs? What just happened? What was going to happen? Perhaps the bug occurs only on a particular level or in a particular area of the game. Try to build up a characterization of the bug, no matter how vague.

This is a situation in which the programmers would definitely want to enlist the help of the testers. They play the game very differently from how the programmers play it. A good tester will try to make a bug happen more often and will often come up with convoluted theories as to what sequence of events precipitates the bug. These theories are often wildly off the mark, and contain many red herrings, but they also can contain many valuable clues. If a tester can reproduce a bug in a reasonably period of time, even an hour or so, then it's often worth watching the tester do it, as the programmer could quite easily waste several hours or days in fruitless code speculation, when observing some gameplay might provide a clue.

The classic definition of a Heisenbug is one that goes away when you look at it. This is not strictly the case, though. While it's true that you often get bugs that only occur while playing the game, but not when you hook up the debugger or when you recompile in debug more, you can always make some changes to the situation that will tell you more about the nature and location of the bug.

## FIX BY NOT FIXING

Characterizing the bug by describing the gameplay situations under which it occurs (or is more or less frequent) is half the story. The other story is what modification you can make to the code, and how it affects the bug.

If you've gone through the usual debugging methods and failed in isolating this elusive bug, then you need to focus on narrowing it down. A Heisenbug is different from a regular bug. They are sensitive to state changes in the total state of the program. If you remove some code and that prevents the bug from happening, it generally tells you nothing definite about the bug; you've quite possibly simply modified the state so the bug is either removed or hidden. You can't tell either way.

For example, if you suspect synchronization issues, and when you turn off multi-threading and the bug goes away, this unfortunately does not mean that you've isolated the cause of the bug. It's a clue, except that turning off multi-thread so greatly alters the state of the system in so many ways, you might have simply hidden the bug.

On the other hand, if you remove some code and the Heisenbug still happens, then paradoxically this could be much more useful. You have eliminated some code that has nothing to do with the bug, meaning you don't need to consider that code any more, and your field of possible culprits shrinks. If you turn off multi-threading and the bug still happens, that means you can be 99 percent sure it has nothing to do with multi-threading, and you can move on with confidence, having eliminated a huge range of possible causes.

As well as narrowing down the bug, you can try to clarify its location (speeding your tracking) by trying to make it happen more often. You have to be creative here and focus on amplifying the bug. If it seems to happen when more instances of a certain object are in the level, then modify the level so there are hundreds more of those objects. Make bold sweeping moves! If it often happens

```
5c6b6369 73636f64 6d61675c
6e697365  ick\docs\gamesin

3e6fdb1a bd0ee1b0 3f7909cd
6f635c6b  .Ûo>°á.1/2 Í.y?k\co

655c6564 706d6178 5c73656c
6d617865  de\examples\exam
```

**FIGURE 1A** **A hex dump of some ASCII data (file names) with some corruption on the second line. The numbers look like they might be floats.**

```
2.6502369e+017  1.8019267e+031
4.3599426e+027  1.8062378e+028

0.23423424      -0.034883201
0.97280580      7.0364824e+028

6.5049435e+022  2.9386312e+029
2.7403974e+017  4.3612297e+027
```

**FIGURE 1B** **The same data, but viewed in float mode. The numbers that are actually sensible floats are quite obvious.**

when explosion are triggered, then trigger thousands of random explosions. If it happens when running fast, then double the running speed. Stress-test the game until the bug either becomes repeatable or its nature is revealed.

## MAGICAL THINKING

Mental discipline is important when tracking Heisenbugs. Their very nature makes it very difficult to discern anything concrete about them and so even quite wild theories can start to take root in your mind. Perhaps, you might think, your computer or dev kit is malfunctioning. Perhaps there are glitches in the power supply. Perhaps that flickering light is causing EMF resonance in the CPU. Perhaps vibration from passing trucks is jigging a loose component in the motherboard. Perhaps there's a bug in the compiler.

This is magical thinking. It is tempting to ascribe some esoteric cause that will absolve you from guilt, but it's rarely true. You can waste a lot of time entertaining these remote possibilities, especially with bugs that are highly intermittent—so don't. If you suspect your computer, then change it. If you think there are problems with the power supply, then install a UPS or move to a different circuit in another room. Perhaps it was a cosmic ray, but it's vastly more likely there's something wrong with the code.

It's also tempting to blame the compiler. Compiler bugs do exist, but they are very rare. Of all the bugs that the programmer has said, "That can't possibly be a code bug; it must be the compiler," 95 percent of them, in my experience, turned out to be an ordinary bug. If it is a compiler problem, then the solution may require the assistance of someone familiar with the very low-level debugging required during the final stages of tracking this down.

Heisenbugs are mentally difficult for programmers to deal with. It's frustrating to have something that eludes clear methodical debugging and forces you to speculate, experiment, and even debug based on vague statistics. But a single Heisenbug can derail a project, especially if no one addresses it early. Some Heisenbugs crop up only when the system is stressed, which might not be until just before beta, when all the assets and systems are fully incorporated.

## RESOURCES

Goodwin, Steven. *Cross-Platform Game Programming*. Boston: Charles River Media, 2005. See in particular Chapter 6.

Paquet, Philippe. "Debugging Concurrency," Gamasutra.com, June 6, 2005: **www.gamasutra.com/features/20050606/paquet_01.shtml**

Zeller, Andreas. *Why Programs Fail: A Guide to Systematic Debugging*. Boston: Morgan Kaufmann Publishers, 2006. See in particular Chapter 4.

NOAH FALSTEIN

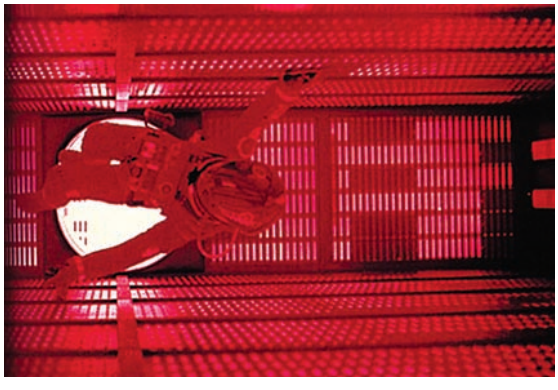


# HAL AND MYCROFT

## A Tale of Two Computers

**ABOUT FORTY YEARS AGO, 1960S** science fiction introduced us to two intelligent computers, one in a movie and one in a book, that still have relevance for us today.

The first was HAL 9000, arguably the biggest star of the film *2001: A Space Odyssey*. HAL is quite a remarkable computer even by current standards, capable not only of speech recognition, facial recognition, and natural language processing to a degree that would be impressive today, but also lip reading, sophisticated reasoning, and volition, even to the point of committing murder.



**Pulling the plug on HAL 9000 in Kubrick's *2001: A Space Odyssey*.**

Many other things depicted in the film are well beyond our current capabilities now, including an extensive moon base, a space station hundreds of times larger than our current International Space Station, routine commuting flights to the moon, and more.

But in two ways, HAL is primitive compared to our current computers. The graphic displays he shows are ugly and monochromatic. And when he plays a game with one of the astronauts, it is merely chess—and not even as intriguing or pretty as an ancient (to us) version like 1988's BATTLE CHESS, but rather an ugly black and white 2D version. Imagine being stuck on a years-long trip to Jupiter and not even having a decent computer game!

### MEANWHILE, IN LUNA CITY ...

More likeable (although ultimately responsible for an even higher body count) than HAL 9000 was Mycroft, from Robert Heinlein's *The Moon is a Harsh Mistress*. Mycroft is a computer in a city on the moon which, in the mid 2070's, achieves a critical mass of processing power and simply "wakes up."

He is in many ways even more human than HAL, and much more sympathetic, with a sense of humor and capacity for nobility and loyalty. But his most impressive technical achievement—in the book he has to devote nearly his entire processing power to this—is to display a realistic graphic video of a synthetic human being good enough to fool people into thinking it is real, something apparently novel in 2075. Granted, we're still not quite at that point yet, although the CG Angelina Jolie currently showing in trailers for the upcoming film *Beowulf* is pretty close. But there's little doubt we'll hit that point in the next decade.

### THE WAY THE FUTURE WAS

Although in terms of space flight we have fallen far short of where science fiction visionaries thought we'd be by now, computer games and computer graphics in general exceeded their wildest dreams. I think we game developers should feel grateful that we get to work in one of the very few areas of technology that has managed to exceed the imagination of some of the best writers of the past.

This also presents us with a challenge as we imagine future settings (and computers) for our game stories. Let's be bold enough to conceive of some images and concepts that will stand the test of time and not seem quaint or naive in another 40 years!

### READERS REFLECT

I've received several interesting emails about my June 2007 column "Reflexes and Reflection." Stephen Triche, programmer and writer with Yatec Games notes, "I think there is a pretty straightforward reason the balance of reflexes and reflection may lean more on the side of reflection. There's a word for reflex with no reflection: instinct. To have a game that offers no chance for reflection is a game based purely on instinct. Sid Meier's famous definition of a game is, of course, a series of meaningful choices. Without reflection, there is no choice, merely reaction based on instinct. Anything that isn't instinct is learned, and learning requires reflection."

Intriguingly, Kevin McClusky, a CTO not in the game industry, counters with the question, "Have you ever gone to a bowling alley or pizza parlor and played AREA 51 or S.W.A.T? Those games are 100 percent reflex."

I'm not sure I agree with the 100 percent figure there, but he did make me think of the old whack-a-mole games where the point is to just hit moles on with a mallet as fast as possible. Although there is a tiny amount of room for strategy, or at least tactics, this does get pretty close to pure "reaction based on instinct," and yet has had some success as a fun game, perhaps exposing a loophole in Meier's definition of a game.

I wonder if we'll still be playing whack-a-mole in lunar gravity when we finally do get our moon base.

**NOAH FALSTEIN** *has been a professional game developer since 1980. His web site, www.theinspiracy.com, has a description of The 400 Project, the basis for these columns. Also at that site is a list of the game design rules collected so far and tips on how to use them. Email him at* ***nfalstein@gdmag.com****.*

STEVE THEODORE



# ONE FOOT IN FRONT OF THE OTHER

## The art and science of move cycles

**THE HUMBLE WALK CYCLE IS THE** foundation of the animator's art. A really good cycle doesn't just move a character from place to place: every cycle ought to be a highly compressed character study, as concise and elegant as a haiku. The climax of *Toy Story*, when Woody and Buzz race after the moving van, is a brilliant example of two characters doing the same thing, and yet doing it in ways that are perfect expressions of their respective personalities.

All too often, of course, the demands of production get in the way of the poetic ideal. Between the technical demands of game engines and the casual disregard which designers and players share for the laws of the universe, the harried game animator isn't always going to have the opportunity to carve out that gem-line slice of time that describes a character.

**FIGURE 1** **Marching formations show the relationship between stride length and speed; as the column turns, soldiers on the outside use longer steps to keep up with their ranks without falling out of step.**

### WALKING FODDER

Naturally, most animators prefer a visual to a verbal reference for something as complex as a moving human being. In an ideal world, we'd have the chance to perfect our knowledge with lots of reference footage, mo-cap data, and observation time.

That's the classical approach, going back to the days of Disney's *Nine Old Men*. Any animator who can pore over video, mo-cap data, and Muybridge when time permits, should.

Even so, it's good to have a little cheat sheet handy for those times when there's no authoritative reference lying around. In particular, it's nice to be able to give designers and coders some real world facts about how human locomotion works for those delicate little negotiations around things like character speed. With that in mind, we're going to borrow a little science for this month's look at locomotion.

If you're researching the mechanics or physics of walking, you're likelier to end up reading medical journals than back issues of *Animation World*. Most of the reference work on the web comes from academic researchers, not artists. From choreographers to fossil hunters to orthopedists, the study of movement on two legs is a busy field, so at least we'll be able to borrow a little bit of terminology and some useful numbers from our scientific friends (some useful references can be found in Table 1).

Our real interests are art and drama, not science, so don't feel you're enslaved to any figures cited here. Never forget the tried-and-true Pixel Pusher rule: Do what looks best to you, not what some book or magazine column (however witty, erudite, and trustworthy it may be) tells you.

Any movement cycle can be defined by four basic components:

- gait: the pattern of footfalls
- cadence: the timing of the strides
- stride length: how much ground is covered by each pace.
- stride width: often forgotten, but an important key to the style of a cycle.

You'll notice that the obvious gameplay element, namely ground speed, isn't on this list. As we'll see, the speed of a cycle is produced by the interaction of the cadence and stride length. By itself, speed doesn't tell you enough to distinguish one walk from another.

### WALK, DON'T RUN

Move cycles come in two basic flavors: walks and runs. As any animator knows, walks contains a moment when both feet are on the ground at the same time, while in runs, only a single foot is ever supporting the body.

The mechanics of the two movements are quite different as well. As every animation tutor since Seamus Culhane loves to repeat, a walk is a "controlled fall." The walker pivots over the "down" foot like an inverted pendulum using a minimal expenditure of energy. A run, on the other hand, uses the raw power of the planted leg to essentially jump from foot to foot. This is why jogging is better exercise than walking even though a brisk walk may be faster than a slow jog:

PHOTO BY MATTFM

**STEVE THEODORE** *has been pushing pixels for more than a dozen years. His credits include* Mech Commander, Half-Life, Team Fortress, *and* Counter-Strike. *He's been a modeler, animator, and technical artist, as well as a frequent speaker at industry conferences. He's currently content-side technical director at Bungie Studios. Email him at* **stheodore@gdmag.com**.

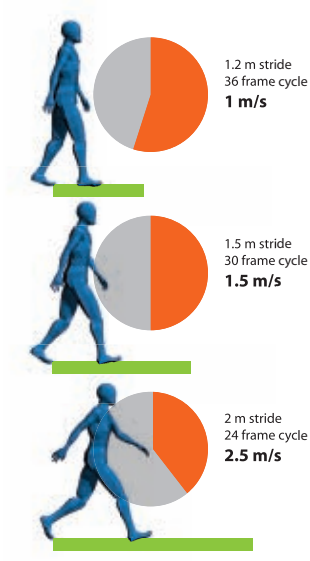



**FIGURE 2** **Stride lengths and cadences for different walking speeds. The change in stride length accounts for more of the changes in speed than does the change in cadence.**

walking is a more economical way to get around and running, even a slow run, is more forceful.

The shopworn game industry conventions treat "walk" and "run" as different speeds rather than ways of moving. It would, of course, be more flexible and realistic to cover a range of speeds. Unfortunately, we can't achieve this just by blending walks and runs together. The mechanics are quite different and there's no such thing as having one-and-a-half feet on the ground.

However, there is a lot of natural variation within the two gaits, so it's possible to cover a broad range of speeds by creating fast and slow versions of both the walk and run gaits with some overlap in their speed ranges.

Working with speed ranges rather than single speeds does involve some work on the code side. Tom Forsyth's presentation "How to Walk" is a good overview of the technical issues involved (see Resources). For the artist, a jog is in some ways easier than authoring two fixed speed cycles. Since the actual runtime speed of the character will be the product of a blend, animators can work on artistically clear extremes without waiting for the designers to settle on the character's speed down to the last decimal place. Doing two runs or walks also encourages animators to emphasize the character aspect of the cycle over the mechanics, since precise ground speed is less of a constraint.

## HUP! TWO, THREE, FOUR!

Many game engines already have a rough-and-ready mechanism for adjusting the speed of a move cycle: they slow down or speed up the default walk and run cycles.

Although this makes intuitive sense—moving slower or faster would certainly seem to mean stepping more or less quickly—it's actually unrealistic. You can see proof of this very easily by watching army drill maneuvers (see Figure 1).

A typical quick march step uses a 5-foot (1.52m) stride once per second. (When the drill regulations were standardized in the 19th century, that was a big purposeful step, but for today's taller soldiers it's a fairly natural pace.) When the formation wheels around a corner, you'll notice that the soldiers on the outside of the formation, who have to cover much more ground than those near the pivot, never break the rhythm of the march. They simply extend their strides to about five-and-a-half feet (1.67m) to keep up with their ranks. The overall rhythm of the march never varies.

The experimental data in Figure 2 gives a good idea of the relationship between cadence and stride length at different walking and running speeds. As you can see, without the martial music walkers and runners do vary their cadence to adjust their speeds, but variations in stride length account for more of the speed changes. Blending cycles with different cadences is a bit of work for coders, but it makes life easier for animators. Trying to create two walk cycles that cover quite different speeds but in the same amount of time is far more difficult than finding a combination of timing and stride that works both for the character and the specified speed.

Establishing a cadence is obviously critical to building a good cycle. Since ground speed is the interaction of cadence and stride length, it's important to find a combination that matches the character and not just to settle for one that "works" to move the character across the ground at the right velocity.

Faster cadences imply excitement, hurry, or anxiety. Slower cadences tend to suggest relaxation, fatigue, reluctance, or solemnity. The army, for example, reserves a special 60-step-per minute (that is, 60 frame) step for funerals and memorial services. Interestingly, though, cadence is not a good indicator of age. One famous study found that runners in their 80s step at about the same cadence as those in their 30s. They do, however, cover far less ground with each stride. They also spend more of each cycle firmly on the ground, and less of it pushing off or bounding through the air.

Those geriatric marathoners illustrate an important rule to animators for working with move cycles: cadence and stride length are hard constraints that

**TABLE 1: STRIDE LENGTHS, CADENCES, AND SPEEDS**

| GROUND SPEED (METERS/SEC) | GROUND SPEED (MILES/HR) | STRIDE LENGTH (METERS) | CADENCE (STEPS/MIN) | FRAMES 30 HZ | |
|---|---|---|---|---|---|
| 1 m/s | 2.23 mph | 1.2 m | 100 | 36 | Deliberate Walk |
| 1.5 m/s | 3.35 mph | 1.5 m | 120 | 30 | "Average" Walk |
| 2.5 m/s | 5.59 mph | 2 m | 150 | 24 | Brisk Stride |
| 1.6 m/s | 3.71 mph | 1.33 m | 150 | 24 | Slow Jog |
| 2.7 m/s | 6.03 mph | 1.8 m | 180 | 20 | Easy Jog |
| 4.5 m/s | 10.06 mph | 2.7 m | 200 | 18 | Distance Runner |
| 11.2 m/s | 25.05 mph | 4.8 m | 280 | 13 | Sprinter |

have to be met, but they leave a lot of room for individuality within the rhythm of the cycle. The point of balance, height of the vertical bounce, and side-to-side hip sway are all important to the character of a run or walk. The depth of the "bounce," in particular controls the character's sense of weight and energy level as well. Keeping that movement separate from the gross movement of the character across the ground (as discussed in "Conquest of Space," Game Developer, June/July 2006) makes the bounce a far easier variable to control.

## DADDY LONG LEGS

Stride length is an important determiner of speed, so it's important to remind your concept artists and designers about it early. Even small changes in a character's physique can make a big difference in his or her stride length, thus the range of plausible speeds.

Track and field coaches have a rule of thumb that a human's stride length is about 83 percent of their height (actually, they tend to use steps rather than paces as their measure, so they say 41.5 percent rather than 83 percent, but the proportion is the same). Thus a typical 6-foot (1.82m) game character would have a stride length of just over 1.51 meters.

Combined with the common 120-steps-per-minute cadence, this gives a "natural" walking speed for a human character around 1.5 meters per second, which is the figure you'll find in many web references. A four-and-a-half-foot (1.37m) dwarven warrior, on the other hand, has a natural stride length of about 1.13 meters. Unless he has very different proportions, he'll have to scurry to keep up with that six-foot comrade. To match the human's ground speed, the dwarf will have to have about a 22-frame walk cycle, or more likely break into a run.

**PLAYER MOVEMENT SPEEDS**

| GAME | PLAYER RUN SPEED |
|---|---|
| Max Payne | 5.5 m/s |
| Jak And Daxter | 6.6 m/s |
| Halo | 6.86 m/s |
| God of War | 7.5 m/s |
| Unreal Tournament '04 | 8.8 m/s |
| Quake Wars | 8.94 m/s |
| Serious Sam | 12.5 m/s |
| Quake 4 | 15.25 m/s |

**While these are (mostly) within the range of real world speeds, few people in the real world can peg a headshot while running a 4 minute mile.**

> **"Even small changes in a character's physique can make a big difference in his or her stride length."**

Although stature has a lot to do with stride length, it's not the only factor. For example, the track coaches' rule of thumb says a man's stride length is 83 percent of his height, but a woman's is 82.6 percent of hers. Women, however, have proportionately longer legs than men, so the difference there is one of musculature and usage. Race walkers may have a stride length that's more than 90 percent of their height, since they're willing to look silly in pursuit of speed.

On the other hand, children and older folks tend to use less of their potential stride because they're less sure of their footing. The very young and the very old also have a tough time keeping their stride lengths consistent. Toddlers can vary their steps by as much as 20 or 30 percent, while by the mid teens most kids maintain their stride length down to the millimeter.

## ON STRIDE FLEXIBILITY

Not surprisingly, the flexibility of stride length is the animator's greatest friend in the run cycle business. It's hard for a human character to look anything but silly if the cycle is much faster than 14 frames (a fantastic 260 steps per minute), but it's comparatively easy to add a little extra flight time to achieve the impossible speeds so beloved by designers. One useful tip when extending strides beyond their natural limit: Don't over-extend the forward foot; instead shorten the plant and increase the kick of the back foot. If the angle of the front leg at strike time is 45 degrees or lower, it wants to be a brake, not a lever.

## STRIDING WIDE

Long strides convey confidence, drive, and assertiveness. Shorter steps suggest caution or timidity—it's why we call them "baby steps." They're also the way we adapt to complex or crowded environments. The tension between confidence and caution is also reflected in the width of moving stride, a detail that animators often forget. Children, the elderly, and the infirm walk keeping their feet spread wide to help maintain balance, as does anyone who has to cope with uncertain terrain.

Narrower gaits are a sign of self-assurance, as both Olympic sprinters and supermodels place their feet very close to the centerline of the body as they move along. For runners, this is a matter of efficiency, since the thrust that pushes the body along works better close to the line of movement-although sprinters start with their feet about 15 inches apart, roughly in line with their hips, by the time they reach full stride 9 or 10 steps into their run, their steps are less than 7 inches wide.

In the case of supermodels, the narrow track width accentuates the sway of a woman's hips (already wider than a man's) and helps emphasize her femininity. In both cases, however, the compact posture reflects confidence where a more open stance anticipates potential difficulties.

Speaking of potential difficulties, try cramming the whole of human locomotion into a space the size of a college book report. That's all for this month—till next, keep on cycling!

## RESOURCES

Forsyth, Tom. "How to Walk" GameTech, 2004.
**http://home.comcast.net/~tom_forsyth/papers/papers.html**

JESSE HARLIN



# COOKING UP ICONIC MUSIC

**ASK SOMEONE TO NAME THE MOST** memorable piece of music from a video game and you're almost guaranteed to get the theme from SUPER MARIO BROS. as an answer. But with 22 years and hundreds of thousands of games since its release, why isn't there more variety to how this question is answered? Video games have a peculiar lack of widely recognizable signature themes. Film and television, on the other hand, have cottage industries devoted simply to theme soundtracks. Iconic themes are like hit songs. There's no easy recipe for how to create them. There are, however, three ingredients that composers can try to incorporate in order to give their creations a fighting chance at immortality.

## A DASH OF RISK

There are hundreds of subgenres of music. If anything, game music in general can be accused of a fairly narrow scope when it comes to delving into this wealth of material. Racing games have thumping electronica, sports games have licensed tracks, and action/adventure titles have cornered the market on cinematic "action music." The problem with this approach is that many soundtracks end up feeling largely interchangeable.

One potential solution is to play off of expectations by focusing on a genre of music other than the initially obvious choices. One of the reasons the MARIO theme is so memorable is that Koji Kondo pumped an infectious 8-bit swing into our living rooms, instantly coloring a new imaginative world with a familiar genre of music intimately tied to fun and movement. Pete McConnell's GRIM FANDANGO score brought tango to the macabre land of the dead. Nothing about Gregorian chant immediately says "first person shooter" and yet it's the signature sound of Marty O'Donnell's HALO score.

Does this mean that BURNOUT would do well with an all bagpipe score? It's doubtful (though Criterion can feel free to take that as a dare, if they'd like). Working against expected genres doesn't mean nonsensical risk simply for the sake of being different. However, calculated, artistic risk—if it still fits with the project—can go a long way towards helping a signature score stand out from the crowd.

## A PINCH OF THEREMIN

One thing that television composers do extremely well is to utilize signature instruments as a means of instantly coloring a theme with a unique flavor. From the Cuban percussion of *I Love Lucy* to the jangly opening guitar riff of *Friends*, television themes have been achieving an incredibly high rate of individualism throughout their history. More often than not, this success is due not as much to the strength of their melodies as to the signature approach given to their orchestration.

There are notable examples of this same approach in game scores. FINAL FANTASY has its ubiquitous harp arpeggio. KATAMARI DAMACY has a main theme done entirely in a cappella "na na"s. A large percentage of the rest of games are now scored with a generic full orchestra—whether real or sample-based. Just as generic orchestral music doesn't serve television or film well, neither does it help to distinguish game scores from one another. Many composers have successfully experimented with the addition of signature instruments to an orchestral palette, such as Danny Elfman's oom-pah piano or Thomas Newman's use of marimba. Still others have made signature orchestras by removing instruments from the traditional palette, such as Bernard Herrmann's all strings *Psycho* score. The only things stopping game scores from approaching orchestration in the same manner are a lack of vision and the giddy notion that because publishers are now willing to pay for a full orchestra, every project now needs a full orchestra.

## A HEAP OF LUCK

The hardest element to control with a signature theme is how it is treated by luck and the industry around it. Nintendo chose to bundle SUPER MARIO BROS. with the NES for its North American release, instantly ensuring a massive audience for the game's music. HALO became the must-have launch title for the original Xbox, again ensuring that the audience had heavy exposure to its music. Quirky or captivating gameplay, controversial content, Hollywood actors, or a dev team's previous track record can all serve to give a game an unexpected amount of public attention.

Unfortunately for everyone, there's no way to know which games will be successful. Even game scores like that of BEYOND GOOD & EVIL that experiment with elements of genre and instrumentation can still fade into obscurity simply because of how the game does at market. A single player's exposure to a unique theme will make it memorable for them. Exposure to a vast audience, however, turns a memorable theme into a culturally relevant piece of art. More than any other factor, it's the luck of having placed music into a game that then finds a wide audience that makes a theme iconic.

## SERVING UP RESULTS

Signature, iconic music takes a willingness to experiment. Whatever the temp track or audio design documents might reference, the composer is being hired to give a game its own unique style and its own signature sound. Few development teams value generic graphics or derivative gameplay, and most are striving for something special from their work. As such, a signature soundtrack is no less than a duty owed to the creative vision of each individual game. That way, with an audience there to hear it, your work will still be hummable 20 years on.

**JESSE HARLIN** *has been composing music for games since 1999. He is currently the staff composer for LucasArts. You can email him at* ***jharlin@gdmag.com****.*


Neversoft Game Shop
LOOKING FOR TALENTED & ENERGETIC PEOPLE TO
JOIN US IN MAKING OUR NEXT GREAT GAME
WWW.NEVERSOFT.COM
NEVERSOFT
THPS2
TONY HAWK'S
PROVING GROUND
GUITAR
HERO
ROTATE
ME

# CRYSTAL DYNAMICS AND EIDOS-MONTREAL ARE SEEKING ADVENTURERS FOR A NEW RIDE


CRYSTAL DYNAMICS

eidos MONTRÉAL

## Eidos Interactive's North American studios are searching for new talent!

In California, Crystal Dynamics, fresh off of the critically acclaimed and successful Lara Croft titles Tomb Raider: Legend and Tomb Raider: Anniversary, is hiring for its game teams and shared central services in art and technology. The studio has recently moved to its new offices in Redwood City, at the heart of northern California's Silicon Valley.

Crystal is specifically looking for Level Designers, Systems Designers, Art Directors, Materials Artists, Environment Artists, UI Artists, Lead Technical Artists, Illustrators, Gameplay Programmers, Network Programmers, Maya Programmers, Animation Programmers and External Producers.

**To apply, please go to our careers page at www.eidosinteractive.com.**

In Canada, EIDOS-MONTREAL, the newest studio in Eidos's family, continues to grow. The studio is seeking senior staff in Physics, AI Programming, and Level Design.
**Please send your resumes at jobs@eidosmontreal.com for Eidos Montreal.**

# MOM SAID PLAYING VIDEO GAMES WOULD NEVER PAY OFF.

## START PROVING HER WRONG TODAY.

THQ

**Check out our career opportunities now at: careers.thq.com**

rainbow STUDIOS · sandblast · HEAVY IRON STUDIOS · THQ studio australia · concrete games · relic ENTERTAINMENT

KAOS STUDIOS · volition inc · bluetongue · juice games · VIGIL GAMES · locomotive games

Helixe · XDG · mass•media · ValuSoft · PARADIGM ENTERTAINMENT · INCINERATOR STUDIOS

THQ WIRELESS



THQ

www.thq.com


# THE FIRST NATIONAL PARK WITH NEXT-GEN TECHNOLOGY

## NOW RECRUITING ACROSS ALL DISCIPLINES

WWW.LUCASARTS.COM/JOBS

LUCASARTS™

# Join the PlayStation® team!

Be a part of the most exciting and innovating computer entertainment in North America. Sony Computer Entertainment America (SCEA) markets the PlayStation® family of products and develops, publishes, markets, and distributes software for the PlayStation®3 console, the PlayStation®2 computer entertainment system and the PSP® (PlayStation Portable).

## With opportunities in these areas:

Foster City, California

Santa Monica, California
San Diego, California

Salt Lake City, Utah
Bend, Oregon

At SCEA, we offer our employees exceptional benefits, an open and creative working environment, and the opportunity to be part of a stellar team developing high profile action First Party titles.

To send your resume, add updates, and establish a new business relationship, go online at:

**www.us.playstation.com/jobs**

**Equal Opportunity Employer**

SONY COMPUTER ENTERTAINMENT ®

PLAYSTATION 3

PlayStation®2

PSP®
PlayStation Portable


THE CREATORS OF
HITMAN AND KANE & LYNCH
ARE NOW HIRING
LEAD ARTIST
LEVEL DESIGNERS
AUDIO PROGRAMMER
GAME PROGRAMMERS
ENGINE PROGRAMMERS
You are talented, ambitious, hardworking and a dedicated teamplayer
Tell us why WE need YOU to be a part of our team
IO-Interactive
www.ioi.dk
IO Interactive develops AAA titles for next generation hardware. We are located in Copenhagen, Denmark as a part of the Eidos group.
IO Interactive employs 170 enthusiastic people with five games in various stages of production whilst creating our fantastic new next generation game engine.

# ROCKSTAR GAMES IS HIRING

- PROGRAMMERS
- ARTISTS
- ANIMATORS
- DESIGNERS

## IN THE US, UK, AND CANADA FOR OUR HIGH PROFILE NEXT GENERATION TITLES

## WWW.ROCKSTARGAMES.COM/JOBS

NYC • TORONTO • SAN DIEGO • EDINBURGH • VANCOVER • LINCOLN • LEEDS • LONDON

RESUMES@ROCKSTARGAMES.COM
WWW.ROCKSTARGAMES.COM


**Edge of Reality** offers the chance to work in a fun, collaborative environment on projects with enormous potential! Austin, Texas offers a high quality of life, low cost of living, affordable housing, and a wide variety of entertainment. If you want to be part of a studio where your work matters, **Edge of Reality** is the perfect fit for you!


# See it in game.

Join Columbia's community of intensely creative minds.

GAME.COLUM.EDU

create... change®

Columbia College Chicago

INNOVATION IN THE VISUAL, PERFORMING, MEDIA, AND COMMUNICATION ARTS

DIGIPEN
INSTITUTE OF TECHNOLOGY

THE LEADER IN
Game Development Education

You may have the drive to make games, but developing the knowledge and ability to achieve the professional standards demanded by employers is an extremely challenging path.

# Building on your Passion

## DigiPen brings it all Together

At **DigiPen Institute of Technology**, we believe that there are no shortcuts to a serious career in the field of digital interactive entertainment. DigiPen has combined a comprehensive curriculum and world-class faculty to provide a rigorous educational experience in the following programs.

### Computer Science

- **BS in Real-Time Interactive Simulation**

  The Real-Time Interactive Simulation (RTIS) undergraduate degree focuses on the technology and computer science behind video game development, including the development of game engines, graphics, physics, artificial intelligence, and networking.

- **MS in Computer Science**

  At the graduate level, students' theses focus on areas such as graphics, physics, artificial intelligence, and game design.

### Production Art

- **BFA in Production Animation**

  Extensive traditional art and animation skills are taught alongside cutting-edge industry supertools. This approach allows graduates to work in virtually any animation environment.

### Computer Engineering

- **BS in Computer Engineering**

  This multidisciplinary program integrates the fields of electrical engineering and computer science with a specialized focus on video game applications, such as developing a handheld game console.

## CONTACT DIGIPEN ADMISSIONS

CALL (866) 478-5236 EMAIL admissions@digipen.edu VISIT WWW.DIGIPEN.EDU


Explore a career in one of the most creative industries in the world. Stop dreaming it–start living it.

ex'pression
COLLEGE FOR DIGITAL ARTS

Ex'pression College offers Bachelor's degree programs in:

- Animation & Visual Effects
- Game Art and Design
- Motion Graphic Design
- Sound Arts

Call **877-833-8800** or visit
**www.expressioninfo.com**

Artwork by Ex'pression students (from top left) Chan Vernon, Kelsen Thompson, Mieke Loomis, Ryan McCoy, Jacob Clark and faculty Ty Carriere.

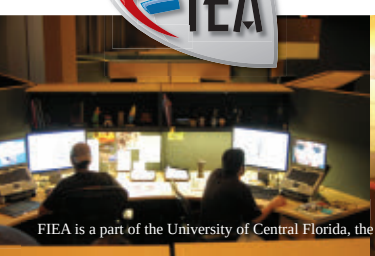
# OUR MASTER'S DEGREE HAS ONE THING ON ITS MIND.

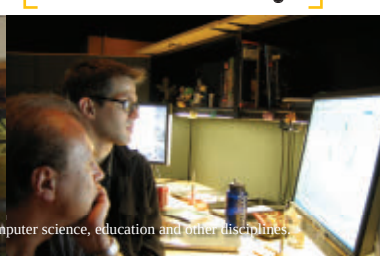
**YOUR NEXT JOB.** At FIEA everything from our industry-based curriculum to our new MOCAP studio is geared toward teaching what you need to know to become a successful video game producer, programmer or artist.

Earn an accredited Master's degree in 16 months while being mentored by industry veterans who have shipped more than 40 games and films. So tip your cap to our 97% placement rate and learn more at **www.fiea.ucf.edu**.

## Florida Interactive Entertainment Academy

Enter. Active. Learning.™



FIEA is a part of the University of Central Florida, the nation's seventh-largest university and a leader in modeling and simulation, optics and photonics, engineering and computer science, education and other disciplines.

# Make More Enemies

VFS Student work by Jeff Plamondon

**Game Design at Vancouver Film School**

**The Leader.**
Dave Warfield, 15-year veteran game designer for over two dozen titles.

**The Know-How.**
In just one year, you'll learn every aspect of game design. Your portfolio project is a playable, industry-ready video game.

**The Results.**
Our graduates work at top game companies including Backbone Entertainment, BioWare, EA Black Box, Next Level Games, and Propaganda Games.

**vfs.com/enemies**

VFS™

# ADVERTISER INDEX



Game Developer (ISSN 1073-922X) is published monthly by CMP Media LLC, 600 Harrison St., 6th Fl., San Francisco, CA 94107, (415) 947-6000. Please direct advertising and editorial inquiries to this address. Canadian Registered for GST as CMP Media LLC, GST No. R13288078, Customer No. 2116057, Agreement No. 40011901. Subscription Rates: Subscription rate for the U.S. is $49.95 for twelve issues. Countries outside the U.S. must be prepaid in U.S. funds drawn on a U.S. bank or via credit card. Canada/Mexico: $69.95; all other countries: $99.95 (issues shipped via air delivery). Periodical postage paid at San Francisco, CA and additional mailing offices. Postmaster: Send address changes to Game Developer, P.O. Box 1274, Skokie, IL 60076-8274. Customer Service: For subscription orders and changes of address, call toll-free in the U.S. (800) 250-2429 or fax (847) 647-5972. All other countries call (1) (847) 647-5928 or fax (1) (847) 647-5972. Send payments to Game Developer, P.O. Box 1274, Skokie, IL 60076-8274. For back issues write to Game Developer, 1601 W. 23rd St. Ste. 200, Lawrence, KS 66046-2703. Call toll-free in the U.S./Canada (800) 444-4881 or fax (785) 841-2624. All other countries call (1) (785) 841-1631 or fax (1) (785) 841-2624. Please remember to indicate Game Developer on any correspondence. 

ERIC PETERSON



# A LICENSE TO REVIEW

**HOW DO YOU DEFINE SUCCESS WITH** licensed games? Some define it in terms of sales, others define it as good reviews, and still others define it as making the right game for the right demographic. Ideally, as a developer, you would like to achieve all three—but review scores should probably be the last thing you think about when setting your development priorities on a licensed title.

## TWO THUMBS UP!

One of our biggest licensed game accomplishments was ROBOTECH: BATTLECRY. As developers, we had a lot of passion for the license as well as a desire for success. Sometimes reviewers are in the same demographic as the fans. This was the case with BATTLECRY. Even though it was a solid game, some of the glowing reviews were written by reviewers that were wearing 'fan goggles.' So we probably received a few extra credit points because they loved ROBOTECH.

ROBOTECH was a hit on every level—great reviews, some magazine awards, and fun for the majority of the fans. Not to mention sales of over a half a million copies.

## ANOTHER THUMB BITES THE DUST

FLUSHED AWAY had even better sales, and we received high praise and compliments from both licensors involved. We also won the Annie Award for Best Animated Video Game. It was definitely an accomplishment to be proud of.

The reviewers didn't agree. Reviewers frequently don't give kids games a fair shake—some don't even bother to review them, either because they aren't "cool," or don't appeal to their demographic. When these games are reviewed, they are often compared to games for older audiences, and which have much longer development cycles.

From the reviewers' standpoint, FLUSHED AWAY was seen as just another movie-based game with shallow gameplay that was rushed out the door. Of course, that isn't how we felt at all—we built the game for our target audience. When developing a kids' title, we bring in children on a regular basis so we can watch them play, take notes on any issues they have, and make changes based on their feedback. If something is too hard, we change it to better suit the age group we are targeting. If they get lost and don't know where to go, we add helpers (verbal and/or visual) to assist them so they feel successful.

DORA: JOURNEY TO THE PURPLE PLANET was another game developed specifically with a specific demographic in mind, in this case 3-5 year old children. With this title, our goal wasn't to achieve high scores from game critics, which was a good move on our part, because it was only reviewed by one gaming web site.

We set out to give children a gameplay experience that was true to the TV show, would keep their attention (no easy feat), and introduce many of them to their first console game experience. We recreated the look of the show by going with cel-shaded art, hired a writer who was familiar with the *Dora* formula, and used all of the original talent that voiced the show.

We focus tested kids that watched *Dora* and tailored the game to their abilities and skills. For example, we made all the buttons perform the same action, which assured that there was no "wrong" button on the controller.

Although DORA wasn't reviewed on game web sites, it did get coverage in newspapers, parent's magazines, and on radio shows. We could also gauge our critical response by reading user reviews on websites like Amazon and through fan mail sent to our office by parents of the kids who had played and enjoyed the game.

## TWO THUMBS DOWN

We had a disastrous experience with a game called DINOTOPIA: THE SUNSTONE ODYSSEY. This game never had a chance in Hell. We went from "great, we can't wait to be part of this game," to "let's get this thing shipped and forget we ever were a part of it."

We had hoped to make an adventure game that paid homage to the Jim Gurney books that we all knew and admired, but were forced to turn the game into a brawler/light RPG. We were forced to follow what the television series was planning to do: turn a peaceful, utopian society into one of chaos and strife. And in the process of doing so, the series shot itself in the foot, and then took direct aim at and blew off the head of our game.

The ups and downs of that project took a heavy toll on our staff's morale. We were like taffy, being pulled between licensor, sub-licensor and publisher, all of whom wanted something different. We still got the game done, but at a heavy price. Everyone felt they were forced to make a game they didn't believe in.

When DINOTOPIA shipped, I don't think anyone here believed the reviews would be positive—but even so, seeing them took the wind out of our sails. On top of that, the *Dinotopia* fans were outraged because they thought that we, as developers, had decided to change the world that they loved.

Something we have tried to do since then is educate our staff as to how a game can be perceived by fans, gamers and reviewers. Nothing can entirely take the sting out of bad reviews, but we always stress to our employees that you can't always please everyone. You should always do your best to please the core demographic of a particular license, but some things are out of your control, and the responses to the end result can be a mixed bag. You just have do your best within your time and budget, stay focused, and ship on time. That is all anyone can ask.

**ERIC PETERSON** *is the President and CEO of Vicious Cycle Software, Inc. You can email him at* ***epeterson@gdmag.com.***

# WHAT DO YOU SEE?

Imagination + Technology

In Orlando, we see aliens and tactical fighters, exploding cars and football stars. That's because industries built on imagination and innovation – like game development, digital production, and simulation – are booming here. And it's why forward-thinking companies and talented workers are thriving in an environment that exudes creative energy. Look closer! You'll see why Orlando is the place to turn your visions into (virtual) reality.

**Call 407.422.7159**

**www.orlandoedc.com**

Putting imagination to work®
ORLANDO