

Appendix to lecture 22

The Future of Computer Entertainment to 2050

Ernest W. Adams
Game Design Consultant

ewadams@designersnotebook.com
www.designersnotebook.com

I'm a member of
 **international hobo**

Three Perspectives on the Future

Technological Advancement

Demographic and Market Changes

Aesthetic Development of the Medium

Technological Advancement

Technology Changes We Can Expect

- More speed, RAM, and power (of course).
 - More detail, faster frame rate, smarter creatures
 - The effect on *design* is indirect, not direct.
 - The PS3 is said to be “1000” times as fast as the PS2 -- but what does this really mean? Nobody knows.
- Broadband and mobile infrastructure (of course).
 - I’ll get to this later.
- Hard disks as standard in consoles (near-term).
 - Permits much more customization by the player.
 - Permits patches, updates, episodic content.

Technology Changes We Can Expect

- Continued growth in specialized peripherals.
 - Wii controller is challenging existing paradigms
 - Dance mats, Eye-toy, etc. all offer additional mechanisms of interaction beyond the handheld controller.
 - Most will remain extra-cost items, however.
- Additional specialized processing accelerators
 - Real-time raytracing
 - Animation, inverse kinematics, or locomotion
 - Neural nets or other AI accelerators
 - Pathfinding hardware is already under development

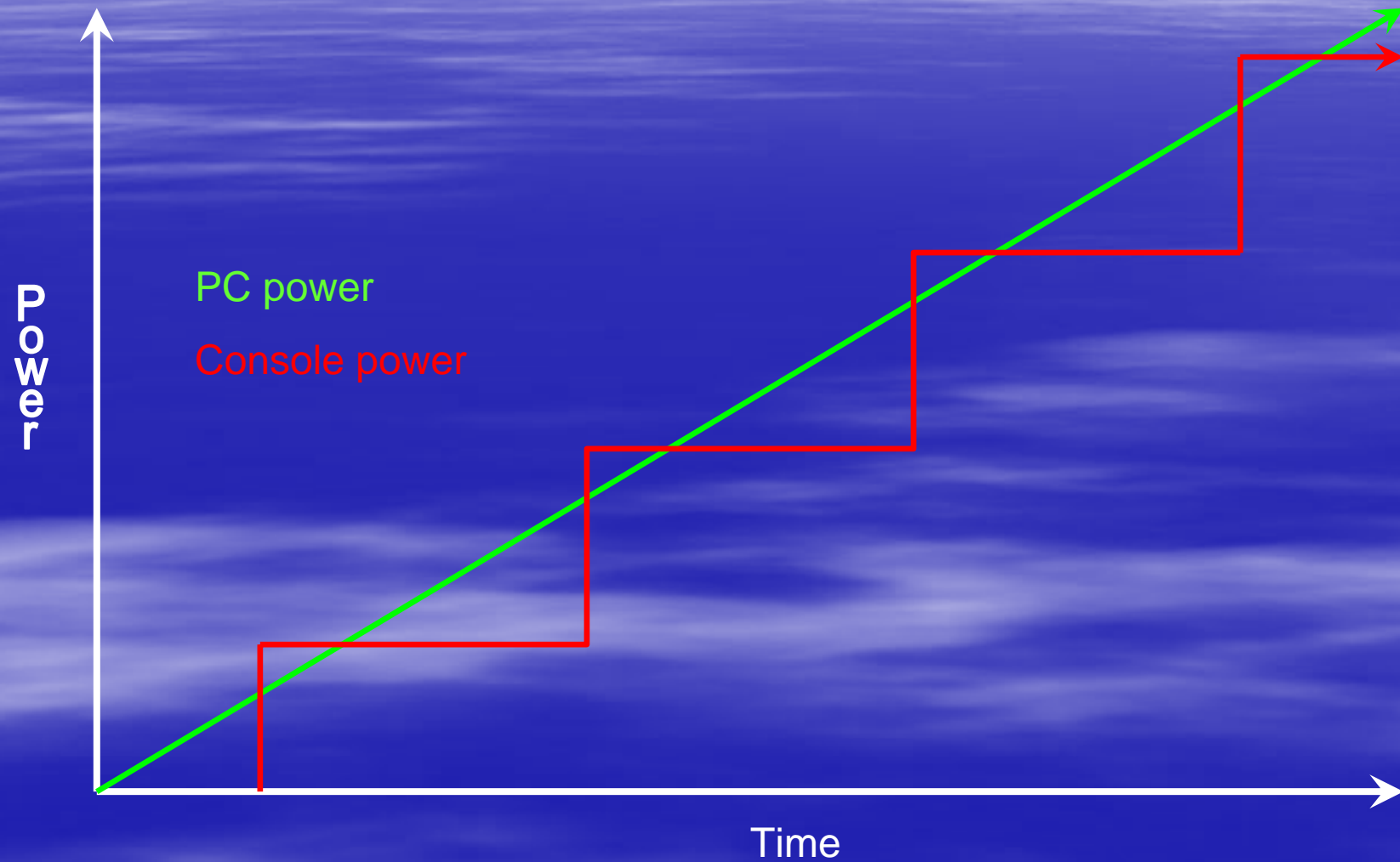
Technology Changes We Can Expect

- Changes in programming methodologies.
 - What's next after object-oriented programming?
 - Graphical programming languages?
 - Non-algorithmic or neural programming?
 - Self-programming computers?
- Changes in content creation methods.
 - Procedurally-generated:
 - Buildings, landscapes, objects, creatures, people
 - Will Wright's *Spore* project, announced GDC 2005
 - Object-oriented artwork?

Why the PC Will Never Die

- With every new console generation, someone declares that the PC is dead for gaming.
- There are many reasons they are wrong:
 - PCs can be expensive, consoles must be cheap.
 - PCs and consoles optimized for different situations
 - PCs, one person at 0.5 m; consoles, several people at 2 m.
 - PCs are open systems requiring no license.
 - No content limitations imposed by publicity-conscious publishers.
 - People need to own PCs for other reasons, so developers will still make games for them.
 - PC technology advancement is continuous, not stepwise.
 - The latest PC is always ahead of the latest console.

PC vs Console Power Growth



What About VR/AR?

- Industry got interested 8-9 years ago, but quit
 - Prices too high, quality too low
 - Depth perception not needed in many games
 - Console gameplay is often a group activity
- It *will* come, but only when:
 - Quality of the experience is high enough
 - Frame rate, resolution, 3D audio
 - We solve the motion-sickness problem
 - HMDs are cheap, lightweight, and durable
- AR only meaningful in mixed-reality environments.
 - Compared with traditional fictitious game worlds, there won't be much demand for mixed-reality games.

Immediate Technological Challenges

- Animation

- Our graphics look great – until they move!
 - People move like marionettes.
 - Masses not properly modeled.
 - Interactions with the environment not properly modeled.
 - Interactions with other people not properly modeled.
- We need inverse kinematics
 - Produces correct interactions with the environment
- We need true locomotion
 - Properly models the behavior of bodies
- More research on the interactions of non-rigid bodies

Immediate Technological Challenges

- Artificial Intelligence

- Areas for research:

- Intelligent opponents (of course)
 - Intelligent teammates (the stupid wingman problem)
 - Voice recognition
 - Must accept all sorts of people, without any training.
 - Computer-generated speech
 - Must not only handle inflections but also create a sense of the character and personality of the speaker.
 - Recorded snippets can only go so far.
 - Natural language comprehension
 - Natural language generation

- AI has proven incredibly resistant to hardware improvements.

Immediate Technological Challenges

- The need for Procedural Content Generation
 - Traditional content development costs continue to climb
 - Traditional development time continues to rise
- Pre-rendered PCG
 - Allows artists to hand-edit the results after generation
- On-the-fly PCG
 - Requires a lot of CPU power
 - Use the graphics hardware, not the main CPU
 - Requires heuristics to avoid generating nonsense
 - Must use pseudo-random sequences so a given object looks the same every time it is generated
 - Good for unimportant objects that fit a pattern, e.g trees

Demographic and Market Changes

Second/Third World Economic Growth

- Second World (former Soviet states)
 - Too many countries, too little demand (for now)
- Third World
 - India and China are the ones to watch.
 - Large centralized governments can implement friendly policies.
 - (Working with many small countries is a pain.)
 - Bigger populations buy more stuff!
 - Those farther behind advance faster in percentage terms.
 - Next: Islamic world, Southeast Asia, Africa.
 - Games are a luxury. Leisure dollars determine the order.
 - Islamic world has the advantage of being (mostly) unilingual.

Obstacles to World Expansion

- **Piracy** is the #1 obstacle.
- Four steps are required to beat it:
 - Governments must **acknowledge** and **support** the idea of intellectual property rights.
 - Governments must formalize this in **legislation**.
 - Governments must **enforce**, with sufficient resources, their new anti-piracy laws.
 - The population must be **taught** that piracy is wrong.
- Technology, infrastructure, economy are smaller problems and will solve themselves in time.

Selling into Other Cultures

- People want their native forms of entertainment.
 - Bollywood, Japanese comic books, etc.
 - Other countries will want games about **themselves**.
 - The West must either learn to build them or lose out.
- Can't sell Western hardware at Western prices.
 - Mobile phone gaming is set to go big in India because the hardware is already there.
- Programming outsourcing will accelerate
 - Already western programming jobs are going to eastern Europe and India.
 - Indians should develop games for Indians!

Shifting Demographics in Western Markets

- Aging player base
 - The average age is 33 and rising.
 - Older players demand richer experiences.
- Fracturing of the youth market
 - Not just “kids” and “adults” any more.
 - Each age-year has its own interests (esp. girls).
- Arrival of women... in force!
 - Now more women players than teenaged boys!!
 - Women want different kinds of challenges.

Changes to Data Transmission Methods

- *Real* broadband
 - Electronic software distribution
 - Richer versions of existing online games
 - 3D-positioned speech based on virtual proximity
 - New kinds of games not possible before
 - Streaming video UPlod
- Mobile entertainment
 - Tug-of-war between formats
 - Growth but not explosive growth

Electronic Software Distribution

- Driving digital data around in a truck is really stupid.
 - It's slow.
 - It's wasteful of natural resources.
- Once we solve two problems, electronic software distribution is the way of the future.
 - Speed
 - Must be able to download a game's worth of data in less time than it takes to drive to the store and buy it in a box.
 - Several gigabytes in 30 minutes.
 - Piracy (again)
 - We'll solve this with encryption techniques and distribute-on-demand mechanisms.

The Age of Online

- According to Jim TerKeurst:

(Business Development Manager, University of Abertay, Dundee)

- New value chain:
 - Developer
 - Provider
 - Consumer
- Only publishers with in-house or owned development capability will survive
- Telecoms will become key providers
 - No more retailers
 - Telecoms eventually buy up developers also
- Eventually, no CD drive **or** hard drive in consoles; all data is downloaded with each play.

Content Explosion for Niche Markets

- Consider American TV in 1965:
 - Bandwidth limited to terrestrial broadcast.
 - Broadcast spectrum dominated by 3 networks.
 - All content aimed at broadest audience possible.
 - One or two animal documentaries a year.
- Consider American TV after cable:
 - Huge amount of bandwidth available.
 - Dozens of networks.
 - Channels based on content, i.e. markets.
 - One channel devoted 100% to animal documentaries!

Content Explosion for Niche Markets

- Consider video game delivery today:
 - Bandwidth limited to shop shelves.
 - Shelves dominated by a few big publishers.
 - Content aimed at big markets only.
 - One or two games for Civil War fans, total.
- Consider video game delivery via Internet:
 - Shelf space is infinite.
 - Anyone can set up a website.
 - No need to guess how many copies to manufacture.
 - Small developers can serve small markets.

From the Designer's Perspective

- With electronic distribution, products don't have to fit within a mechanical format.
 - Delivery cost is a linear function of file size, not a step function of # of DVD's needed.
 - A game can be as large as it *needs* to be
- We can assume that the player is on-line and make use of that.
- We will have a closer relationship with the players — fewer middle men.

Why Games Aren't Movies

- Movies can sell the same content 5 times
 - Cinema, pay-per-view cable, pay cable channel, free cable channel, broadcast, VCR/DVD
- Movies are not tied to a display technology
 - You can still watch movies that are 50 years old
- Movies have star power
 - People feel a personal attraction to movie stars

Unanswered Questions

- How important is the retail shopping experience?
 - Retailers may actually add some value.
 - Maybe people **like** browsing in game shops.
 - Some sales are impulse purchases.
 - Children whining at Wal-Mart sells games!
- Is it important to get a **box** at Christmas?
 - Maybe people won't like presents that consist only of a URL in an envelope.

Mobile Entertainment

- The universe of mobile devices:
 - Handheld game devices
 - Nintendo DS
 - PSP (equivalent to a PS1)
 - PDAs
 - Mobile phones
 - Windows Mobile Smartphone
 - Tablet PCs
- It's a mess! No device has all the features needed to do everything.

Mobile Convergence? Maybe Not.

- Screens
 - A PDA needs a large minimum screen size.
 - Phones only recently got screens at all.
- Inputs
 - You must be able to hold a phone to your ear.
 - You must be able to write on a PDA.
 - A game device must have joysticks & buttons.
- Conclusion: nothing does all of these well at once.
 - Phones serve the ear
 - PDAs serve the eye
 - Game devices serve the thumbs

Who Plays Mobile Games?

- Japanese a lot, Americans less. Why?
 - The Japanese commute to work on the train, Americans drive cars.
- Will women play on phones?
 - Probably not; if the cost is the same as to talk, they would rather talk.
- In the West:
 - PDAs are an adults-only device
 - Game handhelds are a children-only device
 - Phones are an EVERYBODY device.
- Therefore phones will have the broadest range of game **types**.

When to Play Mobile Games?

- Adults: during brief breaks, or while commuting.
 - This suggests short, simple games.
- Children: whenever they have free time.
 - Children's games can be bigger than adult ones!
- Games that depend on location or travel?
 - Useful in theme parks, Laser Tag, etc.
 - Not ever going to be a major segment.
 - Compare # of video gamers to # of paintball players.

Mobile Phones = Digital Clocks

- In the long run...
 - Mobile phones will not drive out other devices.
 - Other devices will absorb mobile phone capability.
 - Just as everything now contains a digital clock, someday everything will contain a mobile phone.
 - Phone manufacturers should license their technology to other device manufacturers, not compete with them.
 - Don't sell handsets, sell the electronics inside.

Aesthetic Development

Graphical Realism No Longer Critical

- Jason Rubin of Naughty Dog identified this at GDC-Europe 2003. He said:
 - Graphical improvements are starting to slow down.
 - They are no longer a steeply rising curve.
 - We have passed a threshold and they are no longer a primary selling point for games.
 - Graphics are still important. But they are no longer our best sales tool.
 - *The Matrix* has used too many special effects; people are bored with them.

Graphical Realism No Longer Critical

- The quest for graphic quality will still go on, but...
- We must find new ways of attracting the customer.
 - Visual design innovations
 - Non-photorealism, new art styles
 - Game design innovations
 - New kinds of games, new ways to play.
- We need groundbreaking innovators in all areas.
 - Impressionism was a **new way of seeing** that changed painting forever.
 - We need a **new way of playing** that may change gaming forever. Where are our Impressionists?

Integrating Interactivity and Narrative

- We do this very well right now in a limited domain, action-adventures and *Half-Life*.
- We're good at interactive Schwarzenegger movies (all action, no character or emotion).
- Our larger challenge is to do this in other contexts.
 - Can we make an interactive romantic comedy?
 - Soap opera?
 - Political thriller?

Replacing Tired Conventions

- Gaming has evolved many conventions.
- Some of them are turn-offs to new gamers:
 - “Logic and common sense are not important.”
 - “If you **can** blow it up, you **should** blow it up.”
 - “Levels end with a boss who’s very hard to kill.”
 - “Your soldiers are expendable cannon fodder.”
 - “Players prefer destroying to building.”
 - “Women should have big breasts and few clothes.”
- We must replace these to reach new markets.

What About the Online Experience?

- We need new forms of online entertainment.
 - Not everybody wants to compete.
 - There must be something in between the chat room and the MMORPG.
 - MMORPGs are too “gamer”-y for many people.
 - Short games for extremely large groups.
 - Going online as an means of personal expression.
- Broadband will enable richer, more personal experiences.
- Microsoft is already researching this issue for Xbox Live.

Getting Recognition as an Art Form

- We need:
 - An aesthetic for judging and a vocabulary for discussing interactive artworks
 - Serious criticism by well-educated people
 - (Not just “game reviews” by teenagers.)
 - Academic study of the medium
 - Highly-publicized, well-respected awards
 - A cult of personality à la film directors
 - Art requires an artist – someone for people to admire

The Growth of Academic Research

- The industry has little time or money for basic research.
- Academic research offers many exciting possibilities.
 - Technical - graphics, AI, game algorithms.
 - CHI - interfaces, VR, psychology, perception.
 - Aesthetic/ludic - narrative, art, music, play.
- Best of all, academic research does not have to produce commercial products!
 - You are free to explore new areas -- so do it!

Fifty Years from Now

Looking Back to Look Forward

- In 30 years, *how we play* has not changed much.
 - Handheld/mobile on the bus to school
 - Console in the living room
 - PC in the home office or kid's bedroom
- Convergence will be partial, not total.
 - A computer monitor is better than a TV.
 - Handhelds *cannot* contain the best hardware.
 - A PC is a poor machine for group play.

A Few Popular Fantasies

- The all-over VR body suit
 - Only as a very high-end option for fanatics
 - Current equivalent is ThunderSeats for flight sim fans.
 - Have to take it to the dry cleaner's after every game.
- Jacks into your brain
 - Only nerds think this is a good idea.
 - Not in 50 years. Biology is harder than electronics.
- Artificial People
 - Very likely. Good enough to be in a game.
 - *Real* people aren't always that bright anyway!
 - Turing's test would disqualify a lot of them...

Ray Bradbury's Dark Visions

- *Fahrenheit 451*
 - Interactive soap operas on wall-sized TV screens.
 - Wall-sized TV screens are possible now, but not that useful.
 - We already have interactive soap operas.
- “The Veldt”
 - An entire room devoted to gameplay: walls, ceiling, floor
 - Not many people have complete home cinemas today.
 - It's overkill; VR would be cheaper and more effective.
- Technically possible, but sociologically unlikely.
 - Housing used to cost 25% of income, now at 40-60%.
 - It's not the gear but the living space that's at a premium.

Final Thought

It's not about the technology,
it's about the human beings.

Don't ask what we **can** build.

We **can** build nearly anything.

Ask what people **want** us to build.

The Future of Computer Entertainment to 2050

Ernest W. Adams
Game Design Consultant

ewadams@designersnotebook.com
www.designersnotebook.com

I'm a member of
 **international hobo**