Research Investigating Generation-Beyond-Next Computer Game Culture and Technology:

A Collaborative Research Partnership between the UCI Game Culture and Technology Laboratory and the Daegu Global R&D Collaboration Center

Progress Report

Walt Scacchi
Game Culture and Technology Laboratory
California Institute for Telecommunications and Information Technology
University of California, Irvine
Irvine, CA 92697
Wscacchi@uci.edu

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Introduction

The report documents progress and results obtained from our research study that is investigating generation-beyond-next computer game culture and technology during the period of 1 July 2007 through 31 December 2007. This study is in support of a collaborative research partnership between the UCI Game Culture and Technology Laboratory and the Daegu Global R&D Collaboration Center, in Daegu, Korea. The initial scope and research areas for study was agreed to by both partners in December 2006, and that served as the basis for effort initiated during this project reporting period.

The process of completing all negotiations related to this study were completed at the end of March 2007. Later during Spring 2007, there were additional changes in the research scope and activities that were to be part of the study. Specifically, the research study agreement as of the end of March 2007 included a set of activities and corresponding budget line items that were focused on the organization and presentation of a series of multiple research workshops to be held each year during the 2007-2009 period. Early project effort during this reporting period focused on organizing these workshops. Thus, some of the results for this reporting period were produced in anticipation of these workshops. These will be identified later. However, as a result of research project renegotiation during Spring 2007, the proposed workshops were dropped from the study, and two courses were substituted in their place, and the previous budget for the workshops was reallocated to support production and delivery of these courses. These courses will be offered during the 2007-2008 project year (during the period from July 2007 through June 2008).

The first course will focus on the Computer Game Industry in the United States, which was completed by the end of December 2007. Preparation of this first course was completed and a mutually agreed schedule of course meetings was presented and executed. The second course will focus on Research

Topics in Computer Game Culture and Technology and this course will start sometime in 2008, subject to the agreement of DIP regarding the overall schedule and start/completion dates yet to be determined. These courses will be taught over the Internet using both broadband audio-visual technologies (e.g., the *LifeSize* HD videoconferencing system at UCI Calit2) and and also Web-based delivery of related course materials (e.g., course lecture notes). This allows access to the course lectures and lecture materials over the Internet to our project partners at the Daegu Global R&D Collaboration Center.

With this project background in mind, we now turn to identify and describe the materials that are included in the remainder of this progress report for 1 July 2007 through 31 December 2007.

Project materials and results

There are research project materials and results in each of the following areas: (a) video lecture series on the computer game industry emphasizing efforts in the U.S.; (b) lecture presentation materials prepared and presented by Professor Robert Nideffer in conjunction with his visit to Daegu during October 2007 as part of his participation in the *First World Game Culture Conference* held in Daegu; (c) an overview of meetings and presentations held during the week of 26 November 2007 for the delegation of visitors from DIP during their visit to UCI and related destinations with leaders in computer game related technologies and new media applications; and (d) an overview of research project activities planned for 2008. Each of these is described in turn. Beyond this, other project related activities during this period included a multi-day visit by both Walt Scacchi and Robert Nideffer from the UCI GameLab to Daegu during October 2007. Numerous meetings were held during this time in Daegu with people from DIP, Daegu City government (including Mr. Kim, Director of Planning, and also Mr. An, Director of Culture), game companies associated with DIP, and also faculty and students from Keimyung University and POSTECH, as well as many delegates from government, industry, and

academia attending the First World Game Culture Conference in Daegu during this time. No attempt is made to document those meetings or their outcomes in this report, though many important meetings, agreements, and relationships were achieved.

Video lecture materials

During August through November 2007, Project Director, Dr. Walt Scacchi, organized, prepared, and presented a series of 20 lectures on the future of the computer game industry that emphasized activities, efforts, investments, and strategic direction in the U.S. Market. These lectures were presented to an audience of DIP affiliates, faculty, and students who attended courses broadcast live over a videoconferencing system from UCI to DIP in Daegu. All lecture materials were prepared in English and delivered in advance for translation into Korean. A condensed version of these lecture materials follows. These lecture notes contain many Web hyperlinks that associate external reference materials and related Web sites so as to further elaborate the details of topics covered in the lectures. Due to the extent and diversity of these materials that are accessible through a Web browser, they are not included here, nor are they made available for translation into Korean, which would be beyond the scope of our resources. Nonetheless, the lecture materials that follow do represent a complete set of lecture notes that correspond to the course topics that were identified, discussed, and agreed to during the first half of 2007 as conveyed by Ms. Jenny Yang from EDEX Inc. in Daegu, acting on behalf of DIP. These same topics were again reviewed and approved by others at DIP, including Dr. Hong-Hee Lee, Deputy Contents Manager at DIP, after 1 July 2007 and before the start of the lecture series in August 2007. More than 100 printed pages of lecture materials are included in this report and they can be accessed through a PDF-compatible Web browser viewing this report. However, all of these lecture materials (and associated reference materials included via embedded Web hyperlinks) can also be found on the Web via the hyperlink http://www.ics.uci.edu/~wscacchi/GameIndustry/

Nideffer Daegu lecture materials

As part of his visit to Daegu during October 2007, Professor Nideffer presented an invited lecture to the audience at the First World Game Culture Conference. His lecture provided an introduction and overview of research and education efforts underway at UCI and the UCI GameLab. The delegation of visitors from DIP who came to UCI in November 2007 got to see many of the efforts and results Nideffer described in his lecture first hand. However, many other people at DIP or its affiliates may not have had the opportunity to see his lecture materials, so they are included next. His lecture is fairly comprehensive and include approximately 80 pages of lecture notes, images, and related documentation sources, which are indicated by embedded Web hyperlinks. All dynamic media content, like remote Web sites, live game demonstrations, and embedded videos/movies are not included in this report, but they can be accessed through a PDF-compatible Web browser viewing this report.

Materials outlining visits by DIP delegation to UCI and related game culture and technology R&D centers

During the week of 26 November 2007, a delegation of 13 visitors from DIP came to UCI for a week of meetings and related activities with a number of people, R&D laboratories, and companies involved in computer game related research and development activities. However, the visit began with a "graduation" ceremony held at the UCI Calit2 for the participating students and game industry executives affiliated with DIP who completed the Fall 2007 video lecture series on the U.S. Computer Game Industry presented as part of this project (see Video Lecture materials section). All participants received a certificate of completion from the University of California Irvine, and this certificate was signed by the UCI Calit2 Director, Professor G.P. Li, and by the Project Leader, Dr. Walt Scacchi. After this ceremony, an extensive schedule of meetings, demonstrations, and follow-up discussions was organized and executed during the remainder of this week long visit.

Meetings were held with the following people and R&D centers: (a) Dan Legeskar, Chairman of the Board, EON Reality, Inc. in Irvine, CA; (b) Robert Nideffer, Walt Scacchi, and Alex Szeto, UCI GameLab, in Irvine, CA; (c) Joe Adams, President, Kellee Preston, Vice-President Operations, Janet Yamaguchi, Vice-President Education, at the Discovery Science Center, Santa Ana, CA; (d) Professor Bill Tomlinson and students, EcoRaft Project, UCI Interactive Animation Laboratory, Irvine, CA; (e) Professor Steve Jenks and Dr. Sung-Jin Kim, HiPERWall Project, UCI Visualization Laboratory, Irvine, CA; (f) Eleanore Stewart, Director, and David Familian, Associate Director, UCI Beall Center for Art + Technology, in Irvine, CA; (g) Professor John Crawford, Active Space Laboratory, Irvine, CA; and (h) Jeff Hwang, President, K2Network Inc., in Irvine, CA. Though each of these meetings and demonstrations extended up to many hours in some situations, all we seek to provide here is simple and brief documentation in the form of the lead page on the corresponding Web site for each of these eight centers engaged in research and development activities helping to shape the future of computer game culture and technology in the U.S. and beyond. However, in each meeting, members of the DIP delegation representing computer game companies had the opportunity to meet and discuss possible business relationships and opportunities according to their interests, and we believe there will be follow-up meetings and business partnerships in one or more cases. For example, we believe that our friends at EON Reality, Inc. are interested in pursing a partnership to establish an “Interactive Development Center” in Daegu, and that discussions with people in industry and city government in Daegu are now underway, with promising results anticipated for possible announcement in early 2008. Thus, it should be noted that business relationships such as this may be the first sign of success for this research project between DIP, Daegu City, and the UCI GameLab, and therefore, DIP may be able to note this as an early result arising from our partnership.

Research project activities for 2008

Based on the results of the preceding activities and meetings (in Daegu and Irvine, as well as via video-conferences during July-December 2007), we believe the best course of action to pursue for 2008 includes a number of activities. The activities outlined here were first discussed and negotiated with Mr. Kim from Daegu City, as he was directly involved in the proposal and contract negotiations from the beginning, and he has also been a key supporter for encouraging an successful research and development collaboration between DIP, Daegu City, and the UCI GameLab. The activities follow next. However, we also discussed with Mr. Kim our need at the UCI GameLab for local research project staff (specifically, game research programmers and artists) who could work on the project with us in a most efficient, effective, and timely manner. This constitutes a change in the proposed project staffing, so that instead of hiring two research programmers from "Company A" we would hire local people already available to us. Part of our reason for proposing this change, was that as of this time, there is no Company A and thus there are no programmers, and this situation negatively affects our ability here at the UCI GameLab to move forward with the three research topics originally proposed. Also, if the programmers or anyone else to work on the project is a citizen of South Korea (or not a citizen/resident of the U.S.) then it is necessary to recognize that application for a U.S. Work visa requires 3-4 months minimum to process, and this time duration is not within our control at UCI. As such, Mr. Kim agreed with our recommendation to allow the research project to continue to move forward on the project research topics as proposed, but now using local game research programmer/artists.

The research activities we will pursue in 2008 include the following: (a) organize, prepare, and present a lecture series of up to 20 lectures on the future of computer game culture and technology; and (b)

engage in the ongoing development and enhancement of tools, techniques, and infrastructure that can further link the UCI GameLab to the Daegu Global R&D Collaboration Center, DIP, and others in Daegu (this is the first topic in our original research proposal). We believe this later activity should include extending and enhancing the *DinoQuest Online* (DQO) computer game environment that we have previously developed at the UCI GameLab to incorporate new tools and functional capabilities that will allow for: (i) DQO game play in English and Korean; (ii) Korean-English multi-player communication through localized game conversation languages; (iii) extension of DQO to provide core functional support for massively multi-player online games; (iv) provide new end-user oriented tools for DQO (or DQO-like online game environments) that support the concepts and techniques for *user created content* that allow users to modify existing or develop new game content; (v) addition of related computation services that support "social networking" and related communication capabilities for DQO end-users; and (vi) demonstrating how these functional capabilities can enable the creation of casual games or casual MMOG-style games, which were highlighted as an emerging trend in the U.S. Computer game industry over the next 2-5 years during the Fall 2007 video lecture series.

Next, it has come to our attention that our friends and colleagues at DIP also now want to propose another change to the original research proposal, by recommending that one full-time research associate from DIP be able to come to work and be paid with project funds at a full-time (100%) level at the UCI GameLab. A review of the project budget and contract indicates that at present, the project budget and contract call for such a person designated by DIP to join the project at a level that is only funded by a 50% level from the research project funds. Thus, in order to support this person at a 100% level with project funds, we may require a reallocation of budgeted funds to support the project. As this change may affect our research efforts going forward, we believe that this change should be discussed

and reviewed by project participants from the UCI GameLab, DIP, and Daegu City so that we can all come to a common understanding for how best to successfully accomplish the objectives of the proposed research effort and activities, as well as how to continue to grow and expand the research and development collaboration we are building between the UCI GameLab, DIP, and Daegu City.

As such, we recommend that we plan to engage in one or more video-conferences during early 2008 with our colleagues and friends at DIP and Daegu City to discuss and explain the proposed changes to the project, project staffing, and project budget, as well as the other activities identified above for 2008, and how we believe they will be of value to DIP, and its industrial and academic affiliates involved in computer game research and development, as well as others in Daegu City in the future.

Final Remarks

The remainder of this report is far more voluminous that this overview. This is as it should be in our view, as what follows are the first round of results from our research project covering just the period of 1 July 2007 through 31 December 2007. Whether the diversity and volumes of results that follows is indicative of what will be produced in the research period ahead is unclear. So please do not assume that what follows reflects what to expect in the near future. Instead, please view the remaining materials with an eye towards what research or directions might be investigated in the months or years ahead. We will of course have the opportunity to discuss and review these materials through video-conferences and other meetings during 2008.

As such, we now present the detailed Project materials and results of our research efforts during 1 July 2007 through 31 December 2007.

Video Lecture Series Notes and Related Materials

Video Lecture Series on the U.S. Computer Game Industry: Opening & Online Game Technology Trends and Directions in 3-5 years

Walt Scacchi
Game Culture and Technology Laboratory
and
Institute for Software Research
University of California, Irvine
Irvine, CA 92697-3455 USA

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Opening remarks and Web-based course information

Overview Description:

- This lecture introduces and outlines the structures of the series.
- The overall focus is to provide an overview of game technology trends and directions over the next 3-5 years for:
  - casual games
  - mobile games
  - PC/local-area network games
  - massively multiplayer games (MMOGs)
  - virtual worlds
- This is to help identify emerging markets, game and game technology development opportunities, as well as challenges in game development and deployment in the years ahead.
- Facts and opinions informed by
  - published references and case studies
  - industry experts
  - experience in game development

- experience in software development, technological innovation, and corporate sponsored projects

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Opportunities and strategies for entry into U.S. game market and other global markets

- New games, game play experiences, game interfaces, game play venues, and game technologies all represent opportunity areas for innovation, new products and services, and new markets (domestic and international)
- Expect the future of computer game culture and technology to be "high growth" on a global basis.
- Key challenges are how best to realize innovation, new products and services, and increased market (share) growth
- No single best strategy exists to approaching the U.S. market or any other national market
    - Strategies will vary by
        - game production studio
        - game publisher
        - game content franchise
        - game player community
        - business partners and investors
    - Strategies must also address "business model"
        - direct to consumer (pay-to-play versus free-to-play)
        - retail distribution
        - publishing partners
        - content licensing
            - in-bound (books, comics, cinema)
            - out-bound (merchandising)
        - role of advertising and external advertisers (non-publisher business partners) in revenue stream
        - role of platforms and (corporate) platform owners
        - overall revenue stream sources and production cost controls

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Casual games

- Future games

- not addressing existing parlor, board, card, or legacy arcade games
- focused on frequent, short-duration game play (up to 30 minutes)
- games accessed or downloaded from the Web or corporate portal server (or via promotional storage package)
- corporate games for job/task training
- corporate games for consumer education on new products/services
- adver-gaming--games as advertisements for other products/services
- corporate games and adver-games may require U.S. marketing partners

- Future game play experiences and interfaces
  - game play as training or education
  - Web browser-based user interfaces (including plug-in components or helper applications, as embedded scripting)
- Future game play venues
  - at workplace
- New game technologies
  - multi-core processors
    - not expected to impact casual games
  - video/cameras and audio recording, playback, mixing and remixing
    - likely to appear in Web-based games
    - may leverage partnerships with video/audio social networking and content distribution services (YouTube, Joost, Aleric)
  - other embedded devices
    - GPS-based games for training applications
    - Television
  - heterogeneous user interfaces
    - new game interface devices
      - video and audio
      - haptic and gestural devices (wireless)
  - service-oriented computing (game content servers)
    - Game services provided through Web Portal (Yahoo Games)
    - Integrated with other portal services
- Relationship to social networking Web sites or online communities
  - via partnership with established portal service provider (Cyworld, MySpace)
  - social networking service APIs (application program interfaces) that support user-created games
- Game production, development, marketing and deployment issues
  - Production: costs, schedules, complexity increasing
    - Focused on dramatic cost, schedule, and complexity reduction
      - small team (single developer?), schedule measured in weeks, known complexity (based on prior experience)

- Development
  - Relative ease/complexity of game development
    - Must be easy to develop, therefore low complexity, but focused to realizing quick and simple high-value game play experience
  - How may new game technologies "break" traditional approaches to game development?
    - use integrated game development and deployment tools and techniques
  - What kinds of new game development concepts, techiques, and tools are needed?
    - What about massively multi-developer (MMD) approaches to game development?
      - Not applicable
    - What role for free/open source software development?
      - Many projects now in progress worldwide.
  - What about user/player created game content, modifications ("game mods"), and complete conversions?
    - may be promising approach to single player or casual game development
- Marketing
  - Market cultivation and community development
    - tied to established market channels (retail stores, Web portals)
    - look for partnership opportunity with established U.S. portal
- Deployment and post-deployment support
  - Distribution model (download, retail sales, product tie-in, other)
    - expect growth in download, difficult access to retail channels (unless via partnership with major U.S. publisher), game give-aways.
  - Community maintenance
    - via periodic new game offerings and cross-promotional tie-ins on portals
  - Game upgrades and expansion
    - to be avoided, due to growth of game software complexity
    - better to offer new game rather than game upgrade

Mobile games

- Mobile game platforms
  - Cell phones
  - Personal digital assistants (PDAs)

    - Handheld consoles (PSP, Nintendo DS, etc.)
    - Media players (Ipod)
    - Ultra-mobile personal computer (UMPC)
- Mobile mixed reality games

- Future games
    - not addressing existing parlor, board, card, or legacy arcade games
    - focused on frequent, short-duration game play sessions (1-15 minutes with asynchronous or aperiodic interactions)
        - phone-based games anticipated
        - geo-referenced games and geographic maps anticipated
        - games that incorporate GPS, Web, and phone-based services provide mixed reality experiences
    - games accessed or downloaded from the Web or corporate portal server (or via promotional storage package)
    - adver-gaming--games as advertisements or promotional tie-ins to phone services
    - corporate games and adver-games may require U.S. marketing partners
    - little/no mobile ecommerce capabilities in the U.S.
- Future game play experiences and interfaces
    - very casual gaming near term
    - mixed reality game play in real-world and online anticipated
    - user interfaces to remain bandwidth and display limited
- Future game play venues
    - outdoor or urban situated game play venues anticipated
    - location-specific game play venues (shopping malls, theme parks, outdoor stadium or motorsports facility)
- New game technologies
    - multi-core processors
        - mobile game platforms will evolve to incorporate more functionally dedicated processor cores that increasingly mimic current PC platforms (with CPU, GPU, audio processor, network processor, etc.)
        - 4-8 processor cores for low-power mobile devices anticipated
    - (video) cameras and audio recording, playback, mixing and remixing
        - future mobile games incorporate video/audio capture and upload to remote service providers anticipated
        - remote services to provide value-added computational processing of uploaded game content for user-directed sharing or redistribution
    - other embedded devices
        - Global Positioning System (GPS) based game mechanics anticipated as component of mobile games

        - waterproof or weatherproof mobile devices that can serve a data capture instruments for mobile games anticipated
        - diverse mobile devices that can interoperate over wireless networks with other devices
            - cell phone to television with embedded processor
    - heterogeneous user interfaces
        - new game interface devices
            - one-hand versus two-hand haptic interface devices (wireless game play remote wand and "nanchuk")
            - body-worn sensors or body-area sensor network for capturing/ uploading sensor telemetry data
                - health/fitness training or personal improvement games
        - multi-language interfaces enabling people with different natural languages to communicate and interact through games
            - restricted language-language translation of user-constructed phrases on mobile device
            - more comprehensive language-language translation (including text-to-speech) via remote phone service providers
    - heterogeneous networking
        - mobile devices that can interoperate over wireless data communications, sensor telemetry, and telecommunications networks (Internet/Web, GPS, phone service provider)
    - service-oriented computing (game content servers)
        - game-based digital merchandising
        - game-based digital products
            - ring-tones
            - screens or wallpapers
        - games as promotional rewards or giveaways with use/purchase on other phone services
- Relationship to social networking Web sites or online communities
    - mobile online communities and social networking services anticipated
    - community portal user interfaces tailored for mobile devices
- Game production, development, marketing and deployment issues
    - Production: costs, schedules, complexity increasing
        - single-user mobile game costs, schedules, and complexity may be comparable to casual games
            - not including fees paid to phone service provider
        - mobile-specific games or mixed reality games expected to have higher cost and complexity and longer schedule, due to technical innovation and market development risks

- Development
  - Relative ease/complexity of game development
    - single user mobile games comparable to casual games
    - multi-device, multi-player, or multi-service games more complex to develop
  - How may new game technologies "break" traditional approaches to game development?
    - Tools for casual single user games may suffice for developing single-user mobile games
    - Tools for multi-device, mixed reality games still experimental at present
      - May represent an opportunity for development of integrated multi-device game development environment, framework, or component library
      - Tool development and sales is not typically a profitable undertaking by itself
  - What kinds of new game development concepts, techiques, and tools are needed?
    - What about massively multi-developer (MMD) approaches to game development?
      - not for single user mobile games
      - possible or potential for multi-device, multi-server mobile games and mixed reality game development
    - What role for free/open source software development?
      - Some experimental projects now underway
      - OSS component libraries for multi-device mobile game networking may appear
  - What about user/player created game content, modifications ("game mods"), and complete conversions?
    - little/no mobile game content or modification tools available
    - integration of video/audio services into mobile deviced may enable user-created innovations
- Marketing
  - Market cultivation and community development
    - primarily centered around phone service providers (closed markets)
    - need to look for partnerships with phone service providers that can generate two-way revenue streams with phone service providers
- Deployment and post-deployment support
  - Distribution model (download, retail sales, product tie-in, other)
    - primarily download via phone service provider; no retail store sales

anticipated
- Community management and maintenance
  - primarily centered around phone service providers (closed markets)
  - U.S. phone service providers do little/no mobile game community management/maintenance services
  - need to look for partnerships with phone service providers that can generate two-way revenue streams with phone service providers
- Game upgrades and expansion
  - likely to be avoided, due to growth of mobile game software complexity
  - better to offer new game tied to new phones, rather than game upgrade on existing phone/mobile devices

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PC/online games

- Supports single player standalone
- May support up to 128 concurrent online players
  - Each with a PC game client connected to a game server over local-area (LAN) or wide-area (WAN) network, such as the Internet
  - More typically support 4-16 concurrent users on a LAN
- Future games
  - largest area of market focus due to very large numbers of PCs
  - PC games may be more/less complex to develop compared to current console games
  - superset of casual and mobile game
  - market segmented by game genres (action versus real-time strategy versus role-playing game versus simulated world, etc.)
  - continuing emphasis on visual/graphic realism, game play physics, spatialized multi-channel audio, higher speed networking, etc.
  - games that exploit multiple dedicated function add-in processing cards or multiple processor cores anticipated
  - new types of game engines anticipated
    - Chemistry, biology, and sociology game engines that enable increasing game-play realism anticipated
  - games that utilize multiple (up to three or more) displays anticipated
    - exploits continual reduction in existing display costs versus increased single display resolution
    - easy way to create more immersive game play experience (or field of view) at reasonable cost

        - can be amortized across multiple games
- Future game play experiences and interfaces
    - PC games that enable play to continue across networks and devices anticipated
        - PC-to-cell phone-to-PC games anticipated
    - games that incorporate content creation or modification as a core game play mechanism anticipated
- Future game play venues
    - Current venues (home, arcades, Internet cafes, PC Baang)
    - Corporate (training) workplaces
    - Schools
    - Libraries
    - Cinemas
    - Concert halls
    - Sports stadiums
    - Broadcast studios
- New game technologies
    - multi-core processors
        - 8-128 processing cores per PC anticipated
        - homogeneous versus heterogeneous versus mixed processing architectures
        - concurrency alternatives (from coarse-grain to fine-grain)
            - agent (programmer control)
            - task/transaction (programmer control)
            - thread (programmer control, compiler detection and allocation)
            - data parallelism (signal processing device drivers)
        - game software functionality distributed across cores:
            - game play dynamics (user interactions, display management, repository management and data decompression)
            - numerical simulation (collison detection, inverse kinematics, and other game physics)
            - non-player characters and in-game bots (artificial intelligence)
            - rendering/shading (graphics)
            - audio (decoding multi-channel spatialization and speech chat)
            - networking (secure data communications)
            - game functionality coordination and scheduling (game "operating system")
            - all functionality affected by interactions between up to 10,000 in-game objects, each object interacting with up to 10 other objects
    - (video) cameras and audio
        - game-based recording, playback, mixing and remixing anticipated
    - other embedded devices

        - game players (game client or game engines) embedded in consumer televisions or standalone displays
    - heterogeneous user interfaces
        - new game interface devices
            - superset of casual and mobile games
        - multi-language interfaces enabling people with different natural languages to communicate and interact
            - superset of casual and mobile games
    - heterogeneous networking
        - superset of casual and mobile spanning data communications, sensor telemetry, and telecommunications networks
    - service-oriented computing (game content servers)
        - game asset/content creation or modification based on video/audio inputs and processing anticipated
    - domain-independent collaboration environments
        - anticipated as common environment for PC game community
- Relationship to social networking Web sites or online communities
    - superset of casual and mobile games
- Game production, development, marketing and deployment issues
    - Production: costs, schedules, complexity increasing
        - All increasing at exponential growth rate
        - Top-tier games in U.S. anticipated to cost $30M-$50M at current growth rates
        - U.S. game studios outsourcing some game development anticipated
    - Development
        - Relative ease/complexity of game development
            - Top-tier retail game development complexity increasing exponentially!
            - new game development concepts, techniques, and tools needed!
                - may include new game or genre-specific programming languages
        - How may new game technologies "break" traditional approaches to game development?
            - Increased reliance on new, genre-specific game development environments (content and software development kits, game functionality libraries, incrementally compiled scripting/programming languages)
                - custom-built, in-house development (expensive, long time to develop, high risk if not core competency)
                - buy/license from third-party (game engine vendors, such as id Software, Epic Games, CryTek, Emergent Technologies)

        - limited to game functionality or capabilites provided by third-party software
        - extensive modification of third-party source code anticipated (expensive, long time to develop, high risk if not core competency)
    - What kinds of new game development concepts, techiques, and tools are needed?
        - What about massively multi-developer (MMD) approaches to game development?
            - definitely possible
            - particularly where large number of game developers (or students) may participate
                - See Google's Summer of Code project (http://code.google.com/soc)
        - What role for free/open source software development?
            - highly probable, especially for large-scale game development "experiments"
            - particularly where large number of game developers (or students) may participate
                - See Google's Summer of Code project (http://code.google.com/soc)
                - See OGRE project (http://code.google.com/soc/2007/ogre/about.html or http://www.ogre3D.org)
    - What about user/player created game content, modifications ("game mods"), and complete conversions?
        - many top-tier retail games sold with user-accessible "software development kit" (SDK) or integrated game development environment
            - no source code access, so no user-modification to game engine
            - all changes made via game scripting language (a domain-specific or genre-specific programming language)
        - some top-tier games are marketed in ways that highlight/encourage user-created/user-modified game content or game play experience
        - user-created/user-modified content enables "mass customization" and personalization
            - increases user investment, commitment to, and "viral promotion" of game brand
        - user-created/user-modified content can be collected, refined, re-implemented, and packaged for distribution as game expansion pack
- Marketing
    - Market cultivation and community development

        - strong, established U.S. market for retail distribution of games
        - publishers control/mediate access to retail distribution vendors (WalMart, Costco, Best Buy, Circuit City)
        - emerging U.S. market for direct-to-consumer digital distribution
            - facilitates transition to online commerce and micro-transactions
    - Deployment and post-deployment support
        - Distribution model
            - download, retail sales, product tie-in, other
        - Community management
            - always a good investment prior to game release
        - Community maintenance
            - always a good way to collect customer feedback and product upgrade ideas
        - Game upgrades and expansion
            - increasingly user-driven anticipated

Massively multiplayer online games (MMOGs)

- Future games
    - same as PC/online games
    - but not as technically sophisticated or resource-intensive as PC/online games
- Future game play experiences and interfaces
    - same as PC/online games
    - but not as technically sophisticated or resource-intensive as PC/online games
- Future game play venues
    - same as PC/online games
    - but not as technically sophisticated or resource-intensive as PC/online games
- New game technologies
    - same as PC/online games
    - but not as technically sophisticated or resource-intensive as PC/online games

    - multi-core processors
    - (video) cameras and audio recording, playback, mixing and remixing
    - other embedded devices (GPS, televisions)
    - heterogeneous user interfaces
        - new game interface devices
        - multi-language interfaces enabling people with different natural languages to

communicate and interact
    - heterogeneous networking--spanning data communications, sensor telemetry, and telecommunications networks
    - service-oriented computing (game content servers)
    - domain-independent collaboration environments (for community support)
- Relationship to social networking Web sites or online communities
    - same as PC/online games
    - but not as technically sophisticated or resource-intensive as PC/online games
- Game production, development, marketing and deployment issues
    - same as PC/online games
    - but not as technically sophisticated or resource-intensive as PC/online games

    - Production: costs, schedules, complexity increasing
    - Development
        - Relative ease/complexity of game development
        - How may new game technologies "break" traditional approaches to game development?
        - What kinds of new game development concepts, techiques, and tools are needed?
            - What about massively multi-developer (MMD) approaches to game development?
            - What role for free/open source software development?
        - What about user/player created game content, modifications ("game mods"), and complete conversions?
    - Marketing
        - Market cultivation and community development
    - Deployment and post-deployment support
        - Distribution model (download, retail sales, product tie-in, other)
        - Community management
        - Community maintenance
        - Game upgrades and expansion

Virtual worlds

- Whyville.net
- Nicktropolis (Nickolodeon)
- Virtual Laguna Beach

- Virtual Magic Kingdom
- Second Life
- Corporate VWs in development
    - IBM
    - Sun
    - others anticipated

- Future game-based virtual worlds (GVWs)
    - similar to "casual MMOGs"
    - basis for Web 3.0 concepts, techniques, and tools
    - basis for Web 3.0 web sites
        - personal or corporate game level/map as Web site
- Future GVW play experiences and interfaces
    - similar to casual games combined with Web navigation ("Web surfing")
- Future GVW play venues
    - similar to "casual MMOGs"
- New GVW technologies
    - similar to MMOGs

    - multi-core processors
    - (video) cameras and audio recording, playback, mixing and remixing
    - other embedded devices (GPS, televisions)
    - heterogeneous user interfaces
        - new game interface devices
        - multi-language interfaces enabling people with different natural languages to communicate and interact
    - heterogeneous networking--spanning data communications, sensor telemetry, and telecommunications networks
    - service-oriented computing (game content servers)
    - domain-independent collaboration environments (for community support)
- Relationship to social networking Web sites or online communities
    - similar to MMOGs
- GVW production, development, marketing and deployment issues
    - similar to MMOGs, but with lower cost and shortet development cycles due to user-created/user-modified GVW content

    - Production: costs, schedules, complexity increasing
    - Development
        - Relative ease/complexity of game development
            - must be very easy to support user-created or user-modified content

- How may new game technologies "break" traditional approaches to game development?
- What kinds of new GVW development concepts, techiques, and tools are needed?
  - What about massively multi-developer (MMD) approaches to GVW development?
  - What role for free/open source software development?
- What about user/player created GVW content, modifications ("game mods"), and complete conversions?

- Marketing
  - Market cultivation and community development
- Deployment and post-deployment support
  - Distribution model (download, retail sales, product tie-in, other)
  - Community management
  - Community maintenance
  - Game upgrades and expansion

Video Lecture Series on the U.S. Computer Game Industry: Industry Needs & Expectations--I

Walt Scacchi
Game Culture and Technology Laboratory
and
Institute for Software Research
University of California, Irvine
Irvine, CA 92697-3455 USA

Version of: *23 August 2007*

(Return to Course Materials)

Overview Description

This lecture focuses on industry needs and expectations associated with the development of:

- future games
- future game play experiences and interfaces
- future game play venues

It also introduces issues associated with the advent of new game technologies such as:

- multi-core processors
- camera-based devices

This will include examination of the combination of online games with Web-based virtual worlds and social networking (or online community) Web sites/services.

Future casual games

- not addressing existing parlor, board, card, or legacy arcade games
- focused on frequent, short-duration game play (up to 30 minutes)

- *games accessed or downloaded from the Web or corporate portal server* (or via promotional storage package)
  - Yahoo! Games
    - organized by game genre
    - community services for game genres
    - more women in the 18-45 age group playing, compared to males of all ages
  - DinoQuest Online (Science Learning Games at the Discovery Science Center, Santa Ana, CA)
    - targeted to 5-12 age group in family play situation
    - collaborative problem-solving (usually led by young players)
    - focused on supporting "informal science education" consistent with California Science Education standards for 5-12 age group
    - 13 casual games organized into multi-hour (3-5 hour) play-learning experience
- corporate games for job/task training
- corporate games for consumer education on new products/services, government/ public programs, health, and others
- adver-gaming--games as advertisements for other products/services
- corporate games and adver-games may require U.S. marketing partners

Future mobile games

- not addressing existing parlor, board, card, or legacy arcade games
- 4 billion cell phones expected in use world-wide by 2010
  - More than 2000 distinct cell phone hardware packages
    - What is the best target for mobile game development?
    - Cell phones have very short product life cycle compared to Web, PCs, and game consoles
    - Many incompatible phone hardware and software packages
- focused on frequent, short-duration game play sessions (1-15 minutes with asynchronous or aperiodic interactions)
  - phone-based games anticipated
  - geo-referenced games and geographic maps anticipated
  - games that incorporate GPS, Web, and phone-based services provide mixed reality experiences
- games accessed or downloaded from the Web or corporate portal server (or via promotional storage package)
- adver-gaming--games as advertisements or promotional tie-ins to phone services

- corporate games and adver-games may require U.S. marketing partners
- little/no mobile ecommerce capabilities in the U.S.

Future PC/online games and MMOGs

- largest area of market focus due to very large numbers of PCs
- PC games may be more/less complex to develop compared to current console games
- superset of casual and mobile game
- market segmented by game genres (action versus real-time strategy versus role-playing game versus simulated world, etc.)
- continuing emphasis on visual/graphic realism, game play physics, spatialized multi-channel audio, higher speed networking, etc.
- games that exploit multiple dedicated function add-in processing cards or multiple processor cores anticipated
- new types of game engines anticipated
  - Chemistry, biology, and sociology game engines that enable increasing game-play realism anticipated
- games that utilize multiple (up to three or more) displays anticipated
  - exploits continual reduction in existing display costs versus increased single display resolution
  - easy way to create more immersive game play experience (or field of view) at reasonable cost
    - can be amortized across multiple games
- MMOGs not as technically sophisticated or resource-intensive as PC/online games

Future game-based virtual worlds (GVWs)

- Similar to "casual MMOGs"
  - basis for Web 3.0 concepts, techniques, and tools
  - basis for Web 3.0 web sites
    - personal or corporate game level/map as Web site
- Whyville.net (already supporting >2.5M users, predominantly girls in the 12-17 age group)
- Nicktropolis (MTV+Nickolodeon investing $100M during 2007-2009 into GVWs for 8-14 age players)
- Virtual Laguna Beach (MTV investing $500M during 2007-2009 into Games and GVWs)
- Virtual Magic Kingdom (Disney)

- Second Life
- IBM
- Sun
- many other corporate efforts underway!

Future casual game play experiences and interfaces

- game play as training or education
- Web browser-based user interfaces (including plug-in components or helper applications, as embedded scripting)

Future mobile game play experiences and interfaces

- mostly casual gaming near term
- mixed reality game play in real-world and online anticipated
- user interfaces to remain bandwidth and display limited

Future PC/online game and MMOG play experiences and interfaces

- PC games that enable play to continue across networks and devices anticipated
  - PC-to-cell phone-to-Web-to-MMOG-to-GVW anticipated
- PC/online games and MMOGs that incorporate content creation or modification as a core game play mechanism anticipated
- MMOGs not as technically sophisticated or resource-intensive as PC/online games

Future GVW play experiences and interfaces

- similar to casual games combined with Web navigation ("Web surfing")
- incorporation of content creation or modification as a core experience mechanism anticipated
- not as technically sophisticated or resource-intensive as PC/online games

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Future game play venues

- Current venues (home, arcades, Internet cafes, PC Baang)
- Corporate (training) workplaces
- Outdoor or urban situated game play venues anticipated
- Location-specific game play venues (shopping malls, theme parks, outdoor stadium or motorsports facility)
- Schools
- Libraries
- Cinemas
- Concert halls
- Sports stadiums
- Broadcast studios

New game technologies

- multi-core processors
  - not expected to impact casual games
  - mobile game platforms will evolve to incorporate more functionally dedicated processor cores that increasingly mimic current PC platforms (with CPU, GPU, audio processor, network processor, etc.)
    - 4-8 processor cores for low-power mobile devices anticipated
  - 8-128 processing cores per PC (including MMOG and GVW PCs) anticipated
  - homogeneous versus heterogeneous versus mixed processing architectures
  - concurrency alternatives (from coarse-grain to fine-grain)
    - agent (programmer control)
    - task/transaction (programmer control)
    - thread (programmer control, compiler detection and allocation)
    - data parallelism (signal processing device drivers)
  - PC/online game and MMOG software functionality distributed across cores:
    - PC/online game play dynamics (user interactions, display management, repository management and data decompression)
    - numerical simulation (collison detection, inverse kinematics, and other game physics)
    - non-player characters and in-game bots (artificial intelligence)
    - rendering/shading (graphics)
    - audio (decoding multi-channel spatialization and speech chat)

        - networking (secure data communications)
        - PC/online game functionality coordination and scheduling (game "operating system")
        - all functionality affected by interactions between up to 10,000 in-game objects, each object interacting with up to 10 other objects
    - MMOGs and GVWs not as technically sophisticated or resource-intensive as PC/online games on client-side
        - Most MMOG server infrastructure and some GVW server infrastructure exploitation of multi-core processors highly anticipated
            - Requires game server architecture and implementation that exploit various concurrency alternatives
            - GVW servers likely to exploit different architectural choices compared to MMOG servers
  - video/cameras and audio recording, playback, mixing and remixing
    - likely to appear across all types of game platforms
    - may leverage partnerships with video/audio social networking and content distribution services (YouTube, Joost, Aleric)
    - incorporating video/audio capture and upload to remote service providers anticipated
        - remote services to provide value-added computational processing of uploaded game content for user-directed sharing or redistribution
- Relationship to social networking Web sites or online communities
  - via partnership with established portal service provider (Cyworld, MySpace, Yahoo, YouTube, AOL)
  - social networking service APIs (application program interfaces) that support user-created games and user-modified games that are integrated with social networking services
    - game-based "virtual dating"
    - record, replay, share, or modify virtual dates online

Return to Course Materials

Video Lecture Series on the U.S. Computer Game Industry: Industry Needs and Expectations--II

Walt Scacchi
Game Culture and Technology Laboratory
and
Institute for Software Research
University of California, Irvine
Irvine, CA 92697-3455 USA

Version of: *29 August 2007*

Overview Description

This lecture focuses on industry needs and expectations associated with:

- new ways to produce, develop, and deploy future games, game experiences and interfaces, and future game venues

This will include examination of traditional and alternative ways of developing game software and content

- in-game character appearance and behavioral capabilities
- levels
- game play mechanics, etc.

It will also address community-based development methods and deployment techniques.

It also introduces game software development issues associated with the advent of new game technologies such as multi-core processors and heterogeneous user interface devices:

- Location-based, table-top game playing surfaces (example picture and video demo)
- Localized language-based and culturally sensitive user interface dialogs (reference)
- User-programmed interactive toys (video demo and Web site)
- Mixed reality across physical and virtual (game) world interaction (example picture)

- Augmented/mixed reality surfaces with video camera input processing (example picture)
- Bare-hand (touch-free), gesture-based user interfaces via video camera input processing (video demo)
- Human muscle and skeletal behavioral animation (video demo)
- Human face video capture and behavorial re-animation (reference and video demo)

Last, it addresses issues in console game development, where console games:

- Primarily support single player standalone
  - Single player experience is critical, more so than network play
- May support up to 128 concurrent online players through subscription network service (Microsoft Xbox Live, Sony Home)
  - Each console game client connected to a game server over a wide-area (WAN) network, such as the Internet
  - More typically support 4-16 concurrent users per game
  - Most concurrent user interaction focused on game community and game-related commerce (e.g., buying in-game objects through game service network provider)

Traditional and alternative ways of developing game software and content

- Game production, development, marketing and deployment issues
  - Production: costs, schedules, complexity increasing
    - Focused on dramatic cost, schedule, and complexity reduction
      - casual and mobile games focusing on small game development teams (single developer?), schedule measured in weeks, known complexity (based on prior experience and mature/familiar technology)
      - mobile-specific games or mixed reality games expected to have higher cost and complexity and longer schedule, due to technical innovation and market development risks
      - Console, PC, and MMOG production costs, schedules, and complexity all increasing at exponential growth rate
        - examples (see Game Developer magazine post mortems)
        - prior game platforms viable market for up to ten years (Sony Playstation 2)
      - Top-tier Console, PC, and MMOG game production in U.S.

anticipated to cost $30M-$50M at current growth rates
        - U.S. game studios outsourcing some game development anticipated
- Development
    - Relative ease/complexity of game content development for in-game character appearance and behavioral capabilities, levels, game play mechanics, etc.
        - must be easy to develop, therefore low complexity, but focused to realizing quick and simple high-value game play experience
        - multi-device, multi-player, or multi-service games more complex to develop
        - Console, PC, and MMOG content development cost and complexity increasing exponentially
    - How may new game technologies "break" traditional approaches to game content development?
        - Tools for casual single user games may suffice for developing single-user mobile games
            - Flash 9 (PC)
            - FlashLite (Cell phone, PDA, PC)
            - AJAX (Java or Javascript)
            - Flash Game Engine (custom-made, no standard, no FlashGame development environment)
                - example: tile-based game engine in FlashMX
                - UCI developed *DinoQuest Online* game environment created on custom-built Flash game engine
            - Which one to use?
        - Tools for multi-device, mixed reality games still experimental at present
            - May represent an opportunity for development of integrated multi-device game development environment, framework, or component library
            - Tool development and sales is not typically a profitable undertaking by itself
        - Current generation console, PC, and MMOG content developed using vendor-specific (game engine) integrated development environment and deployment tools and techniques
    - What are current best-of-class game development tools or integrated development environments (not addressing casual or mobile games)?
            - Id Tech 5 (video demo)
            - Unreal 3 and Unreal 3 tools
            - Crytek CryEngine 2
            - Gamebryo and Gamebryo tools
            - Renderware (EA proprietary)

        - What about massively multi-developer (MMD) approaches to game development?
            - Not applicable for casual, mobile, or console games (at present)
            - applicable for PC, MMOG, GVW
                - but not with commercial, vendor-specific integrated development environments!
                - requires construction of free/open source integrated game content development environment
                    - Research opportunity area!
    - What about user/player created game content, modifications ("game mods"), and complete conversions?
        - may be promising approach to single player or casual game development using available tools
        - PC games provide vendor-specific integrated development environment (without game engine source code) to end-users
        - Console games and MMOGs in general do not provide support for end-user content creation beyond in-game character personalization
            - this is likely to change in time (user-created content will be supported)
        - GVW is all about user-created content
            - how best to build and deploy free/open source GVW integrated development environment is research opportunity area!
    - How may new game technologies "break" traditional approaches to game development?
        - Single-core versus multi-core platform architectures
            - single core game development well understood
            - mature console game development tools and skilled game developers
            - long-term demand for single-core game development, but targeted to market niches
        - Multi-core game development varies by platform
            - Industry news of concern over challenges and payoffs in developing multi-core software
            - XBox 360 console game development similar to PC game (multi-threaded single-core), unless seeking to exploit multi-core processing capabilities (which allow for new kinds of game visualizations--for example, in motor racing sim games, multi-cores are employed to create "tire-tread" terrain deformations)
            - Playstation 3 games currently most challenging to develop
                - need for game developers (programmers and artists) to understand how to exploit processing concurrency
                - how to detect/prevent game faults that arise from latent/

undetected concurrencies, or from unintended multi-thread interactions
- however, once understood, game development experience may then guide development on simpler platform architectures
  - "*Multi-core first hypothesis*": develop first for Playstation 3, then for MS XBox 360, then for single processor platform (older PC, Nintendo Wii, cell phone)
    - provides a game development business model, if a successful multi-core game can first be developed and deployed
  - this hypothesis has not been proven yet!
  - unclear if hypothesis extends beyond console game to multi-core based PC games or MMOGs
- Future multi-core PC processors will not be structured like the Playstation 3 cell processor
  - compelling desire to test and validate the Multi-core first hypothesis!

- What kinds of new game development concepts, techiques, and tools are needed?
  - What kinds of problems arise during game development for multi-core processors?
    - How best to achieve "thread-safe" game development
    - Debugging asymmetric or hidden concurrencies
      - multi-thread interaction
      - unintended blocking/locking
      - sychronization deadlocks and livelocks
      - etc.
    - Visualizing the location of computation and concurrent computation during the development of game artwork, game mechanic dynamics, user interaction, or game servers
      - game engine module/component level
      - memory level
      - game object or composite object level
      - game display frame rate level
      - general purpose debugging or software visualization tools do NOT adequately address these problems!
      - larger granularity concurrency for game (infrastructure) servers
        - multi-processor motherboards per processing blade server
        - multi-blade servers (cluster)
        - multi-cluster server (grid)
    - Example commercial solution to PC/MMOG game development for

current multi-core *game consoles*

- Platform-specific optimizations in the Gamebryo engine

Lecture 4 (19 September 07)

Online Game Development Planning 1

Abstract: This is the first of two lectures focusing on ways and means to plan for online game development.

Emphasis is directed at how best to plan for

- conceiving,
- prototyping,
- play testing,
- marketing, deploying,
- community managing, and
- maintaining future online games,

in the presence of future game technology that may enable more people to play familiar games (and game genres) with new game play experiences

- multi-core processors
  - concurrent processing, multi-processing, and multi-tasking to enable new game features and functional capabilities
    - higher level of visual realism
    - higher level of physical fidelity (better game physics, chemistry, biology, sociology, etc.)
    - multi-sensory immersion
    - etc.
- heterogeneous user interfaces/devices
  - integration of new game input/output devices that enable new game features or functional capabilities
    - video cameras as user input device
    - heads-up displays (HUD) for immersive augmented reality game play experience
    - touch-free user interfaces to control game play
    - gaze-directed user interfaces to control game play

Game conception

- Most game design depends on overarching story or narrative
  - Exception: traditional card games, board games, parlor games

    - Sample reference: C. Bateman, Game Writing: Narrative Skills for Videogames, Charles River Media, 2006.
- Game concept themes
    - Cultural experience or transmission
    - Multi-cultural "mash-up"
    - Language learning
    - Domain knowledge acquisition (know-how) or skill acquisition (know-what)
- Game concepts vary by game genre
    - Casual games
    - Action/FPS (or MMOFPS!)
    - Role-playing (RPG or MMORPG)
    - Real-time strategy (RTS)
    - Simulation (SIM)
    - Music, dance, art
    - Sports
    - etc.
- Design of game narrative requires:
    - Identification and story linkage of multiple scenarios where different game play experiences are encountered
    - *Scenarios* indicate the who, what, where, when, why, and how of the game
        - *Who*--game characters, actors, or agents (non-player characters)
            - Appearance
            - Behaviors or skills
                - Individual actions
                - Multi-actor interactions
                - Collective action (common in RTS games)
        - *What*--game activity or tasks where game mechanics are employed
        - *Where*--game settings, in-game environments, or levels
        - *When*--game time-place and duration of activity
        - *Why*--beliefs or purpose of in-game characters or game players
        - *How*--course of action that human players follow in driving their game charcters to perform/experience different game activities in some sequence of game settings, at particular times in order to accomplish the purpose of game play
    - Core scenarios to develop
        - Game introduction
        - Game space configuration
            - Default
            - Optional
        - Game play tutorial
        - Game levels
            - Single level for repetitive game play (common in traditional games)
            - Multiple levels, which are partially ordered for sequenced game play ("leveling up")

- Multi-core processors and heterogeneous user interfaces/devices enable new types and new kinds of game concepts
  - Sample of multi-core processing functions or capabilities that can be applied to games in 2010-2012.
  - Sample scenario script for future Game-based Virtual World in 2010-2012
  - Sample technical scenario for future GVW where multi-core processing and heterogeneous user interfaces are employed.

Prototyping

- Visualizing and simulating game play scenarios
  - To establish the "look and feel" of the game concept
  - Common technical mistake to skip prototyping activity
- Game prototyping facilitated by existing game development tools and game engines
  - Prototype via game mods, using an existing game and game engine
    - Id Tech 3 (from Id Software) game engine and game software development kit (SDK) licensed by Valve Software to create Half-Life game
    - Counter-Strike game mod for Half-Life, using only SDK (no source code modification)
    - Counter-Strike mod (commercial game "prototype") developed by two people
    - Id Tech 3 game engine now available as open source software (while Id Tech 4 and Id Tech 5 are not--*yet*)
- Game prototyping using other software development tools
  - Pre-visualization tools from the feature film industry (computer animation tools)
    - FrameForge 3D Studio (low-cost pre-visualization tool for film scenario prototyping)
  - Storyboards off-line and on-line
    - Sample off-line storyboard
      - Hand-drawn artwork integrated with scenarios or script (Example storyboard and script)
      - Historical example: The *Scrovegni Chapel* (14th. Century multi-level storyboard, created by Giotto di Bondone and team)
        - Overall storyboard
        - Storyboard layout
        - Sample storyboard image
    - Online storyboards
      - Presentation tools (Powerpoint)--very difficult to use in most cases
      - Web pages with interactive navigation
      - Flash

- Sample online animated storyboard in Flash for GVW where multi-core processing and heterogeneous user interfaces are employed.
- R&D opportunity: computer game industry does not have game pre-visualization or scenario development tools

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Play testing

- Can people other than the game designers and game developers play the game, and enjoy playing?
- Game testing is often the first activity to be cut or downsized when schedule or budgets are exceeded!
- Game prototypes can give prospective game players early user experience before game development begins
- Strategy: use "continuously available" versions of the game to enable *continuous testing* of game and game play
    - May be uncommon approach to employ
    - Can game be developed through progressive expansion and refinement of evolving game prototypes?
        - Technique used in other software application development efforts, outside of games
        - Common technique employed when developing free/open source software

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Marketing and deployment

- National versus international game marketing
- National markets
    - U.S. (or English) game marketing
        - Large game development studios are moving away from developing games for U. S./English-only markets
            - Some game studios opening offices or establishing partnerships with game developers in Asian (Korea, China) markets
        - Small game development studios will often be limited to developing games for single languare or single culture markets
            - However, casual/mobile games may be easy to internationalize
    - Need to focus on community development as game development moves towards completion and commercial release
        - Informal case study: *Grenado Espada* (Sword of the New World)
            - New MMORPG developed in Korea, marketed in the U.S.

        - Early CCUs question eventual success of this MMORPG
        - Comparatively little attention to early online community development or play testing?
- International markets
    - Growing interest in developing and marketing games for English and Asian markets simultaneously
        - Starcraft II
        - World of Warcraft
        - May be possible for large budget, MMOGs
        - Strategic Risk: lack of cross-cultural knowledge may lead to regional or global market failure

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Community management and maintenance

- Online community development--early requirement for successful game deployment
    - Helps stimulate early game user awareness and interest in new game, prior to release
    - Enables game developers to get play testing feedback from "beta testers"
    - Enables discovery and early dissemination of game-related merchandise
        - Indicator of market interest in game and game concept
    - Benefits from use of "domain-independent" community environments
        - Easily reused for new game marketing and customer feedback
        - Incorporates support for online discussion, individual/group blogs, game art Web pages, etc.
    - Reference: A.J. Kim, Community Building on the Web: Secreat Strategies for Successful Online Communities, Peach Pit Press, 2001.
- Unclear what role is for international online community development
    - Are online game communities popular in Korea, China, and other non-English speaking markets?
    - How to overcome cross-cultural and language barriers?
- How to sustain community over the commercial life cycle of the game?
    - MMORPGs like *Ultima Online* and *Everquest* are reported to still have upwards of 100,000 players, more than 5-10 years since their initial depoloyment
    - Starcraft is still a very large market in Korea, but not in the U.S.--Why?
    - Lineage and Ragnarok were also great successes in Korea, but not in the U.S.--Why?

Lecture 5 (20 September 07)

Online Game Development Planning 2

Abstract: This is the second of two lectures focusing on ways and means to plan for online game development.

Emphasis is directed at how best to plan for

- conceiving
- prototyping
- play testing
- marketing and deploying
- community managing, and
- maintaining future online games

in the presence of new ways and means for orchestrating

- small versus large game development teams
  - small teams for casual, mobile games, limited sim games, GVWs
  - large teams for action/FPS, real-time strategy, role-playing games, sports, complex sim games, MMOGs
- single-site versus multi-site development teams
  - single site when centralized control over game design and artwork preferred
  - multi-site when decentralized control and division of labor across game functionality or artwork is preferred
- globally distributed game development communities
  - loosely-coupled, mostly autonomous game development with small group of core game developers/architects and large dispersed internationally dispersed community of game development contributors
  - works well with free/open source game software/artwork development approaches

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Game conception

Most game design depends on overarching story or narrative that guides game design and game play experience.

Multi-core processors and heterogeneous user interfaces/devices enable new types and new kinds of game concepts.

- small game development teams
  - most highly innovative game concepts (including games as contemporary art, or new media artwork) are done by small teams!
    - Example game art portal, SelectParks.net
    - commercial success or financial reward is not central motivation, but original/ creative expression is
  - may choose to distinguish themselves through development of new/innovative games that employ:
    - new/non-traditional user interfaces or interface devices
      - GPS-based cell phones with embedded Web browser for geo-referenced game play synchronized with online (PC/Web) game.
        - Example: Unexceptional.net featuring multiple user interfaces and interface devices
      - bare-hand or touch-free user interfaces (example: EON Touchlight video demo)
    - new game play modalities
      - mixed reality games
      - augmented reality games (example video) or game interfaces (example video)
        - first commercial ARG released by Sony, *The Eye of Judgement* (promotional video)
      - "flash mob" games
  - small teams may experiment with multi-core processing, but primarily for R&D purposes, rather than for commercial game development
- large game development teams
  - may choose to distinguish themselves through development of games that employ:
    - new/non-traditional user interfaces or interface devices
      - Nintendo Wii controller
      - Guitar Hero "guitar" controller
      - User interface devices such as these and others (Dance, Dance Revolution floormat user interface) provide for a unique supplement (or strong product tie-in) to game content and revenus stream (devices are also sold separate from game)
    - multi-core processor platforms
      - game consoles (PS3, XBox 360)
  - large teams generally have small number of people involved in envisioning overall game design
    - to maintain a "single vision" of what the game is suppose to be, and how best to develop and deploy it
  - large teams also allow for division of labor (or task specialization) across game production, marketing, deployment, and community management
- single-site development teams

    - similar to small or large development teams
- multi-site development teams
    - similar to small or large development teams
- globally distributed game development communities
    - generally weak in envisioning new game concepts
    - free/open source game software development better suited for relatively well-understood game design concepts and game play experience
    - best suited for educating/training next generation of game developers who can employ game design concepts provided by experienced game design "mentors"
    - also well suited for development of free/open source game engines, game software and content development environments

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Prototyping

Visualizing and simulating game play scenarios to establish the "look and feel" of the game concept

- small game development teams
    - often start with game modding (very low barrier to entry into market)
    - game modding approach most likely for prototyping or development of GVWs
        - start with something that works, or something that some other group has created and shared as some form of "open source"
        - may be limited to open content sharing and modding, while underlying GVW engine is closed or proprietary
    - many small teams also engaging in use or development of free/open source game engines and content development tools
        - other teams experience with these game engines may serve to demonstrate game prototyping or development capability
    - some developers of independent or casual games use Flash for game prototyping
        - Sample GVW prototype in Flash where multi-core processing and heterogeneous user interfaces are employed.
- large game development teams
    - often focusing on providing new or custom game play features or functions that must first be demonstrated via game prototyping
        - game prototypes help development teams "earn" external financial investment or publishing deal
    - either will "build or buy" a game engine and supporting software development kit (SDK)
        - use of existing, operational game engine and SDK enables game prototyping
        - custom-built game engines usually done to support development and commercialization of multiple games
        - game engines evolved across versions and game platforms (from PC to console, to

Web, to mobile, but rarely to MMOG)
        - previous versions can always serve to support prototyping, as can new version of the game engine
    - prototyping tools from other software application domains also support user interface interaction simulation and replay
- single-site development teams
    - same as small versus large game development teams, above
- multi-site development teams
    - similar to use of multiple teams to create computer-generated imagery (CGI) or "special effects" in the feature film industry
        - all independent teams are now expected to provide pre-visualization prototypes before formal commitment (funding) to production is made
    - multi-site prototyping enables (or reinforces) a modular decomposition of the game design and game play experience
        - game play mechanics may span multiple game modules
        - modular design and prototyping enables parallel or concurrent development of game content or software modules, which in turn can shorten total development time (though not development cost or effort)
        - modular prototyping also allows for multi-national development, where a site can focus effort on development of its assigned modules or cross-module features (example, multi-lingual user interface internationalization)
- globally distributed game development communities
    - can be same as multi-site development teams
    - free/open source game software and content prototyping can be performed independently semi-autonomously teams, who in turn can demonstrate the results of their efforts to other developers
        - this collective and shared prototyping activity collectively advances the game design/prototyping knowledge of all those developers who participants (or observe)

Play testing

Can people other than the game designers and game developers play the game, and enjoy playing?

- small game development teams
    - most likely to focus on "family or friends" of independent game developers for play testing
    - may be leveraged through early dissemination of game versions on independent game portals, to elicit end-user feedback
        - Indie game portal examples: Independent Game Festival , Independent Game

Source, and Indie Games

- large game development teams
  - game testing is often the first activity to be cut or downsized when development schedule or budgets are exceeded!
  - may be able to exploit use of end-user beta-testers (who get early and free access to a commercial game before release)
- single-site development teams
  - same as small or large game development teams
- multi-site development teams
  - may be well suited to employ end-user beta testers in different national markets (U.S., Korea, China)
  - may require game development studios/offices located in different countries
    - alternatively, may be able to engage multi-lingual game developers in one country, if available--this may be unlikely
- globally distributed game development communities
  - best suited to enable continuous game play testing via continuously available versions of the game while in development
  - common technique employed when developing free/open source game software and game artwork

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Marketing and deployment

National versus international game marketing

- small game development teams
  - very limited ability to independently access international markets
  - opportunity for formation of new venture focusing on creating a global brand/portal that offers "internationalization" services and independent games across languages/cultures
    - multi-language or multi-cultural game design hueristics
- large game development teams
  - moving away from developing games for U.S./English-only markets
  - some game studios opening game development offices/studios or establishing partnerships with game developers in Asian (Korea, China) markets
    - seeking early focus on internationalization and cross-cultural access to end-users in different global markets to enable "market sensitive" game design
      - Example: Red 5 Studios (started by former lead developer of World of Warcraft; international financed; studios located in Southern California and Shanghai)
- single-site development teams
  - typically focused on games for single natural language, or

    - small number of games for small number of languages (via user interface internationalization)
- multi-site development teams
    - see large game development teams, above
- globally distributed game development communities
    - can excel at articulation of cross-cultural knowledge about game play, game development practices, and end-user collaboration patterns that have been successful
    - can be mobilized to support both proprietary and free/open source game software development
        - games can be developed and distributed in both commercial and open source ways
        - games may be commerically marketed in one natural language market, and made available as open source in another market

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Community management and maintenance

Online community development--early requirement for successful game deployment.

Need to focus on community development as game development moves towards completion and commercial release.

Enables game developers to get play testing feedback from "beta testers."

- small game development teams
    - leveraged via participation in independent game developer community and community activities
        - Example: Independent Games Festival (in conjunction with the annual Game Developers Conference)
    - hosting independent games on common game portals
        - game mod sites
            - builds visibility and reputation (good/bad)
        - casual game sites
- large game development teams
    - leveraged via production and operation of game development studio portal site
        - hosts community information on current games (bug reports, software updates, etc.)
        - hosts community information on upcoming games in development (preview game artwork, etc.)
    - leveraged via offering end-user collaboration support environment
        - discussion forums, end-user feedback on new game features, etc.
- single-site development teams

- same as small versus large development teams above.

- multi-site development teams
  - generally, large game development teams or large game development studio
  - community infrastructure well leveraged through common end-user collaboration environment
  - internal/proprietary game developer collaboration infrastructure used to discuss common development problems, solutions, or work-arounds
    - not visible or accessible by end-users or other competitors
  - unclear how best to exploit multi-national or multi-cultural end-user communities
    - game development teams in one country (e.g., U.S. or Korea) may setup end-user collaboration environments by natural language of end-users (English, Korean)
      - little crossover of end-user culture or language
      - some Korean games are translated in "KorEnglish", which is often frustrating (or embarassing) to game players and game masters in different cultures
      - large end-user communities for KorEnglish games may be outside of U.S. (example: Turkey/Middle East), and their end-user collaboration environment may be limited to (partial) English, thereby frustrating game developers and game masters trying to best support and grow the end-user community
- globally distributed game development communities
  - may be small or large development teams
    - small global teams usually bound to single Web site for sharing information, source code, artwork, advice, etc.
      - common in free/open source game software development communities (example: OGRE)
    - large global development teams uncommon, but more are anticipated
      - similar community support requirements to multi-site development teams

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Lecture 6: (26 September 07)

MMOG Online Game Development Planning

Abstract: This lectures focuses on how best to plan for the development of a Massively Multiplayer Online Role-Playing Game (MMORPG), as well as other kinds of MMOGs (for example, MMO action games, MMO science learning games, or Game-based Virtual Worlds).

MMOGs pose different kinds of game development issues and challenges, as well as community management issues, compared to single-player or casual games.

- Conceiving
- Prototyping
- Play testing
- Marketing and deployment
- Community management and maintenance

MMOGs will also move to game play experiences that move across different media or devices (for example, from networked PCs to Web sites to cell phones, and possibly to broadcast television).

MMOG Conception

- In the history of MMORPGs since 1997, one MMORPG dominates the end-user market, with another 3-5 likely to be financially successful
    - Dominant MMORPGs in past 10 years
        - *Ultima Online*--upwards of 250,000 registered end-users (subscribers), with >100,000 as of 2006, with approximately 50% of current users in Japan!
            - Two sequels, eight expansion releases, five special package releases
            - First MMORPG to reach 100,000 subscribers.
            - Longest running MMORPG ever!
            - As of July 2006, still appears to have more than 100,000 subscribers
        - *Everquest* (and *Everquest II*)--upwards of 700,000 registered end-users
        - *Lineage* (and *Lineage II*)--Korean MMORPG, more than 3M registered end-users at peak
        - *Runespace*--Java-based MMORPG, 9M active free user accounts; 1M subscribers
        - *World of Warcraft*--upwards of 9,000,000 registered end-users ("subscribers")
            - 2.0M in U.S.
            - 1.5M in Europe

        - 3.5M in China
      - *Guild Wars*--Korean MMORPG, 2M active users
      - *MapleStory*--Korean 2D MMORPG, greater than 5M total users
      - *Lord of the Rings Online*--New 3D MMORPG, fastest growing MMOG user base (1M subscribers, five months past first release)
    - Growing interest in business opportunities around the growth of MMOGs, according to recent IBM study of MMOGs
- MMORPGs typically take 2-4 years to develop!!!
      - *World of Warcraft*
        - *Development announced: 2001*
        - *First Release: November 2004, 10 years after first Warcraft game release*
        - *2M registered users in first 6 months; 4.5M users in 12 months*
    - New MMORPGs allow for both PC and console-based online game play
    - Financial basis for MMORPG development critical (see Interplay financial disclosures)
    - $30M-$100M budgets for MMORPG production and release already anticipated
    - Trade press indicates that as many as 50 or more MMORPGs are in development
    - Vast majority of MMORPGs will fail, and therefore represent a risky financial investment!
- MMOG narratives and scenarios
    - MMOG scenarios are typically (still) targeted to role-playing games (RPGs)
      - Character scenarios, appearance, behaviors, and so forth are critical to game/story design (following World of Warcraft)
        - Races (10)
        - Classes (9)
        - Character types
          - Player character (end-user avatars)
          - Non-player characters (AI-based)
            - Friendly NPCs
            - Hostile NPCs
            - Neutral NPCs
        - Professions/roles (character skill sets)
          - Primary
            - Gathering (3)
            - Crafting (8 plus specializations)
        - Items and equipment
        - Mounts (allows character to "ride" another object, like an animal character)
        - PvP (Player versus Player) ranking (points scoring)
        - Reputation level
      - Worlds and world scenarios (in-game environments or play settings where game-related events occur)
      - Realms (server clusters that allow end-users to choose their preferred gameplay type)
      - Scenarios must address where/how end-users can communicate in-game via their

characters
- Text-chat
- Voice-chat
- Game portal (discussion forums, Web site, and more)

- Scenarios also needed for game-related commerce and/or in-game economic system

- New MMOGs like those for Action/FPS games (MMOFPS) still framed as RPGs

- New/innovative MMOGs
  - MM Mobile Games, such as Disney's Pirates of the Carribean Multiplayer Mobile
  - MMOGs for Dancing (Dance Online) announced and now in development
  - MMOGs for education and training
    - MMO Science Learning Games (MMOSLG) that interlink a network of interactive, hands-on learning exhibits in different regional science centers/ museums
    - MMO Language Learning Games (MMOLLG) that leverage social networking practices in national markets and games, along with various "reading, writing, and pronunciation" tools, as might be found in online collaboration environments
  - Co-located MMOGs--Stadium-area games
    - Concept mockup image
  - Large-scale Game-based Virtual Worlds are similar to "story-free" MMORPGs, where end-users can create their own stories
    - GVWs may focus on user-created stories or narratives
    - GVWs as Casual MMOGs! (to be discussed in Casual Games planning lecture)
    - GVWs may focus on business development or corporate-focused narratives, as found in this IBM funded study
- MMOG business/revenue models
  - Retail purchase (most popular in the U.S.)
  - Subscription (most popular in the U.S.)
  - In-game item purchase/microtransactions (most popular in Asia)
  - Free-to-play (new to U.S., popular in Asia)
  - Advertisement supported
    - in-game advertising--not likely
    - user-created advertising
    - corporate sponsored end-users!
- MMOGs require database management system to capture/log all in-game events and activities by end-users

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MMOG Prototyping

- Many known issues and challenges in single-site and multi-site large development team

approaches to prototyping in online game development
    - See previous Online game planning--I and Online game planning--II lecture materials
- Key issues in MMOG prototyping increasingly will include demonstrating
    - emerging MMOG storylines and narratives
    - business practices for *continuous* MMOG content and game play prototyping
        - to support long-term MMOG product development capability by the game development studio
        - MMOG development is moving to a *continuous game software and game content development model*
            - Free/open source software development projects already use continuous software development processes and practices
    - how to use beta-testing results to improve ongoing content and game play development
        - also, how to minimize the need for end-users to report common game play usage problems, like "griefing"
            - add in-game functionality for end-users to suppress/block undesirable behavior of other users
    - robustness, security, reliability, and "cheat-free" capabilities of end-user online payment systems
        - via use of third-party security "hackers" (can the system withstand their attempts to penetrate or corrupt the payment system)
        - via outsourcing to a commercial payment services providers
            - use quality of service contract (this will not be cheap, but may be worth the cost!)
            - mitigating end-user chargebacks and fraudulent chargebacks
                - migrate to use of non-monetized game points in place of monetized currencies, if possible
    - viability and scalability of game operations infrastructure
        - build or buy infrastructure?
            - building new infrastructure is very costly!
            - outsourcing may be a better alternative, unless already a large game publisher or GSP
        - game services provisioning and game service providers (similar to Internet Services Providers--ISPs)
            - best GSPs own and operate their own network and servers
                - Emergent Game Technologies
                - IBM
        - robustness, security, reliability, and "cheat-free" capabilities of game Web servers and game operations servers
            - number one source of security problems are attacks on game Web servers!

MMOG Play Testing

- Many known issues and challenges in single-site and multi-site large development team approaches to play testing in online game development

- See previous Online game planning--I and Online game planning--II lecture materials
- MMOGs may need to set goal of tens of thousands of end-user beta-testers prior to full game release!
- MMOG will need to accommodate *continuous testing* approach
  - Beta-testing for early expansion pack or new release may be structured as a "reward" to high-commitment game players

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MMOG Marketing and Deployment

Marketing

- MMOG marketing campaign may need to set goal for five to ten years of promotion
  - MMOG product life cycle will feature multiple enhanced product version releases and multiple expansion packs
  - Multi-version product releases are part of marketing strategy to maintain end-user awareness and interest in product, ongoing game play, and ongoing community activity
  - MMOG marketing budget can approach MMOG game development costs ($25M-$50M), in effort to build sustainable end-user community!
    - World of Warcraft launched with 6.5M end-users pre-registered within its first 18 months of release, according to Vivendi Games
      - Blizzard Entertainment, on a percentage basis, the most profitable business unit of Vivendi
    - Planning for a smaller marketing budget therefore will require more inherent interest ("viral marketing" or "recruit-a-friend") in the MMOG.

Deployment

- World of Warcraft MMORPG runs on 9,000 servers, globally dispersed
  - Simplified view of MMOG server organization
- WoW employs 1,300 game masters for end-user support in six different natural languages!
  - English, Korean, French, German, Traditional Chinese, Chinese--Spanish, Japanese, Thai, Portuguese, and Russian planned

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MMOG Community Management and Maintenance

- Building and sustaining (long-term) end-user community is a *core business function* for a MMOG development studio

    - MMO game masters are the critical employees who will ultimately support (and satisfy) the end-users
        - How end-users should be assigned to each game master--5000? 10,000? more/less?
- MMOGs may need to set goal of pre-registering 1M+ end-users prior to full game release!
- MMOG end-user communities may need to be operational up to 12 months (or more) prior to full game release
- MMOG communities may increasingly be targeted to narrow demographic audiences
    - Children
    - Teenagers
    - Young adults (via social networking)
    - Established game players
    - Women (18-45 years old)
    - Seniors
- MMOG communities may be increasingly targeted to audiences interested in certain kinds of game genres or game play experiences
    - *Sword of the New World* features a political system, multi-character control, and "high kills per second"
    - Casual MMOGs will attract differ audience than traditional MMOGs
        - Short-term, frequent drop-in style game play versus sustained long-play user sessions focused on team/guild-style game play
- MMOG communities may also need to be localized
    - Chinese end-users of World of Warcraft have some cultural values incorporated into game play (dead character corpses are transformed into graves)
    - Game play payment systems differ by culture
        - Chinese end-users primarily play in Internet cafes, thus require pay-per-usage or per-time-allotment payment mechanisms
        - U.S. end-users prefer retail purchase and subscription (credit card purchases)

MMOG play experiences across media/devices

- When and how will MMOGs like World of Warcraft move into other media?
    - The WoW media crossovers so far
        - traditional card game
        - feature film (production budget estimated at $100M)
        - audio soundtrack
        - television programming
            - *South Park* episode on "Make Love, Not Warcraft" (video)
            - World Series of Video Games competition
        - BlizzCon (2005, 2006, 2007)
            - BlizzCon 2007, 8,000 attendees at $100 entry

- End-user created media
  - Fan art (graphic illustrations)
  - Machinima (user-created game cinema)
    - Machinima from World of Warcraft
  - Comics (user-created graphic storytelling)
  - Professional photography (sample)

Lecture 7: (27 September 07)

Casual Online Game Development Planning

Abstract: This lectures focuses on how best to plan for the development of a Casual Game.

Casual games pose different kinds of game development issues and challenges, as well as community management issues, compared to single-player or MMOGs.

- Conceiving
- Prototyping
- Play testing
- Marketing and deployment
- Community management and maintenance

Casual games will also move to game play experiences that move across different media or devices (for example, from networked PCs to Web sites to cell phones, and possibly to broadcast television).

Common features of casual games are:

- Extremely simple gameplay, like a puzzle game that can be played entirely using a one-button mouse or cellphone keypad
- Allowing gameplay in short bursts, during work breaks or, in the case of portable and cell phone games, on public transportation
- The ability to quickly reach a final stage, or continuous play with no need to save the game
- No plot or character, or simple ones with no bearing on the game's mechanics
- Primarily 2D graphics and graphic user interfaces
- Some variant on a "try before you buy" business model
- Somewhat antithetical to console games

Casual games can include:

- Game-based virtual worlds (GVWs)
- Online social networking services or service gateways
- Connection to broadcast media programming
- Advergaming -- games designed to promote awareness or sales of commercial products or services not related to games or the game industry

Casual Game Concepts

- Traditional casual game genres
  - puzzle games
  - word games
  - card games
  - board games
  - (limited) action games
  - (limited) strategy games
  - see Yahoo Games
- New/emerging casual game genres
  - social networking/chat room and mini-adventure games
    - Habbo Hotel--7.5M active users (mostly teenagers)
    - Webkinz--3.8M active users (mostly pre-teens)
    - Club Penguin--4M active users (mostly children and pre-teens)
  - (limited) role-playing socialization games
    - Fantasy, avatar dress-up role-play (most popular with young girls players)
      - The Palace (now defunct, started in 1996)
      - Stardoll.com
      - WeeWorld
      - Cartoon Doll Emporium
      - BarbieGirls.com (from Mattel--now in development)
  - racing simulation
    - KartRider
      - Item game
      - Speed game
      - Flag game
  - virtual pets care
    - Neopets.com--more than 100M registered users
  - education and training
    - science learning games, like DinoQuest Online
    - corporate training games
  - advergaming, virtual merchandising, and product information games
    - casual games whose primary/entire purpose is to promote a product, organization, or event
  - serious games
    - health care games
    - persuasive games -- games that encourage socio-political action or social activism
    - (many other topics)
  - Game-based Virtual Worlds (GVWs)
    - (Cyworld--1M active users in the U.S.)
    - Virtual Magic Kingdom

        - Exploration and interaction in virtual theme park, with branded content and characters (from Disney)
        - VMK end-users have a higher rate of attendance at Disney theme parks than non-users
    - Virtual Laguna Beach and Virtual Newport Harbor (from MTV Networks)
        - Virtual shopping for avatar "fashion apparel" in virtual retail stores, based on real-world stores
        - Tied to broadcast television programs
            - Laguna Beach
            - Newport Harbor
    - Metaverse
        - environments where humans interact through avatars with each other (socially and economically) and with software agents/bots in an online space, that uses the metaphor of the real world, but without its physical limitations.
        - Second Life
        - There.com
        - The SimsOnline???
        - Google's MyWorld (in development?)
        - IBM's Virtual Worlds initiative
    - Web 3.0: The Game Web--Web sites that represent 2D/3D virtual worlds, rather than just a collection of text/media files
        - globally distributed game development communities
        - free/open source GVW software
    - end-user generated content in GVWs
        - customized avatars (appearance, costume)
        - in-world vehicles
        - virtual real estate development and related services
        - home/space decorating
        - event planning services (hosting a group meeting)
        - end-user branding and co-branding
    - enabling the global industrialization and development of game culture and technology!
- Casual business/revenue models
    - Online purchase
        - retail casual games
        - training games
    - Subscription
        - social networking games
        - role-playing games
        - virtual pets
    - In-game item purchase/microtransactions (most popular in Asia)
        - social networking games

        - role-playing games
        - virtual pets
        - racing sims
    - Free-to-play
        - traditional games
        - education
        - advergaming
        - serious games
        - GVWs
    - Advertisement supported
        - traditional games
        - in-game advertising--not likely
        - user-created advertising
        - corporate sponsored end-users
        - end-user created content brands and advertisements

Casual Game Prototyping

- Many known issues and challenges in single-site, small development team, and globally distributed game development communities approaches to prototyping in online game development can apply to casual game prototyping
    - See previous Online game planning--I and Online game planning--II lecture materials
    - Casual games will not, in general, require multi-core processors
        - casual game servers will benefit from multi-core processing
    - Casual game will not, in general, initially employ heterogeneous user interface devices
- Casual games will be primarily developed using technologies like:
    - Flash, AJAX, and Web browsers
        - "fat client, thin server" game system architecture
            - well known to develop, operate, scale-up or scale-down, and maintain
    - Storyboarding tools (offline and online)
    - Scenario development tools
        - see new/emerging casual game genres above
        - each genre benefits from tools to protoype, customize, or extend end-user game play scenarios
        - Opportunity: identify and prototype personal information services or personal life management support services that can be realized through casual games
            - example: the "travel agent" game
            - "virtual dating" game (see Sample online animated storyboard for virtual dating scenario)
    - Casual game development frameworks, libraries, components, and game engines

        - Opportunity: to R&D casual game engines of different types
            - see new/emerging casual game genres above
        - casual game performance analysis tools also needed
    - casual game designed for database-driven content delivery
        - casual games may be more readily structured into modular game play components that can be invoked and delivered to end-user
        - enable generative/reactive delivery of casual game content based on accumulative game play experience
    - Continuous development or prototyping only necessary for large-scale casual MMOGs

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Casual Game Play testing

- "Easy" compared to testing online, PC, or console based games
    - simple platform
    - short duration game play
    - mostly single user game play
    - "instant gratification" assessment by end-users
- Well suited for "focus group" evaluation

Casual Game Marketing and Deployment

- Casual games and casual MMOGs are all about marketing, perhaps more so than game play!
- Focused around large Web portals, existing product brands, and content aligned with other media or venues
- Intense focus on collection, mining, and analysis of end-user access/play patterns
    - leverages existing Web usage statistical tools and techniques
- casual game play enables "career paths" into world of game culture and technology
    - casual gamers can become online gamers, and thus consumers of game culture and technology
        - from casual gaming to persistent, online MMOGs, action games, role-playing games, or real-time strategy games

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Casual Game Community Management and Maintenance

- Social networking, chat, socialization and role-playing games all encourage community

participation
    - casual games as a medium for establishing or building social relationships
        - players can help one another to improve their game play or results
- Casual games increasingly targeted to specific demographic audiences
    - casual games for girls--BarbieGirls.com
    - casual games for children--Club Penguin
    - casual games for corporate training (company employees)
    - casual games for product marketing (prospective customers)
- Casual games can span multiple cultures
    - some casual games now feature natural language specific phrases for interacting with players in other cultures who interact in response in their native natural language
    - casual games can play a central role in collaborative environments for language learning
        - game-based story telling
        - game-based writing in community Wikis or group blogs

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Casual play experiences across media/devices

- large-scale casual games can be tied to brands, content, or experiences delivered through other media or venues
    - broadcast television
        - Internet broadcasting of television programs
            - YouTube broadcasts of casual game play
    - corporate training centers
    - museums and science centers
    - theme parks
    - toys and merchandise (examples: BarbieGirls.com and Webkinz)

Lecture 8 (11 October 07)

American Online Game Market Approach--User's Perspective

Abstract: This lecture focuses attention to the concerns of end-users in realizing satisfying and fun game play experiences that are repeatable in either single-player or multi-player game play modes.

- End-users (game players) are globally distributed, but game players around the world differ in their acceptance or desire to play games that are most popular in the U.S. or Europe.
- Many games popular in the U.S. are not popular in other countries, and some games in other countries are not popular in the U.S. Game players will pay for expanding game play content and experience, but will resist paying more for initial game purchase.
- Game players are likely to move to adopt games that have little or no direct purchase price, that offer an interesting, fun, and compelling play experience.
- Long-term acceptance or commitment to subscription-based game play by end-users is unclear.
- Subscription-based game play will compete for end-user attention with free-to-play games, unless these subscription-based games can provide a sustained, unique and personally rewarding experience to end-users.

User perspectives reported in the U.S. and Europe

- Why users play games
  - have fun
  - learn
  - parody physical world situations
  - play as work
    - high-level game play is hard work
- What makes a game "satisfying" to end-users?
  - *Ease of use*
    - *Does the game's user interface help/hinder ease of use?*
    - *Single-player versus multi-player differences*
    - *New user interface devices can make it easier to play new games*
      - *Nintendo Wii wand*
      - *Guitar Hero*
      - *EA/Harmonix Rock Band*
    - *What about mobile games?*
      - *older adults and seniors do not find cell phones easy to use*
        - *keypads too small on most cell phones to be easy to use*
    - *Casual games all about "ease of use" versus sustained game play*

- *Entertainment*
  - *Varies by game genre and game player expectation*
- *Level of irritation*
  - *Varies by game design and game player expectation*
- Each requires user feedback during/after game play
  - See game prototyping and end-user beta-testing materials from previous lectures
- Each may be specific to national culture
  - an easy to use Korean game may be difficult to use by U.S. game players
  - what entertain's a U.S. game player may irritate a Chinese game player
  - prototyping and play testing can help to understand if cultural differences exist

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User-created games and game content

- how important is it
- what kinds of games or game genres are most commonly modified or created by end-users
- what about multi-user development tools
- what about game content generators
  - level, environment, or terrain generators
  - character generators
  - non-player character (bot) generators
  - capturing and mapping physical world object (image textures and geometry) into game level

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Game-based learning

- Using games or game-based concepts to enable simulation-based learning for end-users
  - Health care (example video)
  - Social change or social activism (example video)
  - Corporate training
  - Military/civil defense (example video)
- Situated cognition
  - Getting the user to think with information provided within the game
  - Modeling the end-user
    - what do they know, at what point
    - what do they need to do to advance in the game
    - how to communicate to the user what can be done next
      - game state or status display
      - provide guidance
      - provide assistance/help if requested
      - allow other users to offer advice (multi-user games or via game discussion

forums)
        - Determining (guessing) end-user expectations via in-game play to better guide their play experience
- Social identities and role-playing
    - Getting the user to identify with the in-game characters
        - commander
        - guide
        - trainee
        - automaton/bot
- Compelling experiences
    - Experience design
        - Creating context for in-game experience
        - Framing or setting-up the experience
        - Enacting the experience, risks, consequences, and alternatives
        - Problem-driven resolution or completion of experience
    - Practice and repetitive game play
        - skill improvement
        - overcoming obstacles through repetition with variation
            - trying a game play tactic in a different way each time, with some improvement or progress, until successful
        - reuse accomplished game skills in later parts of the game
            - reinforces the value of earlier game play experience
                - deferred gratification
- Immersive and transparent learning
    - learning without knowing that you are learning
    - having too much fun to realize what you are learning
    - achieving situated digital literacy
    - being able to transfer in-game learning and problem-solving methods to physical world situations and problems

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Panel on User Perspectives of Games and Game Market

- PC, console, and mobile game players
- MMOG players
- Four panelists invited
    - Each has at least five years of game play experience
    - Each has played dozens of games
    - Some prefer MMOG play over PC, console, or mobile game play

Format:

- Questions from Dr. Scacchi and Korean participants

- Answers from different panel members

Lecture 9 (17 October 07)

American Online Game Market Approach--Developer Perspective

Abstract: This lecture focuses attention to the concerns of *game developers* in producing satisfying and fun game play experiences that are repeatable, and that may excel in either single-player or multi-player game play modes.

- Game developers are globally distributed, but are concentrated in the U.S., Europe, Japan, and Korea.
- Developers continue to seek new game development tools that enable their game products to operate on multiple game platforms, including game consoles.
- Game developers may also need to develop games whose game play experience can continue across multiple end-user devices (for example, across cell phones, UMPC, desktop PC, and broadcast television networks).
- Game development studios are moving away from building their own game engines, and towards licensing of top-tier game engines and game development tools.
- Game developers are increasingly looking for ways and means to deploy their games directly to end-users without going engaging game publishers.
- Game development studios will therefore seek new ways and means for financing game development, as well as to engage in alternative game production processes that can reduce development costs or shorten game development time.

Game development goes global

- Corporate versus independent game developers--not in opposition, just different ways of reaching game developers
    - **Corporate game developers** often work for large studios that are part of a larger game publishing studio
        - Electronic Arts, Nintendo, THQ, NCSoft, Nexon, etc.
            - Limited creative freedom
            - Game design usually limited to established game genres or established game brands (*Grand Theft Auto*, *Final Fantasy*, *Super Mario*, etc.)
        - Most game studios seek to operate corporate game developers that maintain strong ties to large game publisher
            - Maintain flow of financial resources to keep developers employed.
        - Not likely to seek independent game development tools--will use what is provided
        - Large studios/publishers all moving towards multi-national game development

teams
        - seeking lower perceived cost of development via "outsourcing" or "off-shoring"
    - Community channel: *Game Developer* magazine and annual *Game Developer Conference (GDC)*
        - Recent top concern: Job recruitment/placement by large studios, including international positions
- **Independent game developers** often work in smaller studios or as contractors, independent of game publishers
    - May have more creative freedom on game design and ability to innovate
        - new game genres and new game interface devices come from independent game development studios
        - Innovation often necessary to maintain flow of financial resources to keep developerd employed.
    - Comfortable using independent/new game development tools
        - often available at lower costs
        - may seek to prototype newgames via game modding
        - may seek to license new game engines and software development kits to enter retail game market
            - requires financial resources--either from investors (mixed) or from advanced royalities (depends on prior record for successful game development and sales)
    - Small independent game studios typically operate in single location, primarily located in U.S. or Europe.
        - Some effort to consolidate or aggregate many small development studios into a large independent game studio
            - See, for example, Foundation 9 Entertainment
                - Funded with venture capital investments
    - Community channel: IGDA--Independent Game Developers Association and Indie Game Festival (coincides with GDC)
        - Recent top concern: Quality of Life at Work in the Global Game Industry

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Role of new game development tools

- Lead game developers perplexed in how best to program new multi-core processors
    - Developers know how to program in C, C++, Java, etc., all of which generally assume sequential or multi-threaded computation
    - Designing for concurrency or parallelism
        - which tools to use?
        - what "design notation" to use?
        - what form of concurrency to design

        - to maximize overall game performance
        - to maximize game play experience
        - to balance major game functions (audio, graphics, networking, user interface, data management, etc.)
        - multi-threading versus multi-tasking versus multi-agent models of concurrency?
      - what about "functional programming languages" (e.g., Haskell) or dataflow programming languages (Irvine Dataflow)?
    - Debugging concurrent programs
      - Interacts with software design
      - Latent or unintended concurrencies (those arising by oversight or error) most difficult to debug
        - some may require memory mapping of program execution traces
    - Excellent overview of game programming language technology issues in 2006 by Tim Sweeney
      - Lead Developer, Epic Games (developers of the Unreal family of game engines and multi-title game engine licenses)
      - Also, provides a case study in leading PC game development (*Gears of War*, 3M unit sales in ten weeks)

Challenges for developers to build multi-device games

- Multi-device games most likely to emerge as multi-platform games
  - make new device work with many alternative game platforms, or with ubiquitious platforms (Web services)
- Independent game studios may lead the development of new game play devices
  - Harmonix, designers of the "Rock Band" musical game instruments
    - Cross-licensed to Electronic Arts (publisher) and MTV Networks (music video--television--broadcaster)
    - Cross licensing increases revenue potential and cross marketing promotion (television ads linking EA and MTV to Harmonix Games and potential rock music publishers)
      - Will most popular new rock music titles move rapidly to Rock Band games?
      - If limited to retail package release, then smaller potential market compared to electronic/Web based distribution (more timely, less overhead)

Licensing game engines and development tools

- Avoid development of any "middleware" software tools
  - Unless developing game engine as commercial endeavor

        - High risk commercial investment!
        - Open source software may provide a low cost alternative, but may lack competitive performance of commercial alternatives

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Deploying games direct to end-users, if possible

- Lessons from David Perry (Web video -- requires Real Media player, and presentation slides), founder of Shiny Entertainment (now part of Foundation 9 Entertainment) and GameConsultants.com

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Financing game development

- Alternatives to publishers for bringing new games to market
    - U.S. retail sales
        - Major retailers--not without a big publisher
            - Limits sales window to best selling games
            - Slowly building games sales may result in removal from sale
    - Web-based distribution
        - Placement on retail game portal
        - Development of corporate portal site for game distribution
            - Long, slow path to profitability
            - Example: Valve Software and Steam electronic distribution network
            - Increased revenue through cross-licensing of distribution channel (Steam) to other game studios
    - Also see David Perry's presentation slides
        - Pay-to-play versus free-to-play
            - Abandon the retail purchase and high-cost subscription business model
            - Free-to-play with micro-transactions for in-game or near-game object sales)
        - Game developers making money from advertising rather than sales?

Lecture 10 (18 October 07)

American Online Game Market Approach--Publisher Perspective

Abstract: This lecture focuses attention to the concerns of game publishers in marketing, delivering, and sustaining satisfying and fun game play experiences that are repeatable, and that may excel in either single-player or multi-player game play modes.

- Game publishers are globally distributed, but are concentrated in the U.S., Europe, Japan, and Korea. Game development costs continue to rise, and game development takes more time.
- Game publishers are acting to engage non-game industry producers, advertisers, and investors to help spread the risk associated with the production of top-tier game titles or franchises.
- Game publishers will also continue to acquire game development studios to insure production of future game titles.

Top Game Publishers are concentrated in the U.S., Japan, Europe, and Korea

- Recent industry survey identifies the following as the Top 20 Game Publishers

1. Nintendo
    - now targeting to audiences outside of traditional game markets (e.g., seniors)
2. Electronic Arts (U.S., California)
    - released more game titles than any other publisher (116)
    - game titles like *Harry Potter*, *Madden*, and *Need for Speed* are all multi-million unit sales per year; leaders in their genre
3. Activision (U.S., California)
    - recently purchased RedOctane studio, creators of *Guitar Hero*
        - massive payback from this acquisition
4. Ubisoft
    - successfully added new casual game versions related to current licensed titles and original Intellectual Property (IP) titles
5. THQ (U.S., California)
    - increasingly diverse set of licensed titles and original IP titles
    - smart management and smart licensing are said to be key to recent revenue growth
6. Take Two (CA studio)
    - Rockstar and 2K games parent
    - recent titles delayed
    - management takeover

- trouble with ESRB rating leading to retailers refusing to sell certain game titles
- nervous investors

7. Sega of America (CA studio)
   - forging new relationships with established U.S. and British game studios based on licensed titles and original IP titles
8. Sony Computer Entertainment (CA studio)
   - game unit sales down
   - still high quality brand and reputation
   - failed to capitalize on the launch of the PS3
   - still short of titles for PS3
9. Microsoft Game Studio
   - *Gears of War* sold over 4M units so far
   - *Halo 3* sold over 25M units so far
   - only single platform (XBox 360) releases
   - strong developer support
   - know how to make a few great games
   - best quality games for ease of use
10. SCI/Eidos (CA studio)
    - mixing licensed, original IP , and new casual game titles
11. Square Enix
    - heavy reliance on Final Fantasy franchise
    - FF spinoff games and remade games
      - also sequels, prequels, movies, and merchandise
    - focused on Role Playing Games
12. Namco Bandai (CA studio)
    - focusing on establish IP titles in the "super-robot" style
    - strong set of anime licenses of interest in the U.S. market
    - updating and releasing classics (*PacMan*) and innovative titles (*Katamari Damacy*)
13. Vivendi Games (CA studio)
    - Did they publish anything that wasn't made by Blizzard Entertainment?
    - Sierra Online?
    - Sierra Mobile Games?
14. Capcom (CA studio)
    - focusing on original IP titles for multiple platforms and multiple global markets
15. Konami (CA studio)
    - reliance on *Metal Gear Solid* franchise
    - best performance in Japan
    - unclear whether they can build new franchises from scratch, or whether they will look to acquire studios with other titles
16. NC Soft (CA studio)
    - Few releases (4)
    - focusing on free-to-play, pay for items (micro-transactions) business model
17. Disney Interactive (U.S., California)

    - targeting studio acquisitions organized around key industry leaders (e.g., Warren Spector, Junction Point Studios)
    - strong selling portfolio of titles that use Disney-related IP
18. Atlus (U.S., California)
    - excelling in quality
    - originality
    - superior localization
19. LucasArts (U.S., California)
    - modest release schedule, year-to-year
    - lack of strong titles that use LucasArts IP franchises
    - look for new *Star Wars* and *Indiana Jones* titles
20. Midway (CA studio)
    - focusing on following industry leaders
    - not a leading game innovator

- U.S. is global leader with 10 top game publishers--why?
- California is U.S. leader with 6 top game publishers--why?
- California is global leader with 16 top publishers with studios--why?
- Southern California is slightly ahead in number of studios--why?
    - Orange County (including Irvine) has about 30 game studios
    - Orange County (including Irvine) is fifth largest area in the U.S. for game studios
    - Irvine is home to Blizzard Entertainment (largest revenue game)

Publisher-Developer (Studio) Relationships

- Publishers control
    - studio titles
    - production schedules and budgets
    - access to licensed IP
    - release dates
    - access to market distribution channels
    - resource for localization or internationalization of titles
    - negotiations with platform owners (consoles, PC vendors, microprocessor vendors)
- Developers control
    - game play experience
    - development tools and techniques
    - prototyping and testing
    - budget allocations
    - staffing

- litigation with publishers over working conditions
- Independent developer studios control
  - titles
  - innovation
  - production schedule and budget
  - tools and techniques
  - prototyping and testing
  - staffing
  - release dates
  - access to electronic distribution channels
  - negotiations with online/Web service providers
  - decision to be acquired or to merge into larger studio or publisher
    - provides wealth to studio owners, not to most game developers

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Lecture 11 (25 October 07--at DIP in Daegu)

Workshop with UCI Faculty in Daegu

Abstract: This lecture will be presented at the Daegu Global R&D Collaboration Center in the last half of October 2007. It will focus on reviewing lecture materials presented so far in order to gain feedback on topics requiring further explanation or clarification. It will also serve to allow for a midpoint course evaluation.

Top level issues for game research projects, based on previous 10 lectures and associated presentation materials

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Project team size

- Small 5-15 researchers between UCI and DIP partners (University, Industry)
- Medium 15-75 team members (5-15 researchers, 10-65 developers (students) mostly in Daegu)
- Large 75-1000+ team members (15 faculty level researchers, 65-1000 developers (students) mostly in Daegu)
    - Google's Summer of Code (500-900 students, 150-450 mentors, 3-5 project organizers, 1 corporate sponsor)
        - Free/open source software (FOSS) development and community development focus
        - "Summer of Game Code"
        - "Summer of Game/Virtual World Content"
    - David Perry's (Acclaim Entertainment) Top Secret project (380 game developers selected from 38,000 applicants, working similar to FOSS community project
    - University of Southern California's *System Factory Project* -- during 1981-1990, engaged almost 2% of all M.S. and Ph.D. Computer Science students in the United States, in large-scale FOSS-like development project (Directed by W. Scacchi)

Game development tools

- Flash (Schockwave) game engine -- casual games
- Flash casual game or virtual world (VW) storyboarding and prototyping environment
- MMOG infrastructure (including multi-user database event transactions)
    - Domain-independent collaboration environment (DICE) services
        - social networking
        - community development and support
    - Flash-based casual MMOG
- Free/open source software environment for game development or VW development
    - Domain-independent collaboration environment (DICE) services
        - social networking
        - community development and support
    - Record, replay, and redo game play services whose results can be published to the Web (e.g., on YouTube or similar)
- Multi-core game software development environment
    - multi-agent (organization, group, institution, social world, society) -- agent/core
        - "sociology engine" and "sociology development environment" for designing and developing MMOG social worlds
    - agent (multi-component object configuration, appearance, behavior, animation, other sub-systems, etc.) -- component/core

    - multi-tasking (middleware engines/services) -- task/core
    - massively parallel tasking -- cores/task
    - multi-thread (compiler derived) -- thread/core
- Game Web portal technology
    - electronic distribution
    - community development, support, and management

Game application domains

- science learning games (SLGs) for interactive science center network
    - water cycles, collection, processing, distribution, usage, waste capture, processing, recycling
    - environmental processes and remediation
    - global climate dynamics and interventions
    - consumer/citizen education
- massively multiplayer online language learning games (MMOLLG)
- corporate training games -- casual games tied to business processes
- cultural and geopolitical transformation games
    - games built to express indigenous cultural experiences, rituals, and rights of passage
- VWs -- composition of agents (foreground, background) that may be configurational, nested, recursive, concurrent, sequential, etc.
    - Private label VWs
        - Featuring high dynamic range imaging of proprietary object models (created with CAD/CAM/CAE tools)
        - IBM
        - Linden Labs
        - EON Reality
- Digital Cities -- VWs tied to ten global cities (at present)
    - Very large-scale VWs -- comparable to size of participating cities (e.g., Dubai, Singapore, London, Beijing, etc.)
        - $100M project
        - Coordinated by EON Reality
        - Irvine-Daegu as Digital Sister Cities focused on Future Game Culture and Technology
            - For adoption, deployment, and use in other digital cities
    - Building VWs that correspond and expand/enhance current physical cities
        - EON Reality
    - Virtual teleportation
    - Virtual tourism
    - Envisioning economic development
    - Inspiring workforce development

New user interfaces for game play experiences

- video cameras
    - gaze-directed user control
    - facial recognition and transmission for avatar expression control
    - real-time camera input as user control
- GPS cell phones
    - geo-referenced games (e.g., Google Earth world games)
        - "waterproof" GPS cell phone as environmental sensor
- hands-on controllers
    - from *Guitar Hero* to Violin Hero

    - from *Rock Band* to Orchestra
- new display devices
    - stereo displays -- feature film industry making multi-billion investment in production of new 3D cinema
    - Touchlight displays -- touch-free gesture-based user interface
    - immersive displays
        - CAVE automatic visualization environments (CAVEs), and Stereo CAVEs
        - LifeSize (or RoomSize) immersive teleconferencing systems
    - EON Reality, current global leader in providing these display devices
- Televisions
    - including socket for plug-in game play engine (and game content storage) module
    - stereo television displays, for use with stereographic polarized viewing glasses

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New game application venues

- corporate settings
- libraries
- cinemas
- concert halls
- sports stadiums
- broadcast studios

Trans-media linkages

- Print
- Phone
- Television
- Cinema
- Web portal
- Radio

Lecture 12 (26 October 07)

Overall Strategies to approach American Market--Challenges & Opportunities

Abstract: This lecture focuses on articulating overall strategies for how best to approach the American market for online games.

- The American market is global in its reach—game players around the world seek to engage many, but not all, types of online games that are developed and widely played in the U.S.
- The emergence of future games, future game play experiences and interfaces, and future game play venues that anticipate (or avoid) new game technologies like multi-core processors will mean that there are no universal strategies for success in approaching the American market.
- Unforeseen technological innovations, unanticipated games or game play experiences/devices all point to the need for strategies that are specific to each game development studio, the game genre, and the game producer.
- What works as a strategy for success for one game studio, game franchise, or game player community may be a failure strategy for another game studio, game franchise, or game player community.

American Game Industry Focus and Opportunities

- Casual
  - Advergaming
  - Corporate sponsorship
  - Corporate training
  - Consumer product/service education
  - Informal education
    - Health care
    - Environmental awareness and ecological remediation
    - Science, technology, engineering concepts, techniques, and tools
    - others
  - Affiliation with Web portals and trans-media linkages for game promotion or distribution
- Mobile
  - Networking games
    - social networking
    - situated play (augmented reality) networking
- Console
  - FOSS-based console

    - Television console
- PC
    - multi-core game client development
        - conceptualization and visualization
        - prototyping
        - testing
        - modding
        - community development and maintenance
        - content generation tools
            - fully automated
            - semi-automated
            - hand-crafted with traditional tools
- MMOG
    - multi-core game server development
- Virtual Worlds (VWs)
    - casual MMOG
        - casual game client
        - multi-core game and community servers
    - private label VWs

Overall strategies

- Game publisher strategies (see presentation materials for American Online Game Market--Publisher Perspective)
- Reduce time-to-market for all new game development
    - reduce time to develop
    - increase shelf life
    - increase brand awareness
    - refresh franchise
- Increase scalability
- Increase and facilitate trans-media linkages
- Accelerate community development
    - reduce community acquisition cost
    - sustain community
    - articulate game play career paths and role migrations

Tool and techniques development strategies

- multi-core processor technology
    - how to use it

    - how best to develop for it
    - how best to exploit it
- content creation or generation
- back-end server (client independent)
    - concurrency optimizations
- mobile to PC/console to MMOG to VW sofware development kit (SDK)

Opportunities by game category

- casual MMOGs
- corporate training
    - corporate domain-independent game engine
    - driven by business processes
        - capable of modeling and simulating specified business processes
    - employing combinatorial game play mechanics
- legacy games (large game publishers)
- innovative games (smaller game development studios)

New game development partners (sponsors, investors)

- Corporate accounts
- Telephone service providers
- Television broadcasters and network producers (e.g., MTV networks)
- Web portal operators (Yahoo, Google, Cyworld)

UCI GameLab development strategies (every game development studio should have its own stategy for developing and publishing games)

- science learning games
    - Discovery Science Center
        - DinoQuest Online--MMO version
            - social networking support
            - collaborative multi-user game problem solving
    - networked science centers
        - regional (across California)
        - national
        - international
- technical and new media communication and literacy skill development games
    - reading

    - writing and media production
        - online discourse (blogging, discussion forums, etc.)
        - semi-structured documents and reports
        - multi-media documents and reports
        - game modding
            - user-contributed content
- multi-core game/VW development
    - Virtual Life 2010+
    - FOSS-based VW development environment
    - Game-based corporate operations modeling and simulation
- Digital Cities initiative
    - Game-based digital cities
    - Game-based events and activities for digital cities
        - virtual augmented reality games
        - virtual game play devices and user interfaces

Lectures 13 and 14 (31 October 07, 1 November 07)

Understanding Online Game Industry in the United States (Past-Present)

Abstract: This lecture focuses on overall trends in the U.S. game industry over the past 20 years. Emphasis is directed to identifying lessons learned and best practices that can help inform and guide how best to develop online games for the U.S. and other global markets. Topics include:

- Game types
- Game engines
- Game systems
- Game play experiences

In addition, there is a separate document that lists citations to Reference materials used in preparing the materials below

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Game Types

How many different types of computer/video game are there? This is a simple question, with a less than simple answer.

A dozen different types of games are identified, with no significance to their order of presentation. Though this list of categories is not exhaustive, it is representative of the types of games that have been available in the market during the past 10-30+ years.

- *Action*
  - games that focus on (near) real-time game play, often involving players with in-game characters that engage in player actions at a rapid pace.
  - The action features highly competitive activity like pursuing, avoiding, or shooting at opposing players.
  - Effective action game play requires fast-paced game play, and thus a sufficiently fast game system processor and low-latency data communication network, when multiple players are supported.
  - Player actions affected through the player control interface must be quickly visualized, transmitted, and received by opposing players, since in game characters move quickly to strike, dodge, block, or retreat.
  - The most popular action games are “first person shooters”, which were first made popular by the game *DOOM* starting in late 1993 [Hall 1992, Kushner 2003].
  - Action games tend to require substantial computer processing and graphic display

capabilities, so there are comparatively few found on handheld or mobile game systems.

- *Adventure*
  - games that focus on providing game players with a navigational journey into unfamiliar territories or places of fantasy.
  - Players oftentimes must discover which path to take, what game objects to pick up or drop off along the journey, which game objects can be used to solve puzzles or open barriers along the journey path.
  - Early adventure games relied on simply presenting textual descriptions (narrative vignettes) of locations, conditions, and events along the journey, together with puzzles (word problems) to solve along the way.
  - Player actions are thus simple, much like turning the page in a novel (Adventure games are sometimes described as "interactive fiction").
  - Adventure, was the first widely used computer adventure game. It was created in 1973 by Will Crowther on a DEC PDP-10 computer, and coincidentally had earlier also worked on the ARPANET *IMP*. The game was then significantly extended in 1976 by Don Woods at Stanford University.
    - The first MUD, an adventure game with multiple players, was developed by Roy Trubshaw and Richard Bartle at Essex University in England in 1978.
    - Adventure and MUDs were also influenced by *Dungeon and Dragons* (D&D), which first appeared in 1974
  - Later adventure games sought to provide the game player with ever more rich and immersive visual displays of the locations, conditions, and events encountered in the course of navigating the games journey.
  - Text based adventure games require legible displays for presenting narrative segments, so they are not commonly found on handheld or mobile game systems, due to their small display screen size.
- *Fighting*
  - games where player action focuses on control and engagement in simulated hand-to-hand combat as its most prominent game play feature.
  - Player actions control their in-game character, which repeatedly encounter opposing player characters individually or in groups that "gang up" on the player.
  - Fighting games often focus on close quarters combat, and thus player actions and control interfaces require deft manipulation of game controls to affect subtle/complex punches, jabs, body twists, jumps, flips, and other forms of combat choreography that may or may not be possible in the real world.
  - Fighting games are available for use on handheld/mobile game systems.
- *Racing*
  - games where player action focuses on control of an in-game vehicle (car, boat, motorcycle, plane, etc.) that navigate either a predetermined course or open-ended space, with the goal of being the first to finish, or to score the most points along the way.
  - Game player action focuses on steering, maneuvering, turning, etc. one's vehicle, while striking or avoiding opposing players vehicles during the race.
  - Racing games are available for use on handheld/mobile game systems.

- *Role Playing Games*
  - games where a player controls in-game characters that possess complex properties or attributes that define their role in the game.
  - *Dungeons and Dragons*, (D&D) originated in the early 1970's, following from the fantasy worlds of literary authors like J.R.R. Tolkein (author of *Lord of the Rings*, *The Hobbit*, etc.), as the modern role playing game.
  - A company called Wizards of the Coast currently owns the rights to the D&D (d20) computer game engine, and they license this game engine and associated game play artifacts.
  - D&D games were originally played with pencil and paper, an odd shaped die, and other artifacts, and both game and role play were monitored by a "dungeon master" who acts as an overlord or god in determining what kinds or conditions of game/role play can follow from a given point in game play.
    - The dungeon master is not an in-game play character, but the person who plays it can in effect determine the rules of game play, as conditions change.
    - This is a powerful, specialized, and comparatively uncommon game play concept.
    - Different from things like sports games, where game play may include non-playing in-game characters like "referees" or "linemen" in football and soccer, who officiate and enforce the established and unchanging rules of the sport's game play.
  - Role playing games do exist for handheld/mobile game systems, but they are primarily oriented to single user game play, or multiple player variations where one game system is handed off between players.
- *Simulations*
  - games where player act to explore, engage, manipulate, and experience a synthetic environment, apparatus, or setting as the purpose or goal.
  - Simulations games can act like an "electronic doll house" where there is no pre-determined end state or winning condition, so game play can continue until abandoned.
  - Simulation games may also allow game players to assemble and control elements within a synthetic play world (e.g., a home, a roller coaster park, a manufacturing business, or an urban metropolis), and the simulation game engine provides for in-game control, processing, and manipulation of the play world (trash accumulates at home, roller coasters crash, manufacturing business runs out of building materials, city is attacked by fire-breathing monster, etc.).
  - Simulation games do exist for handheld/mobile game systems but they are primarily oriented to single player game play.
- *Sports*
  - games that seek to reasonably recreate the experience of managing a sports team in well-known athletic events or competitions.
  - Game play is split between choosing in-game team characters and their performance attributes, and playing the sports game against an opposing team controlled either by the game system, or by another person.
  - Sports games like football and baseball involve extensive turn-taking (reciprocal player

action) in game play, whereas sports game for soccer, basketball, and hockey involve continuous action (mutual player action) in game play.
    - Continuous player-vs.-player sports games are available for use on handheld/mobile game systems.
- *Strategy*
    - games where player action controls and manipulates an array of in-game resources (game pieces) on a game board or virtual game play terrain.
    - Strategy games may be real-time, where game play entails constant player attention and control of in-game resources in response to opposing players (human or computer) actions to gather, harvest, produce, use, or destroy in-game resources that are in the focus of the current game scenario.
    - Strategy games may alternatively be turn-taking, where players spend time setting and configuring the position and composition of in-game resources in order to attack or defend attacks from opponents.
    - Turn-taking strategy games are available for use on handheld/mobile game systems.
- *Music, Rhythm, Dance/Movement/Exercise*
    - games where player action evokes or control the game system to present musical content in a rhythmic manner.
    - Currently available music&rhythm games are primarily oriented to single player game play, or multiple player sharing a common game system who take turns playing the game.
- *Parlor, Card and Board Games*
    - games where common, well-known card or board game play is the focus.
    - Card games are available for use on handheld/mobile game systems
    - Board games like *Checkers* and *Chess* are also available for use on handheld/mobile game systems.
    - Parlor, card, and board games are most popular type of casual games
- *Puzzle*
    - games where game play focuses to manipulation or placement of game pieces into specified patterns that define a winning or end of game objective.
    - Multiple player puzzle games are typically turn-taking games, where each player controls usually controls or places a single game piece per turn, much like board game like Checkers.
    - Puzzle games are available for use on handheld, mobile, and casual game systems.
- *Massively Multiplayer Online Games*
    - games that support in-game role playing by large numbers of concurrent players across a wide-area network.
    - MMOG may be based on any of the preceding game types, but most typically appear as role-playing games (i.e., massively multiplayer online role play games—MMORPG).
    - MMORPG are not yet available in the commercial marketplace for handheld/mobile game systems
        - this situation is likely to change in the near future.
        - also, expect to see casual MMOGs

Observations across game types:

- One type of game (e.g., role playing games like *Dungeons and Dragons*) do not subsume, contain, nor provide the game play experience, player control interface, game play scenarios, or player actions found in other types of games.
- Being skilled in the art of one type of game software development (e.g., building a turn-taking RPG) does not imply ability or competent skill in developing another type of game software (e.g., a continuous play action game).
- Conversely, games of a common type, like card of board games, raise the obvious possibility for a single game engine to be developed and shared/reused to support multiple game kinds of a single type.
    - For example, the games Checkers and Chess both are played on an 8X8 checkerboard.
        - being skilled in the art of developing a Checkers game can suggest the ability or competent skill in developing a similar game like Chess, especially if both games can use the same game engine.
- Game engines can be designed for reuse
    - not always an obvious engineering choice
    - reuse increases the initial cost of game engine development
    - enables the creation or rapid development of multiple, related games
- Developing the software for different kinds of games of the same type, or using the same game engine, requires a higher level of technical skill and competence in software development than designing an individual game of a given type.

Game engines

- Game types have game engines associated with them [Abrash 2000, Bishop, Eberly, *et. al.*, 1998]
- Early game engines were specific to one game
- This began to change with the appearance of the Doom game in 1993 [Abrash 2000, Kushner 2003]
    - Doom's design and implementation as software separate the game processing engine from the content (i.e., game play rules, in-game pieces, graphic appearance of game space, in-game characters and pieces, etc.) specific to a game.
- Game engines thus could be designed to support a family of related games (a game “product line”) for games of a given type.
- Game engines suitable for multiple types of games were also designed [Bishop, Eberly, *et al.*, 1998]
    - performance of the resulting games usually fell short of those games built using a game engine for a specific type of games (like networked, first-person shooter action games [Abrash 2000, Sweeney 1999]).
- Game engines that support *multiple player game play* have taken one of four architectural forms

over the past 10-15 years [Abrash 2000, Smed, *et al*, 2002, Sweeney 1999]
    - single node
    - peer-to-peer, point-to-point (all-to-all)
    - client-server
    - distributed server-network
- client-server or distributed network server types now dominate networked multiple player games played on local-area networks, wide-area networks, or the Internet [Abrash 2000, Smed, *et al.*, 2002, Sweeney 1999].

Example Game Engines

- Example open source software game engines (free, and with source code)
    - OGRE -- open source graphics rendering environment (NOT a game engine) that can be used in the development of games or game engines supporting the development of game families for action, racing, simulation, sports, role-playing, and simple MMOG games.
    - Irrilicht -- open source software engine and graphic modeling tool (IrrEdit -- real-time 3D world and scene graph editor) supporting the development of game families for action, racing, simulation, sports, role-playing, and simple MMOG games.
    - Crystal Space -- open source, portal based real-time 3D game engine supporting the development of game families for action, racing, simulation, sports, role-playing, and MMOG games.
    - Panda3D -- open source game engine, originally developed by Disney Interactive for building Web-based MMOGs like ToonTown, but also supporting the development of role-playing games, virtual worlds, educational and corporate training games.
    - Delta 3D -- open source game and simulation engine supporting the development of games for corporate/military training applications.
    - OpenNeL -- free/open source software for developing MMORPGs and persistent online virtual worlds
        - for Windows and Linux platforms
        - was used to develop moderately successful MMORPGs
            - The Saga of Ryzom (SciFi MMORPG)
            - The Ryzom Ring a user-extendable MMORPG related to The Saga of Ryzom
        - can be used to develop commercial MMORPGs or persistent virtual worlds
        - development/production status unclear!
- Commercial game engines (for sale, with source code)
    - Low-cost game engines (generally for single player or some multi-player games)
        - Torque -- a "complete" 2D or 3D game development environment popular with independent game developers (starting cost, $100-$750/developer with source code)

        - family of game engines supporting either beginner through professional game developers
        - supports game development for Windows, Mac OSX, Linux, Microsoft XNA and Nintendo Wii platforms
        - dozens of commercial games developed using Torque
      - C4 Engine -- a direct competitor to Torque (starting cost, $200/programmer, with source code)
        - supports game development for Windows, Mac OSX, and PlayStation 3 platforms
      - 3D Game Studio -- 2D or 3D game development or interactive presentation development environment for developing action games, role playing games, side scrollers, flight simulators, board games, sports games, real-time presentations, and virtual exhibitions (cost $150, NO source code).
      - Unity -- 3D game development environment for Windows and Mac OSX (cost $200-2000/programmer)
        - also supports development of game that run in Web browsers
        - recently focusing on the development of casual games
    - High cost, high quality AAA game engines for single player, multi-player, or massively multi-player, for PC and console platforms
      - ID Tech 5 from Id Software
      - Unreal 3 from Epic Games
      - Gamebryo from Emergent Game Technologies
      - CryENGINE 2 from Crytek
      - Renderware from Criterion (now owned by Electronic Arts)
- Web portal for 3D game engines
    - 3D Engines -- Web portal identifying both commercial and open source 3D game engines -- hundreds of game engines listed!
- Game engines for Mobile devices (including cell phones)
    - EDGELIB -- claims support for multiple cell phone devices to develop 2D or 3D games
    - Mobiola 3D -- another 3D game engine supporting game development for Symbian OS, Windows Mobile, Linux and BREW-based mobile devices.
    - M3GE -- open source 3D mobile game development library in Java
- Automatic 2D Board Game Generator
    - Extensible Graphical Game Generator by J. Orwant (MIT)

Game systems

The type of game systems used to support game play can determine or constrain the possible modes of game play and player action.

- *Mainframe*-based game systems were the earliest available [Samuel 1960, Spencer 1968].
    - Game play on these computer systems required the player to have access to mainframe operator console.
    - Historically, this was limited to a very small number of potential players.
    - Early game play on these systems was focused primarily on board games (like Chess [Samuel 1960, Schaeffer 2001])
        - later, "third-person shooter" games such as *SpaceWar* [Brand 1972].
    - In the past few years, the rise of MMOGs and MMORPGs now employ mainframe-class enterprise computing systems (or system clusters) to support massive scale networked game play.
- *Network*-based game play starting in the early 1980s, introduced multiple player networked gaming and game play across data communication networks [Berglund and Cheriton 1985].
    - Networked-based game play and game systems have also become the basis for networked virtual environments used in military simulations, business applications, and scientific research [Singhal and Zyda 1999].
    - Networked game play accommodating multiple players (i.e., at least two players, each with a distinct player control interface, like a computer terminal) has approximately a 20 year history.
- *Arcade*-based game play using dedicated computer game systems located in arcades date to the early 1970's and to games like Pong [Kent 2001].
    - In many ways, arcade games (also called "video games" because of their use of a video display of the game board or play space) defined the contemporary game play style and player control user interface that we see today.
    - This includes game play and player actions experienced through game action control buttons and focus mechanism, like joystick or similar player controlled device.
    - Arcade/video games up through the mid-late 1980's relied on fairly modest processors and graphics
    - Many games for handheld computers and PDAs resemble arcade games of the 1980s and beyond
- *Console*-based game play has taken over the commercial market for game systems formerly dominated by arcade game systems.
    - Contemporary game consoles have sold millions (or tens of millions) of these respective game systems.
    - Consoles represent an important milestone in the development of computer game systems in that their vendors control the specification, design, and operation of the software operating system and networking capabilities (if any), application program interfaces (APIs), and software development kits (SDKs).
- *Internet*-based game play is often attributed to have originated or made popular due to the game *Doom* [Hall 1992, Kushner 2003].
    - The LAN version was designed to exploit the network data communications protocols commonly available for developing Internet applications, like the TCP/IP protocol stack. Doom employed network data communication techniques for "point-to-point" networking

that were well known in the academic research community [Smed, *et al.*, 2001].
    - Many networked multiple player games have been developed and deployed for use over the Internet, and industry figures and common Web surveys now indicate over 10,000,000 players per month are playing multiple player networked games over the Internet
        - the vast majority of these players play one game, *Half-Life* or *Half-Life: Counterstrike* from Valve Software Inc.
    - Internet-based game play relies on the common and widespread use of "game servers" (i. e., a distributed server-network) that game players must connect (using persistent network connections and network protocols like TCP/IP) and configure their game system "client" to utilize such servers, in order for networked multiple player game play to commence [Smed, *et al*., 2002, Sweeney 1999].
- *Handheld* personal game systems seem to have become popular with the advent of the Nintendo *Game Boy* in 1989
    - Other handheld personal games systems have appeared as general-purpose computer systems (e.g., PDAs)
    - Similarly, the user interface controls of these devices (e.g., keyboards, buttons, stylus and touch-sensitive display screen) must also be programmed to specifically enable a player control interface
    - Atari LYNX--major innovation in handheld gaming!
        - first handheld game console with color graphics
        - supporting multi-player (4 max.) capabilities via "wired networking using the ComLynx port"
        - built-in 3D graphics chipset
        - "reversible" user controls.
        - Conceived 1987 by Epyx Inc., then licensed for production and marketing by Atari in 1989.
        - Nintendo's GameBoy, also released in 1989 cost less, but lacked the Lynx's features identified above.
    - Other major handheld game systems that include major technological advances include the Sony PSP and Nintendo DS (dual screens)
- *Mobile/cell phone*-based game systems that operate much like handheld personal game systems
    - capable of transmiting and receiving game data via wireless telephone services.
    - networked multiple player games will need to be designed to accommodate the capabilities and limitations of the cellular phone system as a data network.

On review of the capabilities for different types of games and game play for these game systems, a number of trends over the 40 or so year history of computer games can be observed and noted. These include *transitions*:

- from classic pre-computing era games (board games, card games) to diverse array of game categories and game genres
- from text-based or low-resolution graphic displays to the emergence of games as immersive interactive simulations or simulated experiences

- from game play on large enterprise computers to game play on smaller, and ever more powerful computer-based game systems;
    - also from large, enterprise mainframe computers to small, networked, multi-media game/ communication devices
- from isolated single user systems to both single user and networked multiple player game systems
- from static text-based displays to immersive high-resolution, rich color, animated graphic displays
- from typewriter keyboards associated with computer terminals to haptic devices (joysticks or mice, multi-button arrays, keyboards, touch-sensitive displays), high resolution computer graphic displays and video input/output capabilities
- from general purpose computers to both dedicated purpose and multi-purpose computer-based systems.
- from standalone enterprise systems to broadband data communication networks for single or multi-user game, and also standalone personal systems.
- from standalone to wired networked game systems, to wireless short-range and then long-range networks.

Game play experiences

Based on the types of games (i.e., the software that enacts game scenarios) and game systems identified above, it becomes possible to recognize a variety of visually observable *modalities of game play* expressed as player actions affected through the game system's player control interface. These include:

- *discrete turn-taking game play*
    - as found in common multiple player board or card games (also physical mechanism-based games like pinball and slot machines), where each players acts to play a card (or many cards) or move a game piece (or pieces) per turn
- *goal-oriented, winner-loser game play*
    - found in action games, fighting games, sports games, parlor games and others (including Pong), where one or more players mutually act via their respective player actions to defeat or overcome the actions of another player (or players).
- *exploration, climatic game play*
    - found in adventure games where players action traverses or navigates the game play space in search for a pre-determined end state, final outcome, or end of journey marker, much like a story or book.
- *mediated game play*
    - found in role playing games like *Dungeons and Dragons* where one/more non-playing characters (dungeon master, grand wizard, or other external game administrator) affects judgments on game play, arbitrates in-game disputes, provides in-game advice, or changes

rules or conditions of game play during game.

- *exploration, experiential game play*
  - encountered in simulation games or other "electronic doll house" games, where there is no pre-determined end state, so that game play and player action can continue until abandoned.
- *collaborative, team-based game play*
  - where multiple players must participate in teams to engage opposing teams (team v. team play) , or to face common opponents (team v. ominous game-presented opponent(s)—monsters, giants, ogres, demons, vampires, etc., as may be found in team-oriented action games (e.g., *Unreal Tournament*, *Quake Arena*) and strategy games.
- *intense continuous reactive/proactive game play*
  - found in action games, fighting games, and some back-and-forth sports games like hockey, soccer, or basketball.
- *game play in immersive interactive simulations in virtual worlds*
  - typically incorporating one/more of the other game play modalities within an online virtual world that need not operate or behave in a manner similar to the physical/real world as we know it, as increasingly found in massively multiplayer online games.

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Lecture 15 (7 November 07)

Understanding Online Game Industry in the United States (Present-Future)

Abstract: This lecture focuses on overall trends in the U.S. game industry three to five years into the future (2010-2012). Emphasis is directed to identifying lessons learned from the past, present, future game development trends, and new game technologies that can help inform and guide how best to develop online games for the U.S. and other global markets.

- Game types
- Game engines
- Game systems
- Game play experiences

Caveat: We do NOT know the future, and we CANNOT predict the future with certainty.

- Therefore, all materials for this lecture should be considered speculations or extrapolations on current/recent advanced in game culture and technology.

However, what if we were able to make a few good guesses about what could be achieved in the next 3-5 years?

- The rewards or failures of innovation go to those who act, not to those who don't.
- Those who do not act, cannot be expected to experience dramatic growth or market share or revenue.
- Success in the game industry is most frequently associated with the efforts of those who innovate, and not to those who merely try to copy the successes of others.
- We make no claim for potential for success, nor of potential for financial reward--instead we focus on what is possible and probable.

Game Types

How many different types of computer/video game will there be 3-5 years from now? This is a simple question, with a less than simple answer.

Current game types/genres:

- *Action*

- *Adventure*
- *Fighting*
- *Racing*
- *Role Playing Games*
- *Simulations*
- *Sports*
- *Strategy*
- *Music, Rhythm, Dance/Movement/Exercise*
- *Parlor, Card and Board Games*
- *Puzzle*
- *Massively Multiplayer Online Games*

Future game types/genres in the next 3-5 years (2010-2012)

- MMOG hybrids
  - Casual MMOGs
  - Game-based virtual worlds
  - Web 3.0 web sites
- Social networking games
  - games that combine social networking sites or services with games
  - example: games for MySpace
- Combinations of existing game types
  - Example: MMOG and Music/Dance
  - MMODance (now Dance Online)
- Game mashups
  - Mashup
    - a **mashup** is a web application that combines data from more than one source into a single integrated tool
      - a typical example is the use of cartographic data from Google Maps to add location information to real-estate data from Craigslist, thereby creating a new and distinct web service that was not originally envisaged by either source.
    - content used in mashups is typically sourced from a third party via a public interface or API.
    - people are experimenting with mashups using Amazon, eBay, Flickr, Google, Microsoft, and Yahoo APIs, which has led to the creation of the Mashup editor
    - Mashup development editors
      - Yahoo Pipes
      - Microsoft Popfly
  - *Game mashup*
    - a game that combines data (game assets, characters (appearance), world levels) from more than one source into a single integrated game.

        - Example: combine your personalized in-game character from Unreal Tournament 3 as your avatar for use
            - within an MMOG for Dance
        - game mashups may first appear with games allowing for "open content sources" or content modding
            - games developed with a common game engine using common game data/ asset representation formats
            - games that can import data from Web feeds for open content syndication (e. g., RSS or Atom), web services, or screen scraping.
                - Early game example: Majestic
                - game was played by phone, email, AOL Instant Messenger, fax, and by visiting special websites.
                - Gameplay frequently involved the player receiving clues that they would use to solve puzzles and unravel the story.
                - All the messages were automated, with limited dialog options, but AIM provided some interactive conversations.
        - expect early game mashups to appear for puzzle games and parlor games
    - Game mechanic mashup
        - a game that combines the code or scripted behavioral animations from one or more games into a single integrated game
        - more difficult to develop than game mashups
        - requires open source game engines, at minimum
            - further requires in-depth understanding of multiple game engines as well as where and how they implement different game mechanic functionality
        - most likely only to appear in new game engines that are designed for open game mechanic mashups
            - may be a viable technical-business strategy for a new game company seeking to establish itself as technological innovator
- New game genres
    - location-based games (LBGs)
        - games designed and implemented to be played at a destination venue (e.g., night club, theme park, school, business enterprise) where surrounding physical setting or devices allow for situated game play
            - example: DinoQuest and DinoQuest Online at the Discovery Science Center
            - DinoQuest is a unique physical environment that provides experiential game play and science learning
            - quest-style game play using unique but reusable user-identified wireless InfraRed "wands" and embedded sensor net to explore and complete game play tasks
        - similar LBGs can be developed for
            - theme parks (e.g., Disneyland)
            - game-based fantasy world for "immersive entertainment" (e.g., MagiQuest)

        - museums
        - regional science centers
        - corporate training facilities and workplaces (e.g., factories)
        - libraries
        - schools
        - cultural centers
        - sports stadium or sports complex (e.g. Daegu World Cup Stadium)
    - other venues where *alternate reality tools and techniques* can be employed
        - adapting ART games like Eye of Judgment to location-specific applications

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Game engines

From past-current of game engines:

- Game engines *should* be designed to support a family of related games (a game "product line") for games of a given type.
- Game engines should be designed to support multiple types of games
- Game engines will continue to support *multiple player game play* using one of four common architectural forms

Looking forward, game engine technology may advance in the following areas:

- multi-core game engines and development environments
    - especially those that can scale from 2-128 processor cores
    - integrated with massively parallel database management systems (DBMS)
    - integrated with embedded contextual indexing and search services
        - see Virtual Worlds 2010+ demo from earlier presentation lectures
- Flash game engines with MMOG back-end servers
    - integrated with scalable DBMS
    - potentially able to handle game play events (user moves, mouse selections, etc.) as database transactions
    - potentially using in-memory DBMS for performance
- heterogeneous device interface game engines or game engine library
    - providing high-level service APIs to new devices like video cameras, GPS units, etc.
- multi-engine game engine
    - game engine that integrates middleware engine *plug-ins*
    - example: game engine and development environment that can integrate physics engine (hardware/software-based), chemistry engine, biology engine, psychology engine, sociology engine, etc.
- game engines supporting very high-level (end-user) engine mods

- enabling end-users to easily perform genre-level mods
- enabling end-users to configure game genre plug-ins supporting game mechanic mashups

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Game systems

The type of game systems used to support game play can determine or constrain the possible modes of game play and player action.

- *Mainframe*-class enterprise computing systems (or system clusters) to support massive scale networked game play.
- *Network*-based game play accommodating multiple players (i.e., at least two players, each with a distinct player control interface, like a computer terminal).
- *Arcade*-based game will dominate gaming casinos
- *Console*-based games will take market share from PCs
- *Internet*-based game systems will be synonymous with PC games
- *Handheld* personal game systems will constitute mobile consoles, and support console games
- *Mobile/cell phone*-based game systems need to be designed to accommodate the capabilities and limitations of the cellular phone system as a data network, and will grow to support social networking services.

New game systems are likely to emerge for:

- Location-based game systems
  - Example: Creative Kingdoms is a leading company developing location-specific interactive play worlds
  - Off-line (stand-alone) game environment; self-contained
  - employs user-specific wireless player control device (infra-red wand) to designate/ illuminate embedded play-task sensors to trigger corresponding response or environmental effect (play video, emit smoke, open/close apparatus, etc.)
  - business revenue model tied to (a) venue design and development, (b) operation, (c) in-game/near-game cross-merchandising, and (d) facilities support, as well as (e) proprietary intellectual property (patent) license fees.
- Televisions game consoles
  - new LCD/LED televisions with game player plug-ins (hardware/software), and/or accepting new TV game console cartridges

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Game play experiences

Based on the types of games (i.e., the software that enacts game scenarios) and game systems identified above, it becomes possible to recognize a variety of visually observable *modalities of game play* expressed as player actions affected through the game system's player control interface. These include:

- *discrete turn-taking game play*
- *goal-oriented, winner-loser game play*
- *exploration, climatic game play*
- *mediated game play*
- *exploration, experiential game play*
- *collaborative, team-based game play*
- *intense continuous reactive/proactive game play*
- *game play in immersive interactive simulations in virtual worlds*

Given advances in game types, game engines, and game systems, we may expect to see additional game play experiences that include:

- venue-specific or destination-oriented game play
    - moving from entertain-type of venues with little/no game play, or off-line game play, to interactive online game play
- game mediated social experience
    - arising as games are merged with social networking sites, services, and activities
    - example: virtual dating games

Lectures 16 and 17 (15 November 07)

Success/Failure Cases on Online Game Development 1--(Pre-Production Stage)

Abstract: This lecture will present findings from case studies in online game development that address topics, issues, or challenges that arise during game pre-production.

The purpose is to review both what has worked successfully, what problems have emerged, and what now to consider in future game pre-production.

This will include examination of issues associated with the cross-licensing of game content that originates in other media sources (for example, feature films, broadcast television, Web sites, theme parks, science centers/museums, books, or comics), integrating use of future game devices and interfaces, and establishing future game venues.

Pre-production technical activities

- Research game concept
- Analyze reference materials or interview experts to learn about the game's content
- Define game details (levels, play mechanics, character sets, etc.)
- Develop visualizations for what the game will look like
- Plan for production of usable content assets
- Produce key assets for usage by production artists
- Prototype game play scenarios and variations
- Create alternative versions of game assets to help determine what works and looks best.

Pre-production business activities

- Before any game can begin development, the idea for the game is created and must be approved by the publisher/developer.
- In the common case in which developer and publisher are separate companies, pitches are made to management at the developer, then it needs to be shopped around to publishers.
- Demos are often used to articulate game play scenarios.
- Production can begin once (and if) an interested publisher is found.
- Depending on the size of the publisher, this may require several rounds of pitches as the idea makes its way up through the layers of management.

SPORE: Pre-production case notes

E-J. Waugh, Gamasutra.com, 29 March 2006

"What is pre-production? It's what you are going to build" and "how you are going to do it".

Pre-production is a working sketch of the design concepts you have buzzing in your head, that you can throw together to see if they really work and to better illustrate the ideas to the rest of your design team – much as with thumbnail sketches, storyboards, or the "pre-viz" animatics.

Pre-production is a form of planning before actually putting expensive pencil to paper, as it were.

The audience for pre-production includes studio engineers, designers, and other team members. Most objectively, a prototype is used to convince others that your concept is "worth the risk of a full production".

The importance of polish -- a prototype, though humble, should possess a degree of user design put into it. Objects were depicted by clean, round-edged boxes that became highlighted when clicked. There was some minimal work put into a color scheme and to get the whole package to feel smooth and friendly to use. Though you don't want to obsess, Todd said, "a little aesthetics goes a long way" toward making your prototype something that people will actually use.

Part of the point of a prototype: "When you are in pre-production, you're not making the game."

Example prototype scenes from SPORE (c. 2006) -- scene01, scene02, and scene03

It's important to know from the outset, what problem a prototype is intended to solve.

Work in 2D before moving to 3D, since if you cannot successfully the concept in 2D, why believe you can in 3D.

Recent scenes from SPORE (2007) -- scene04 and scene05

Another pre-production case

Project X happens to be an MMO based on a hugely successful TV show/book/boardgame/movie - take your pick. Your are told 20 levels must be designed.

Q & A - How, What, When, Why, Where, & Who

How many exterior zones do we need? How many 'dungeons'? How should they be connected? Where are these zones? Who lives there? How does the player get around? When does the game take place? What kind of gameplay is to be expected there? How many players do we expect to be in a zone/level at one time? Will there be any PvP? What about player housing? etc. The last thing you want to do is dive right into level design without knowing at least preliminary answers to these questions, unless you are prepared to redo your work and in the process look very silly and unprofessional.

A good level designer is always asking questions from the engineers, the artists, the systems designers, the studio head, the coffee man, whoever you bump into. Know the answers to these questions so that when asked, you regurgitate the answers without even thinking. You should probably consider brainstorming meetings.

Do not limit your questions to those that specifically pertain to world construction.

Make it your business to know the game inside and out. How does combat work? How many different mob models will the art team create total? How many quests will there be? How much money is in the budget for this game?

The more you know about the minutiae of the game, the better you'll be able to do your job as a world builder/level designer. This could be considered true for everyone on the team.

Research

Know thy subject matter. A good world builder will always take some time to learn about the world he is going to build before he paints a single height map pixel or drops in even one bush.

Good research involves lots of reading, or even watching movies and/or TV shows related to the subject. Play other games with similar themes and geography. What have they done? How can you do it better?

Go to the museum and make sketches and notes of artifacts from similar periods, if that is possible.

Study books on architecture and geography. If there are books or TV episodes about the franchise, be sure to make it your business to read and watch as many of them as you can.

Browse the web for snippets of knowledge that are otherwise hard to find.

Collect images and articles in your user directory and share them with the rest of the team.

Immerse yourself in the universe. As world builders it is our responsibility to know the subject matter well enough that we can portray the franchise's 'heart' in our worlds.

If you have access to franchise experts, make it your business to get as much info from them as possible. Sometimes you'll learn things from them that you would never have been able to through the normal channels of research, and this goes a long way toward helping you capture the spirit of the franchise in

your designs.

Quiz on game preproduction

From *Teaching Gamecraft: The theory, planning, art, production, and design of video games*, Lane Daughtry, John Gabriel, Ryan Greene, Jason MacCoy, Rick McCann, and Anthony Rossano.

- Quiz
- (Quiz answers)

Success/Failure Cases on Online Game Development 3+4--Production, Commercialization & Community Management

Abstract: This lecture will present findings from case studies in online game development that address topics, issues, or challenges that arise during game production, commercialization, and community management.

The purpose is to review both what has worked successfully, what problems have emerged, and what now to consider in future game production, commercialization, and community management.

This will include examination of production, commercialization, and community management issues associated with game content from other media sources (for example, feature films, broadcast television, Web sites, theme parks, science centers/museums, or print media), integrating use of future game devices and interfaces, and establishing future game venues, as well as what now to consider in future game production, commercialization, and community management.

Production technical activities

- Game pre-production--research
  - See materials from Lectures 15-16
- Game production--development
  - C. Crawford, *The Art of Computer Game Design*, 1984.
  - Game design
    - game play scenarios (for testing)
    - structuring game input/output
    - game structure
    - game balance and interactions
      - artwork
      - animation
      - user control
      - play mechanic
    - game software code structure
      - factoring for rapid prototyping
      - factoring for parallel development
        - architecture and module configuration plan
        - module interface coupling (information hiding)
        - module cohesion (internal structure)

        - refactoring for maintenance
        - refactoring for reuse
    - design evaluation and reviews
    - document everything
  - Game programming
    - reuse of known game code patterns
    - interfacing to game engine
    - scripting versus programming
    - utilizing middleware and device libraries
      - balancing graphics, networking, AI, audio, etc.
    - code inspections
    - bug reporting, tracking, clearing
    - extreme programming
    - code version management and access control
    - code archiving
  - Game playtesting
    - smoke testing
    - black box testing
    - white box testing
    - alpha testing
      - bug reporting
      - game play experience and pacing
        - (re)testing common user scenarios
      - rebalancing game play plan
      - rebalancing game code structure
    - beta testing
    - post-deployment testing of user reported problems
  - Game post mortem
    - what worked well
    - what didn't work as planned
    - surprises and failures
    - schedule
    - budget
    - staff
- Game design technical details found elsewhere
  - See Gamasutra.com, Features, Production, for range of game production technical issues
    - Sample issues
    - Use of Kalman Filters to process accelerometer data stream
      - accommodating new user interface devices (Nintendo Wii)
    - Propagation of visual entity properties under constrained bandwidth
      - managing bandwidth to insure equitable game play for users with limited bandwidth
    - Fast file loading

        - providing for interactive storytelling in games through insertion of pre-rendered "cut-scenes"
    - Building game scripting languages
        - seekint to simplify developing games using a proprietary game engine
        - enabling more end-users to engage in game modding
    - Transitioning to concurrency and multi-core processor programming
        - how to program new game consoles like XBox 360 and Playstation 3
        - unclear what to do with future multi-core processors for PC games
    - Binary triangle trees for terrain tile indexing
        - trying to make best use of state of the art graphic acceleration cards (graphics engines)
    - Steraming for new games
        - providing new ways to provide game content to "heavy client-side, thin server-side" games
        - trying to adapt secure "torrent" style file transfers to game play applications
    - and so forth

Production business activities

- Focusing on game development schedules, budgets, staff, and pre-release game marketing
    - Schedules tend to slip
    - Budgets are overrun
    - Staff is of variable quality, proficency, and commitment
        - New staff may lack critical skills and development discipline
            - knowing when and how to make technical choices to limit creative options
        - Competent staff may be planning to leave to "better" work situation
        - Provision of state of the art game development tools/game engines can retain or attract senior staff
            - platforming skills and decisions that enable comparable game play experience across game platforms (e.g., consoles, PCs, Web)
        - Also, great teams produce great games
            - poor quality teams or teams in conflict do not produce great games
            - game production is hard, time-consuming work
            - working for a game company should be fun, helpful, and supportive
    - Marketing should be focused on increasing game brand awareness
        - build pre-game community
            - provide previews and early asset release to fans
        - recruit game beta-testers
        - engage beta-testers in post-game play focus groups

Other Production issues

- Independent (Indie) game development
  - Producing games with relatively little funding
  - Approaching entry into the commercial game development industry
    - developing derivative games
    - porting established games
    - maintaining existing games
    - developing game mods
  - Developing non-commercial games
    - focusing on innovation
    - creating broader visibility for developers
    - building brand identity and awareness for new game developers
    - creating games as arts or experimental media
    - Case: *Persuasive Games*
      - Casual games as a medium for social commentary
      - Casual advergaming for social change or social activism
      - Exploring the concept of "boring" games
      - All games developed in Flash for "no cost" distribution and play over the Web!
      - Book on the subject of Persuasive Games.
    - Case: *Mermaids*, an MMO focusing on emergent behavior
      - University research project for educating graduate students in game culture and technology
      - employs commericially available MMO development tools
        - Multiverse.net -- develop and deploy for free
        - provides client, server, development tools, starter assets, and sample worlds
        - no publishers
        - 10% royalty fee paid for commercial applications
  - Game developer community management and collaboration support environment
    - wiki
    - group blog
    - discussion forum
    - Frequently Asked Questions (FAQ)
    - instant messaging and chat (transcript recording mode)
    - teleconferencing and videoconferencing systems (with transcript annotation mechanisms)
    - project source and documentation crawling and indexing service
    - project-wide, studio-wide, or community-wide search services
    - and so forth

- Example: UCI GameLab portal

Commercialization technical activities

How to release and distribute a new game

- Game release--going Gold!
- Manufacturing game disks (CD vs. DVD vs. HD/Blu-Ray DVD)
- Packaging design
- Setup customer feedback systems
  - Bug reporting
  - Bug recreation and internal repair assignment
  - Elicitation mechanisms for capturing user suggestions for game improvements or extensions
  - Discussion forums (see Community management)

Commercialization business activities

Moving to retail distribution (U.S. market) or moving to online distribution (Web)

- Wisdom of David Perry about problems of retail distribution
  - manufacturing game disks (CD vs. DVD vs. HD/Blu-Ray DVD)
  - packaging
  - advertising
  - marketing
  - return reserves
  - public relations
  - customer service
  - retail sales
  - retailer road trips
  - other promotional events and product give-aways
  - distribution and wholesalers
  - insurance
  - shipping
  - and so forth
- Potential simplification due to electronic distribution
  - marketing

- public relations
- customer service
- distribution
  - Steam from Valve Software for game distribution and content delivery
  - Official community Web site: Steampowered.com

Community management technical activities

Social networking technologies

- Example vendor case study: Pringo Networks
  - More "open" social networks, with many weak ties and social connections, are more likely to introduce new ideas and opportunities to their members than smaller, closed networks with many redundant ties
  - Foundation
    - Provide a flexible architecture to power an entire site, or to simply enhance the user experience on an existing site, regardless of whether the site has existing memberships or not.
  - Backend
    - Web 2.0 platform on which websites, communities, and social networks are built upon
  - Core functionality
    - Provided by dynamic site content templates
  - Article management
    - User contributed reviews, stories, and news and is the basic content for presentation, supporting by keywords and categories.
  - Gallery management
  - Media sharing
  - Onsite competitions
  - Newsletter management
  - Discussion forums
  - Event management
  - Recommendation links
  - User profiles
  - User groups
  - User awards/prizes
  - User comment
  - Chat and instant messaging services
  - Privacy and notifications

Community management business activities

Case study: A.J. Kim, *Community Building on the Web: Secret Strategies for Successful Online Communites*, Peachpit Press, 2000.

- Bringing people together
  - People Are Talking
  - Mapping the territory
  - Zone for growth
- Getting to know community members
  - Member profiles
  - Why profiles?
  - Setting up a member database
  - Enabling users to create an persona/avatar for personal identity
  - Evolving a social identity and role-playing
- Enabling roles and role migration paths
  - Membership life cycle
  - Welcome new visitors
  - Instruct novices
  - Reward regular users
  - Empower "lead users" or group leaders
  - Honor long-term users
- Providing community leadership and liaisons
  - What's a good leader
  - Unofficial leaders
  - Official leaders
  - Managing user leaders
- Organizing events online and offline
  - Event planning
  - Bringing groups together through planned meetings
  - Showcasing performances and guest performers
  - Competitions to spotlight exceptional users
- Acceptable and unacceptable user behavior online and in-game
  - Develop ground rules
  - Enforce rules and policies
  - Community liaison as mediators
  - Excluding troublesome users or "griefers"
  - Evolve the rules based on experience
- Providing rites of passage
  - Power of ritual

    - Personal acknowledgements
    - Community holidays
    - Passages and real-life transitions
- Supporting sub-groups, clans, and fan clubs
    - Why sub-groups
    - Setting up group meetings
    - Developing official clubs, events, and policies

Robert Nideffer Lecture Materials

Presented in Daegu

25 October 2007

SEMANTICS

Games, Globalization, and Culture Industry

Games: Activities engaged in for diversion or amusement.

Globalization: Worldwide integration of economic, cultural, political, religious, and social systems.

Culture Industry (CI): KOCCA term referring to commercial creation of cultural content through film, TV, animation, music, and new media technology (pos. meaning).

Frankfurt School: CI = "pop culture" = standardized cultural goods to manipulate people into passivity; cultivates "false needs" (i.e., needs created and satisfied by capitalism); ensures continued obedience to market interests (neg. meaning).

CONVERGENCE

Theme of DICON (Seoul, Sep. 2007).

Media convergence (TV, Film, Music, Digital, Telephony).

"Space" convergence - blurring boundaries between the virtual ("unreal", "intangible", "mediated") and the physical ("real", "tangible", "unmediated"); bringing the distant near.

Intellectual convergence - exemplified by the rise of multi/inter/trans-disciplinary programs in academia.

Convergence accelerates the Culture Industry while fueling the need for "hybrid" approaches to content creation.

HYBRIDITY

Theme of YIF at CT KAIST (Daejeon, Sep. 2007).

Hybridity = "mixing“ of ideas and methods, exists at the margins, outside of dominant paradigms.

Challenges institutional practices that have been "disciplined" for hundreds of years.

Encourages use of appropriation, sampling and re-mix, and promotes unintended use of knowledge and technology.

Driver of social change with good potential for innovation.

Games are at the forefront of this convergence and hybridity, and play a key role in defining it.

GAME INDUSTRY

Global: Games currently 5% GDP; 10% projected by 2012.

Players (US): > 60% male, avg age 33, 69% are heads of households, ~8hrs per week on avg, 44% play online games (ESA).

Dev. costs: $400K 1994; $10M 2005; $15-25M 2010 (ESA).

Application areas: entertainment, military and corporate training, health care, real estate, manufacturing, scientific research, etc.

Growth areas: MMOs (csports.net), mobile, learning, augmented reality.

THE BRIGHT SIDE

Games and Interactive Entertainment will be to this century what film & TV have been to the last.

Games possess unique properties that make them ideal for communicating complex processes & ideas across many domains, sci, biz, art, edu, etc (ex: DQ Online, EcoRaft, EPSS).

Games will be a cornerstone for next gen Web development and services such as social networking, practice-based learning, workspaces & collaboratories (ex: WoW UI).

Games help build bridges between cultures through exposure to language, religion, philosophy, art; and between academia and industry through technology transfer and resource exchange (ex: UCI & DIP research project).

THE !BRIGHT SIDE

EA trip - using applied anthropology and sociology to penetrate and localize the "foreign" (changing values and beliefs vs. understanding and respecting them).

Increasing homogenization and loss of cultural diversity in the face of global capital (ex: "Disney-fication" effect - diversity may exist only if subordinated to dominant ideals, i.e., those who are different should assimilate or acculturate).

Reinforcing the ideology and influence of globally dominant markets through *sub-contracted production*, *adaptation* and *assimilation* (ex: Top 10 PC titles, "European-ized" MMOs).

THE HOPE

Create corporate and educational contexts that:

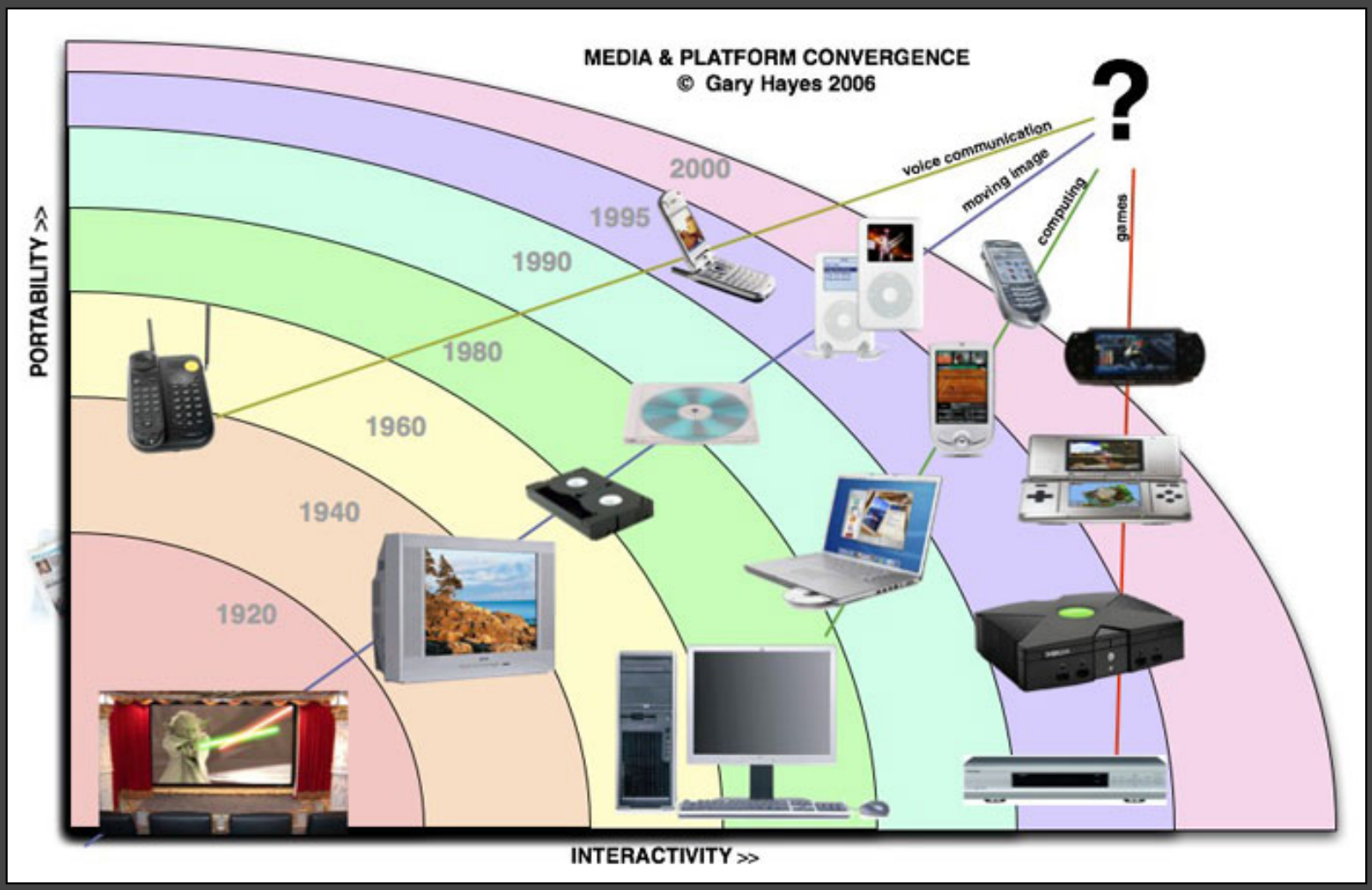
Respect and retain cultural diversity in an era of globalization, corporate consolidation, escalating budgets, and risk aversion.

Embrace unorthodoxy and divergence in times of *convergence* (ex: *commercial* - EA's Majestic, The Sims, Katamari Damacy, Wii; *UCC* - Modding, Machinima, "learning" games, science games, language games, feminist games, multicultural games).

Tools for UCC and support for FOSS (Free and Open Source).

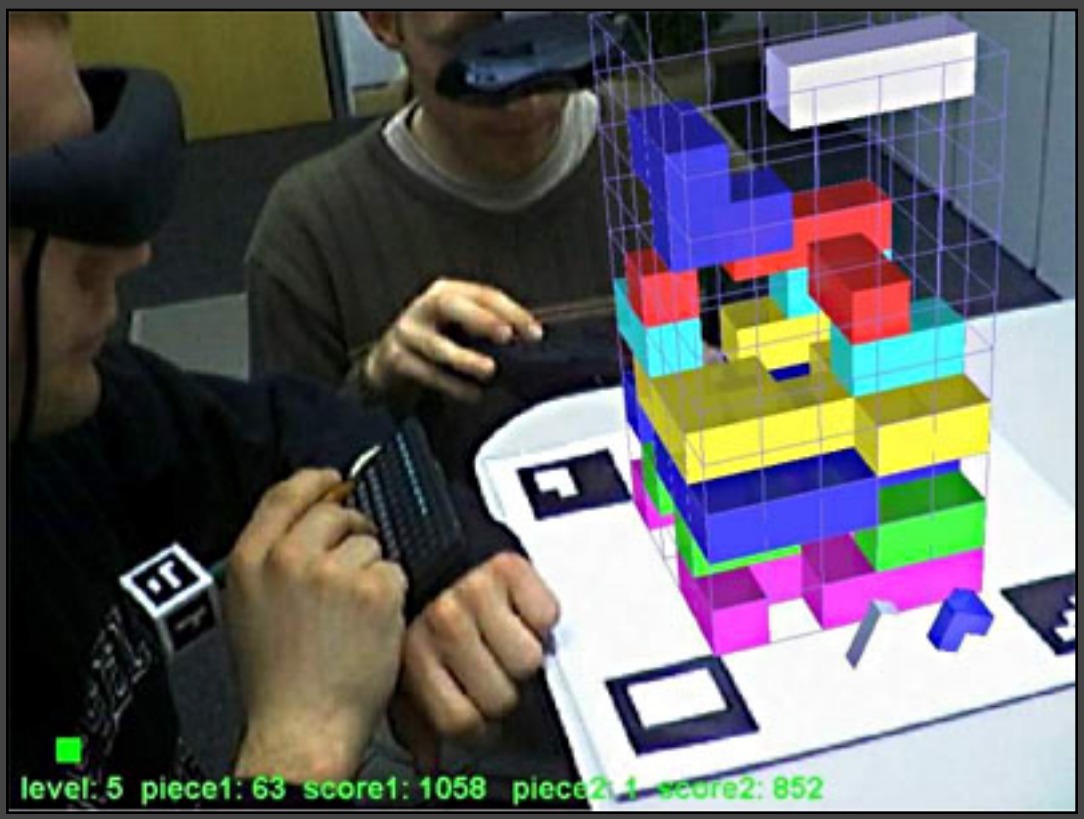
It leads to better business!

Media Convergence



- More portable
- More interactive
- More multi-purpose
- More ubiquitous

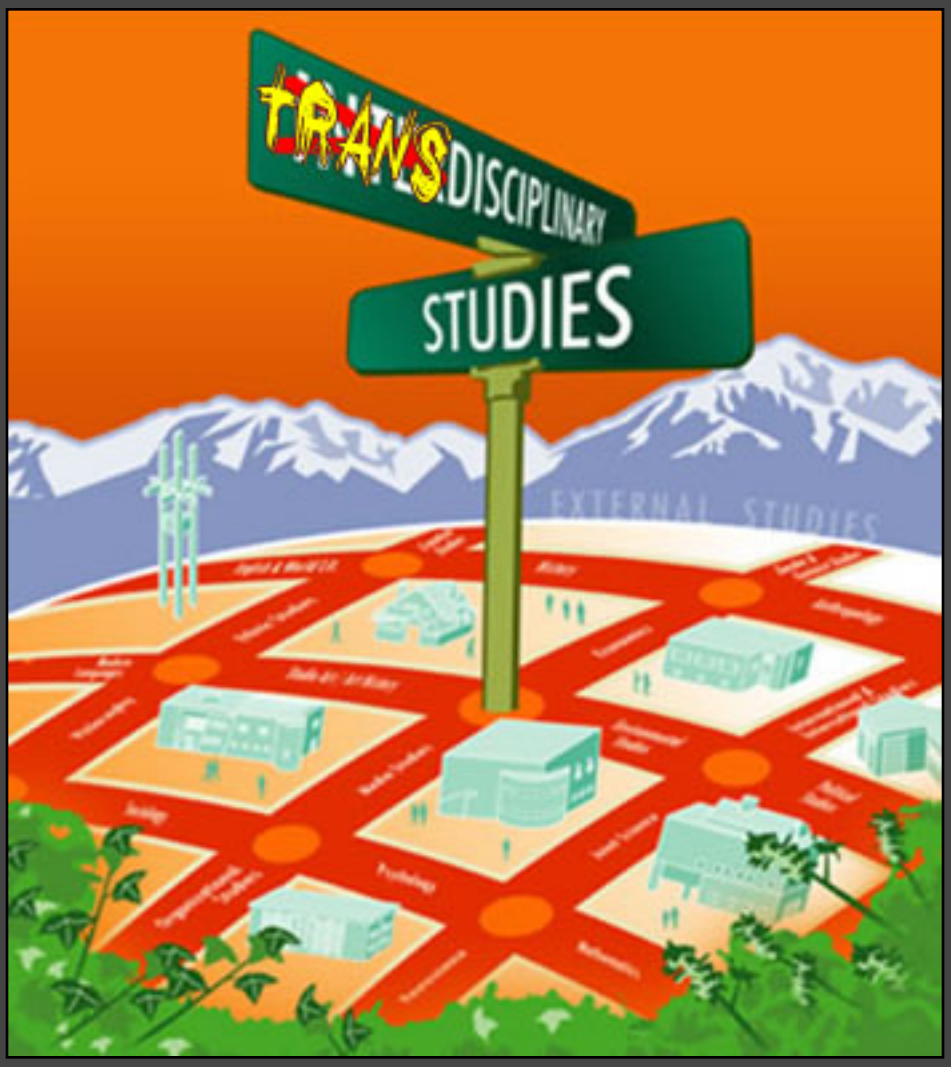
"Space" Convergence



- **Blending of realities**

- **Multiple simultaneous awareness registers (identity, location, perspective)**

Idea Convergence



- Emerging fields existing at the intersections of established disciplines
- Hybrid methods and practices
- More experimental
- Symptomatic of sample/remix-culture

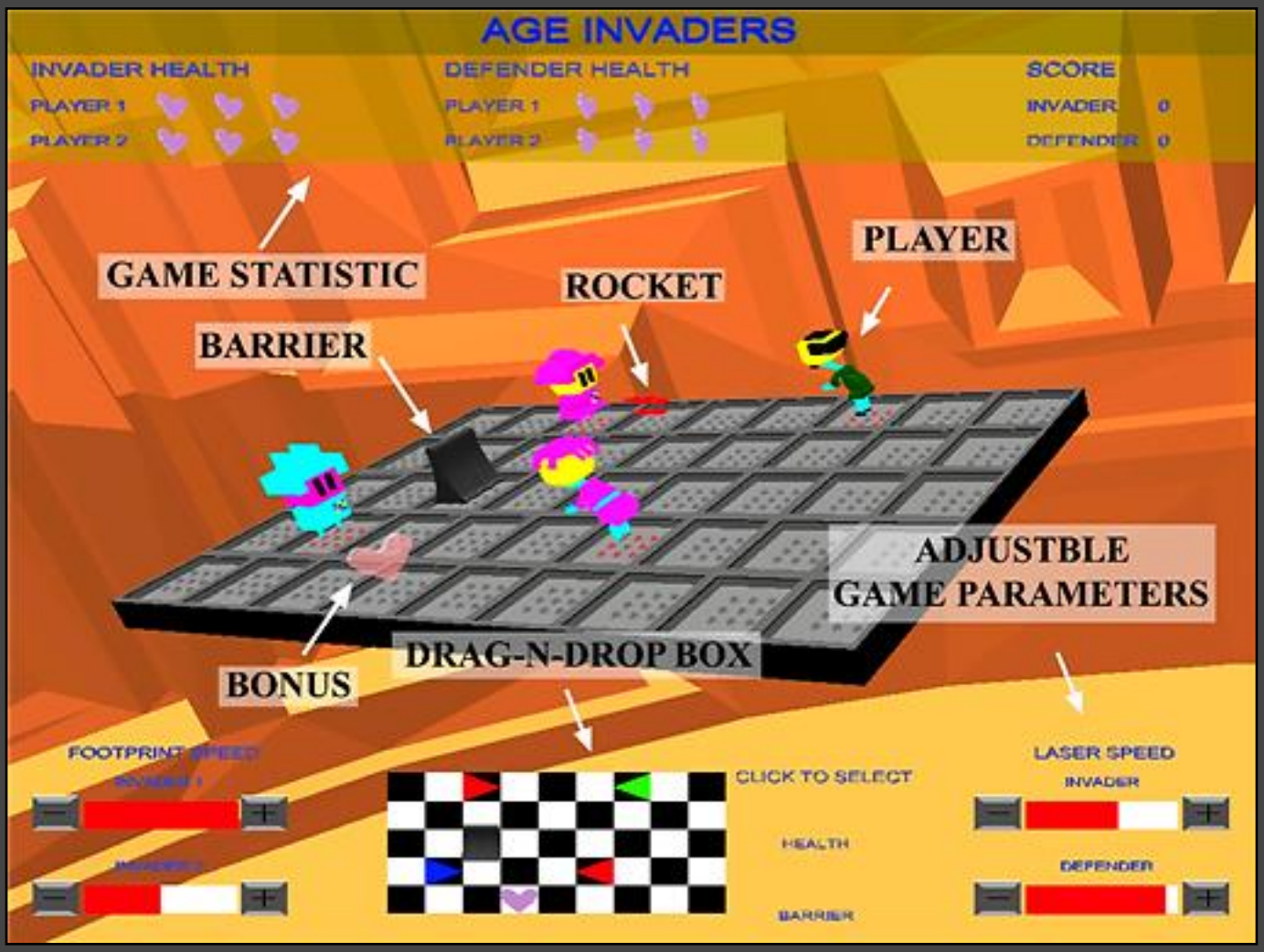
Culture Technology

Young Investigators Forum

KAIST - Sep 8th-9th 2007

Ji-Sang Han

Intergenerational Family Entertainment through Mixed Reality

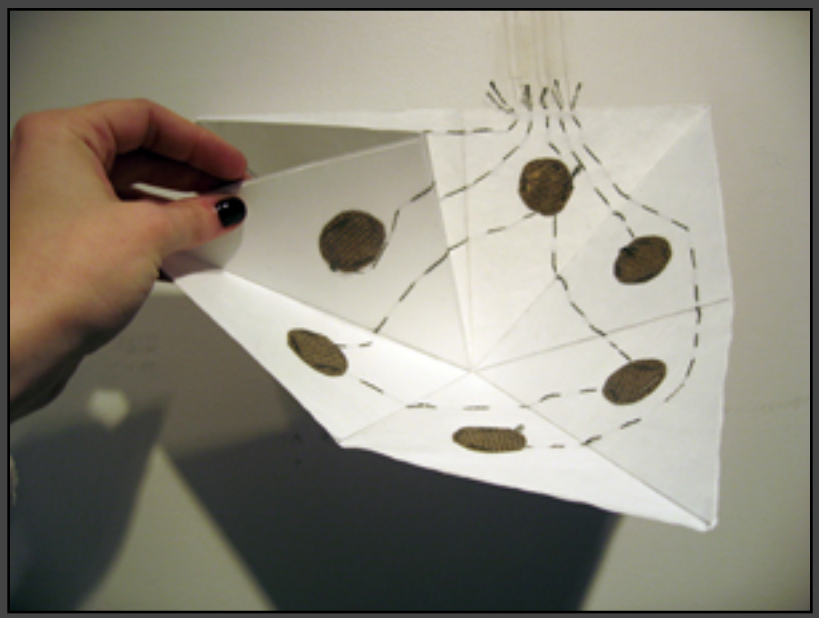


Taeyoon Choi

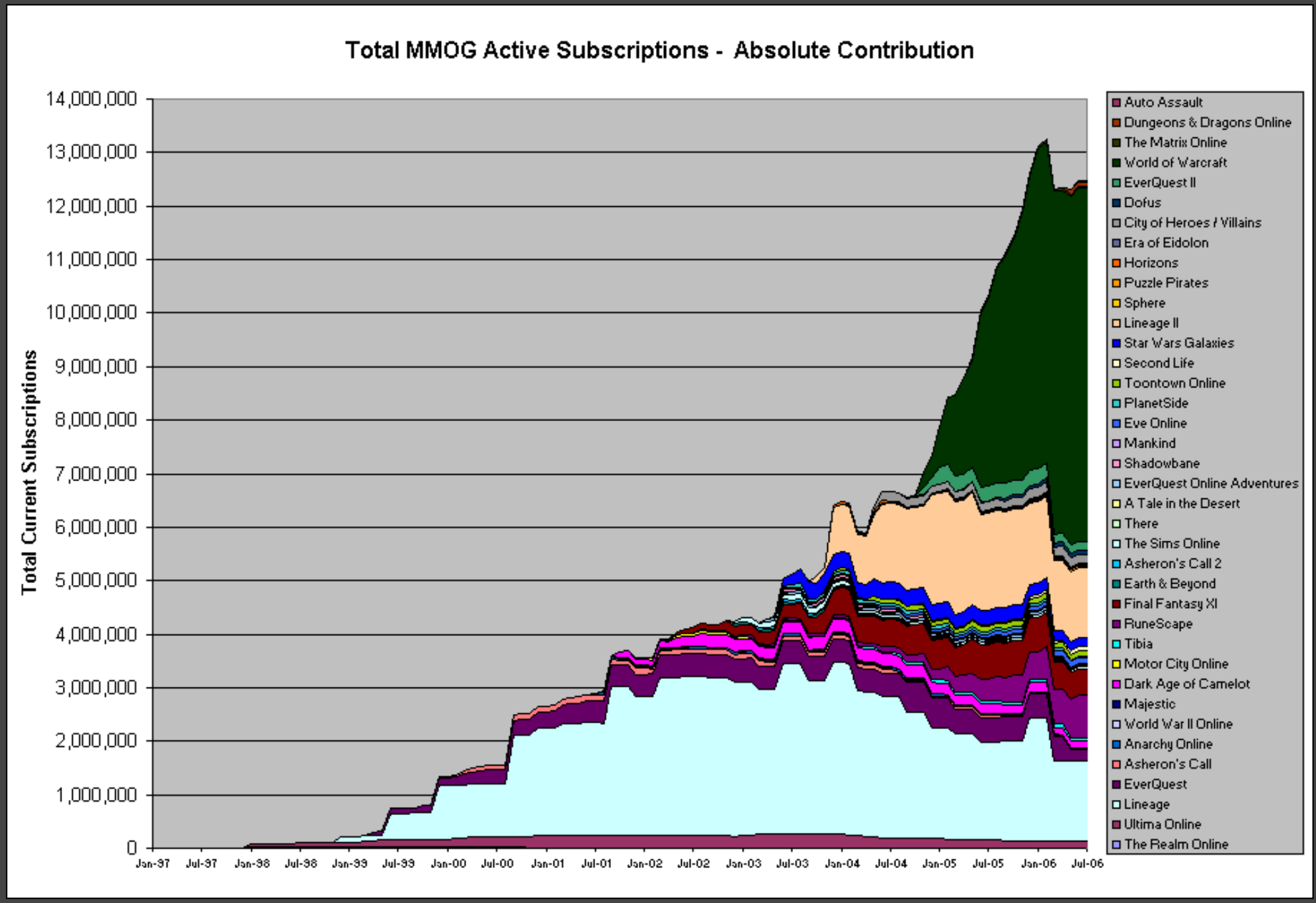
Shoot Me If You Can & DOTPLAY Package

Joo Youn Paek

Zipper Orchestra & Zoonori



MMOG Subscriptions '06



Csports.net '06

CSPORTS.net Stats

All-time Player Names	625,564,007
Active Players	22,547,342
Player Hours Today	2,655,571
Players Online Now	51,836
Servers Online Now	39,756
Modifications Recorded	3,259
Maps Recorded	726,140
Registered Members	183,606

- **Worldwide ranking and statistics service for online games**
- **Ranks 20 million player names worldwide**
- **Registered user base of over 180,000 users**
- **Serves up to 5 million impressions per month**
- **Players can locate their worldwide ranks and statistics in over 50 games and 3000 modifications**

Dino Quest

Robert Nideffer and Walt Scacchi '06

Discovery Science Center - Santa Ana, CA

Dino Quest Physical Site @ DSC

- Physically embodied interactive museum installation
- Life sciences via paleontology
- Addresses CA science education K-6 standards

- **Gesture-based infra-red emitter and embedded sensor network for tracking player's progress**

- Narrative-based scientific quest environment
- International quest stations / givers - ethnically diverse scientific role models
- Live action video (actors) with synthetic laboratory background

- **Multiple on-site quest zones**

- **Fabricated dig-pits, creatures, caves, and quest update/completion stations**
- **Earn "Research Points" for each item found**

- **GOAL** - Recover DNA samples from two dinosaur remains
- Uplink data collected to collaboratories
- Go to Dino Quest Online to bring them back to life

Dino Quest Online Site


DINO QUEST
ONLINE
DINOSPHERE
UNLOCKED
To scroll back and forth between messages, use the arrow buttons here.
DINO QUEST
DISCOVERY SCIENCE CENTER
ONLINE

- **Browser-based casual game modules that extend and deepen on-site game**
- **Four Science Learning Game "collaboratories"**
- **MyLab - physical and online rewards archive**
- **Dinosphere - Assemble virtual dinosaur via DNA collected from physical site**

CO-LAB 1 - 3 Modules + Challenge

- **Dig-Pit, Transport, Reconstruction modules with challenge level**

Dig-Pit

- **Fossil discovery**

Transport

- **Tagging and identification**

Reconstruction

- **Part selection and skeletal building**

CO-LAB 2 - 5 Mini-Games

- **Fast-paced, minimal instruction series of games that must be solved in quick succession**

Balance

- **Keep relative proportion between head and tail so creature can walk across stage**

Feed

- **Select the appropriate creature (herbivore or carnivore) to eat the food moving down conveyor belt**

Flight

- **Adjust the wingspan to allow creature to successfully soar to nest on opposite cliff**

Fight

- **Engage in aggressive or defensive combat with predator**

Pace

- **Adjust leg and body size to keep pace with competitor**

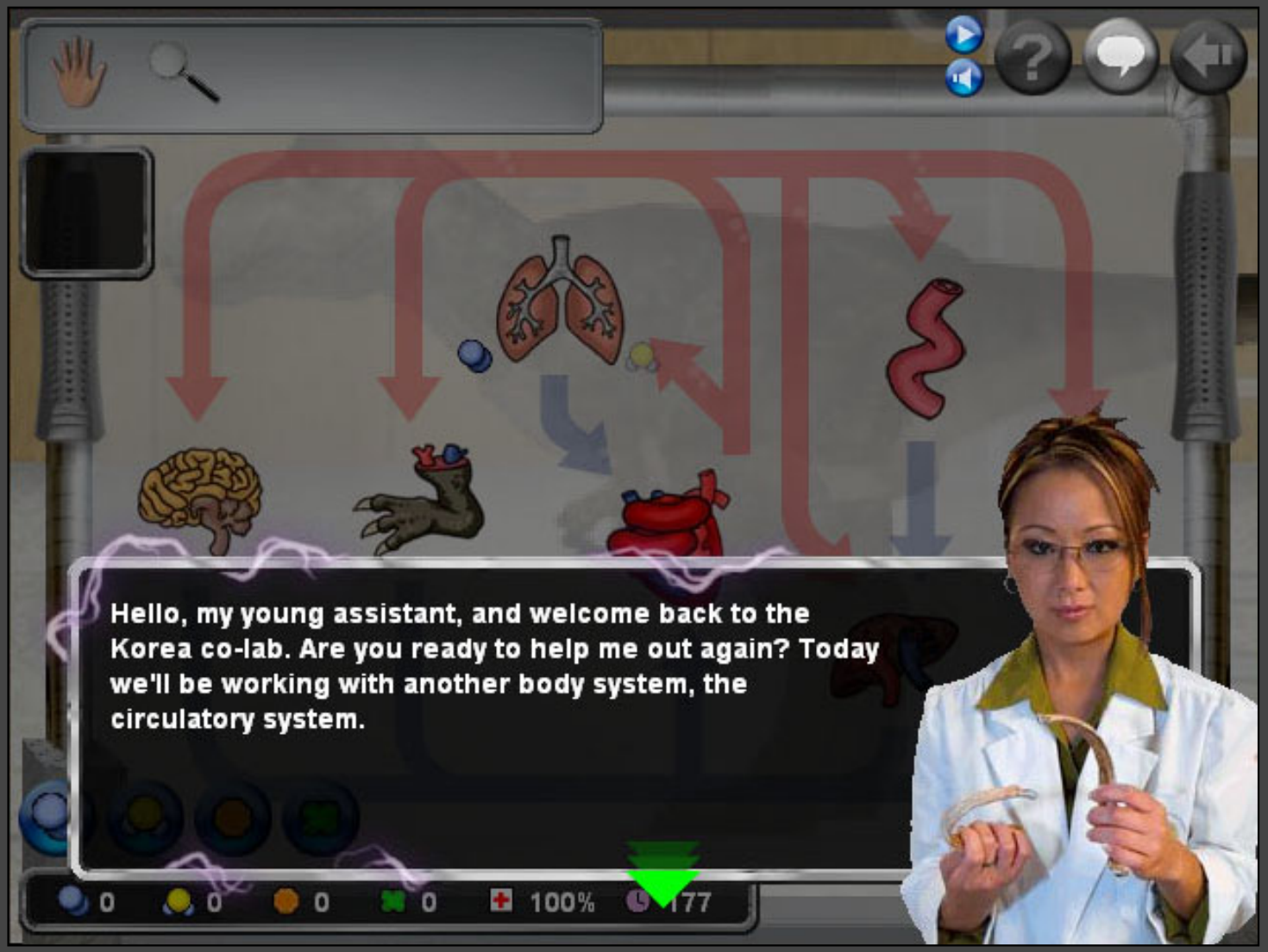
CO-LAB 3 - 2 Modules + Challenge

- **Digestive and Circulatory modules with challenge level**

Digestion

- **Create a working digestive system by linking internal organs in the proper order**

Circulation - Help & Game


Hello, my young assistant, and welcome back to the Korea co-lab. Are you ready to help me out again? Today we'll be working with another body system, the circulatory system.
0
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100%
177

- **Keep the baby T-Rex healthy by sending blood cells to the proper organs**

CO-LAB 4 - 1 Module + Challenge

- **Food Chain module with challenge level**

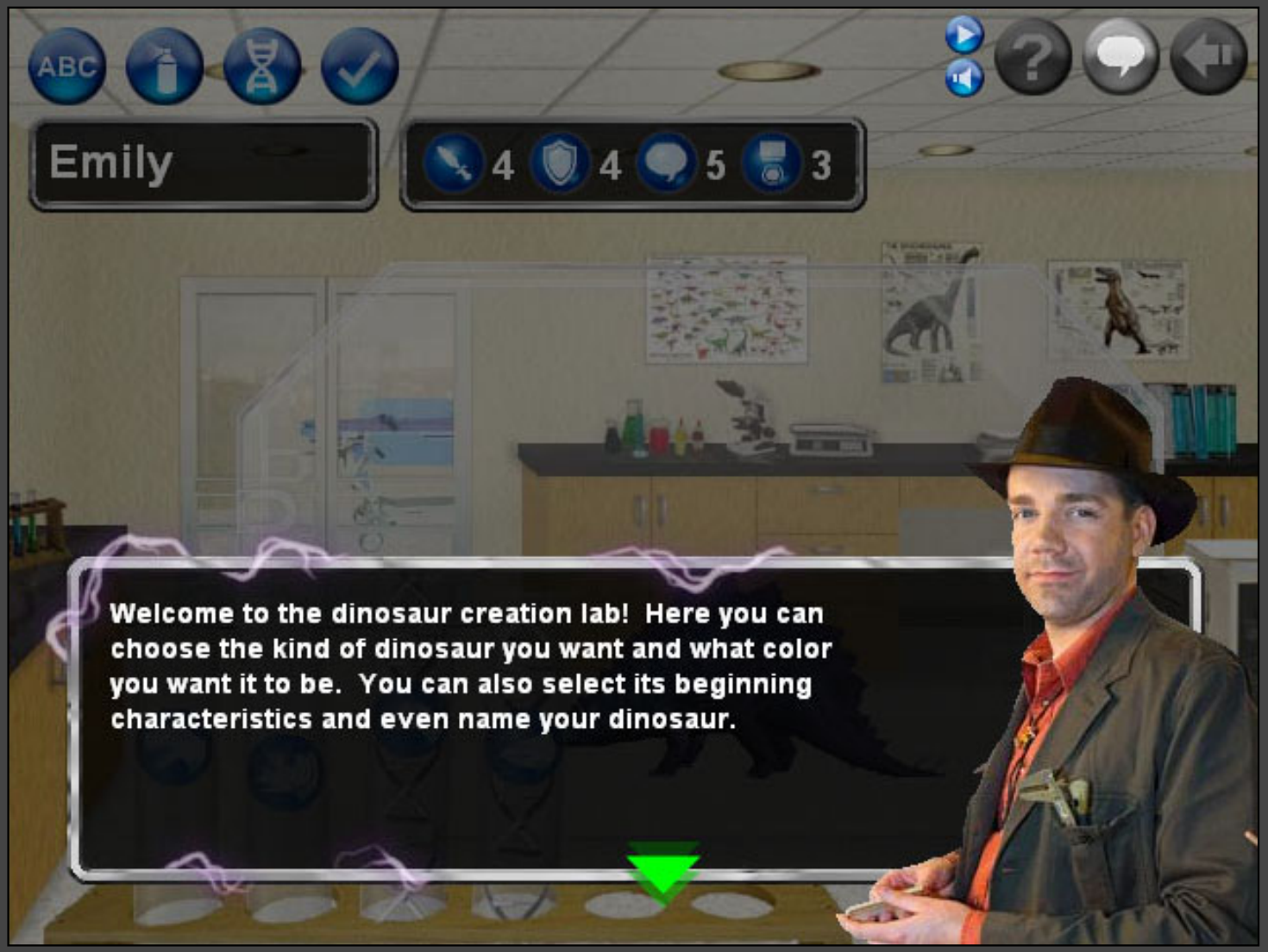
FOOD CHAIN

- **Strike a balance between soil, plant and animal**

MY-LAB - Rewards Archive

- **Personal research space where all rewards from on-site and online games are displayed**

DINOSPHERE - Simulation Environment

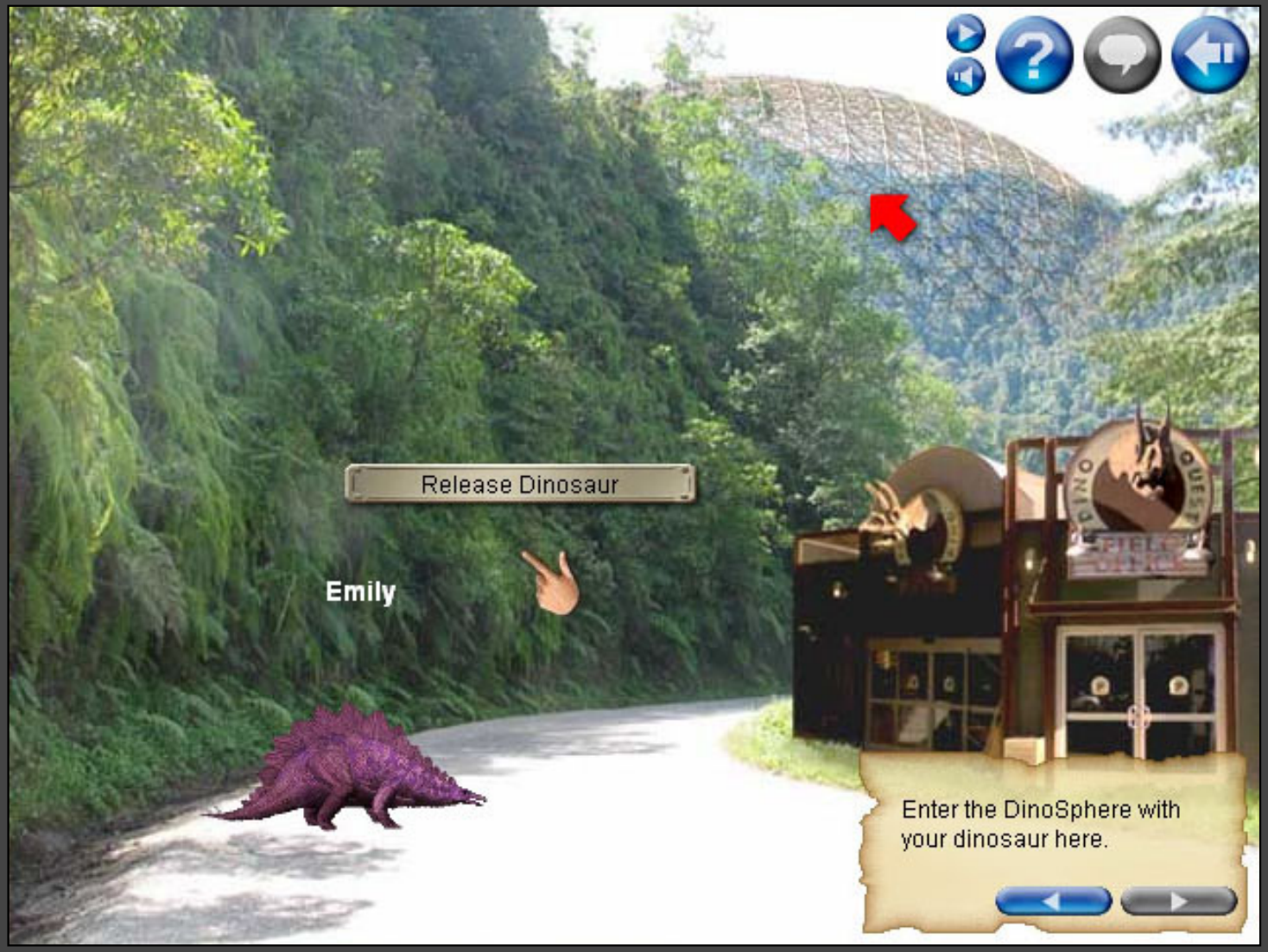


- **Final module unlocked after all others (both on-site and online) are completed**

Create

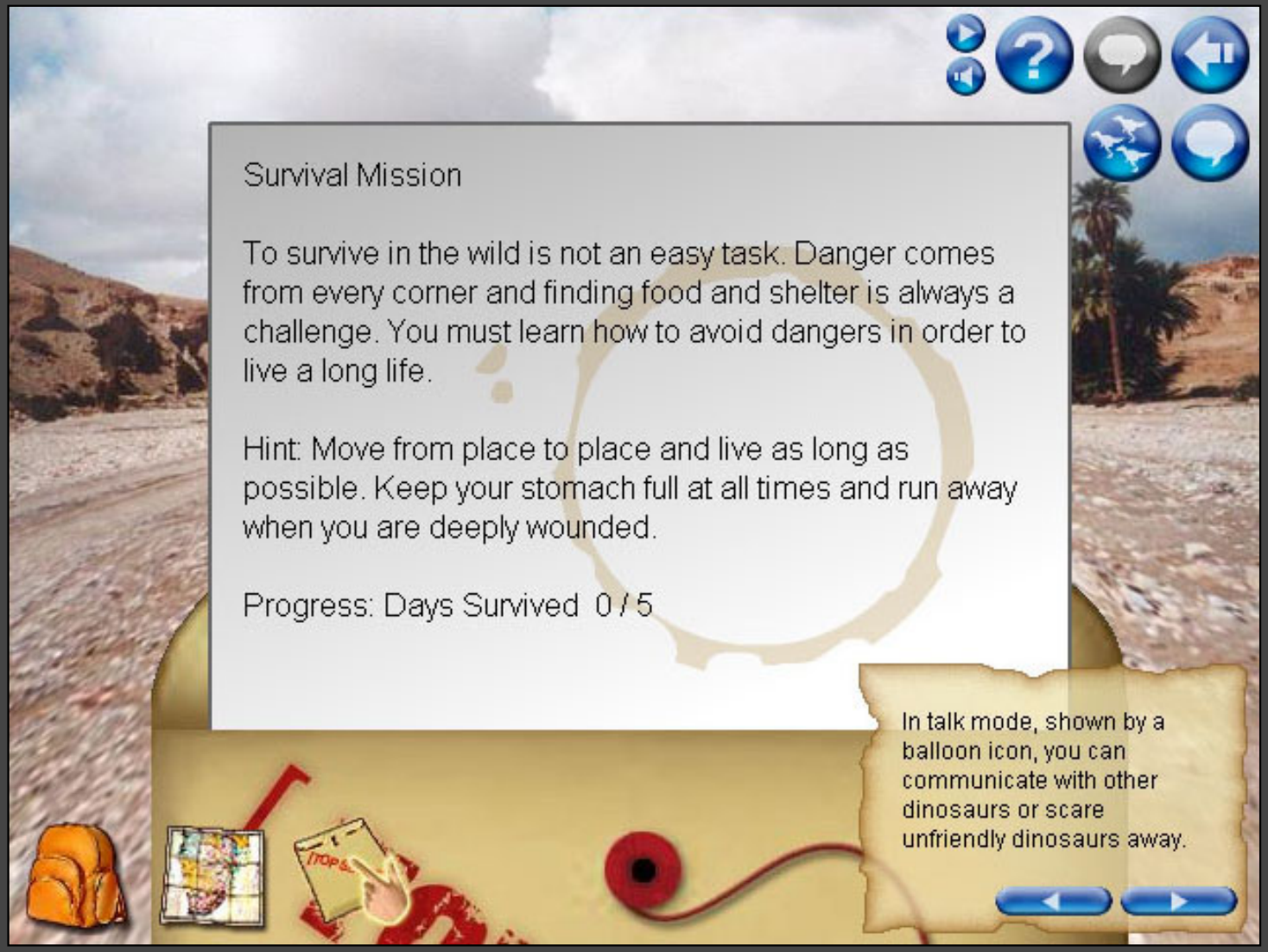
- **Enter the remote field station to create a dinosaur from DNA samples found at physical site**

Release



- **Release your creation into the conrolled environment**

Mission



- **Accept the mission to help your creature survive in the wild**

Meters

- **Find and communicate with creatures others have created and released, make friends, fight, travel solo or in groups**

VIEW SITE - PLAY INTRO MOVIE - PLAY DINOSPHERE MOVIE

EcoRaft

Bill Tomlinson and Lynn Carpenter '06

- Interactive environment designed to teach people about restoration ecology
- Integrates stationary monitors and mobile tablet PCs
- Allow participants to move species between virtual islands

THE GAME

- Peer into the rainforests of Costa Rica
- See flowering plants, trees, and various species of hummingbirds
- You have control over the islands' ecosystems

- **Participate in restoration ecology by transporting species**
- **Use mobile rafts to pick up a seed or bird from one island and deposit it on another**

- **Once an island has been restored you win**

VIEW SITE - PLAY MOVIE

Hiperwall

Falko Keuster '06

- Highly Interactive Parallelized Display Wall
- Primary focus is on Earth science visualization
- Used to visualize multi-dimensional, time-varying datasets
- Cluster of high-performance commodity computers (28 Mac G5s)
- 56 Apple 30" cinema display tiles operating at a combined resolution of > 200 mega pixels

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Earth and Planetary System Science Game Engine

Falko Keuster, So Yamaoka, Chris Knox, Gloria Brown Simmons '06

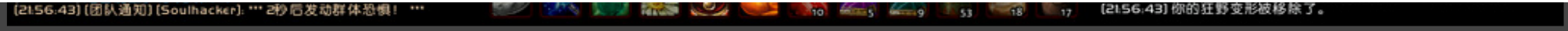
- Develop unconventional scientific visualization strategies in a multiplayer game context
- Explore notions of geophysical scale (temporal and spatial)
- Model interpretation and data exchange mechanisms

- Focused on geo-spatial registration and navigation using game controllers and other UI components
- Give players the impetus to conceptualize how complex Earth and planetary systems work

VIEW SITE - PLAY MOVIE

WoW UI


Necrosis 法术计时条
缩小的系统提示
& SCT 战斗信息
DHUD
可定制的HUD显示
Discord Art 自定义界面贴图



- Custom layout and complex feedback systems (raid & party status, abilities, multi-channel chat, combat stats, Cooldowns, context maps, net latency)
- highly collaborative
- Intensive "play" that's quite a bit of work
- How might this carry over into other domains?

Top 10 Korean PC Games

7/24/07 Gametrics and ItemMania

1. Sudden Attack

Genre: FPS, Developer: GameHi

2. StarCraft

Genre: RTS, Developer: Blizzard

3. World of WarCraft

Genre: MMORPG, Developer: Blizzard

4. Special Force

Genre: FPS, Developer: Dragonfly

5. Lineage 2

Genre: MMORPG, Developer: Hanbit Soft

6. Lineage

Genre: MMORPG Developer: NC Soft

7. WarCraft 3

Genre: RTS, Developer: Blizzard

8. Dungeon & Fighter

Genre: RPG, Developer: Neople

9. Audition

Genre: Arcade / MMO, Developer: T3 Entertainment

10. FIFA Online

Genre: Sports, Developer: EA / Neowiz

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GAMASUTRA
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The State Of Korea: PC Games

By Nick Rumas

The world of PC gaming in Korea never fails to surprise. When I first arrived here over six years ago, I was amazed at the sheer penetration of high-speed internet and the widespread obsession with online play across all age levels, and I still am to this day. While the well-known staples of the Korean PC gaming diet are generally held to be *StarCraft* and *WarCraft* in the West, there's a lot more to it than just that.

First of all, in order to understand the way PC gaming works here in Korea, it's necessary to get an idea of what's happening on the actual retail scene. The answer to that, for better or worse, is that there's not much going on at all, and it's been this way for as long as virtually anyone can remember.

I was rather shocked by it at first; I'd ask friends where the game shops were, because, I'd reason, if everyone is playing this software, there must be the Korean equivalent of a GameStop or EB Games on every corner, right? Wrong. Before we go further into that, though, let's take a look at the most recent top five list for retail sales of PC games to see what's moving off the shelves, courtesy of Korea's Game Industry Total Information Service System (GITISS).

1. *Harry Potter and the Order of the Phoenix* (EA)

2. *Princess Maker 5* (Fujitsu)

3. *Command & Conquer 3: Tiberium War* (EA)

4. *The Sims 2* (EA)

5. *Transformers* (Activision)

At the end of the day, the above list doesn't mean much at all. While exact sales figures are not available, it's safe to say that they're not going to be anything noteworthy. Going to the store to buy the latest PC game just isn't a big thing in Korea.

To give you an idea of what things are like, I'll use the area in which I live -- Yangju, a northern suburb of Seoul well within reach of the massive Seoul Metro -- as an example. The population, mostly made up of overflow from Seoul proper, is nearly 200,000, but there isn't a single dedicated games store to be found in the entire city. The closest would be in the neighboring city of Uijeongbu (population of around 450,000), but even there, you'll only find one fledgling shop in the dark recesses of an underground mall.

The shop owner is a friend of mine, and he'll be the first to tell you that selling PC games in Korea is a dead end; he makes his money by selling console games, the kind that aren't copied so easily.

Even in Yongsan, the retail capital of Korean gaming, there are virtually no customers that come looking for new, legitimate PC games, and as such, hardly any are sold.

Overall, it's a market that barely exists. Granted, every big box retailer -- Lotte Mart, E-Mart, Samsung Tesco HomePlus, etc. -- has a sizeable PC games section, but there generally isn't a whole lot of action going on in it.

There are two main factors that contribute to this. First of all, when it comes to new PC games sold at stores, the vast majority of those interested just download them illegally. In Korea, the consensus among the masses is that P2P downloading is a reality that must be accepted and can't be avoided. It's completely commonplace, and has been for years. Additionally, even if someone doesn't download a certain game personally, they can just as easily make the trek to Yongsan and buy a pirated copy of the title for a fraction of its retail price.

That's not to say that there are none who are opposed to illegal downloading; there certainly are -- at least a few -- but such individuals make up a very small and insignificant minority in comparison with those who support such practices or who don't care one way or the other.

It must be understood that minimum wage in Korea is still quite low by Western standards, while cost of living is high, not to mention fast on the rise. In many cases, products are more expensive here than in the US. As such, when Koreans are faced with the dilemma (if it can even be called that) of whether to pay full price for PC games or download them for free, it's a non-issue for most.

The interesting thing is that this extends even to those with disposable income. To illustrate, I have a friend who is the president and founder of a very successful design firm in Seoul, and one day when the subject of a particular title came up, he immediately exclaimed how he'd recently downloaded it and what a big fan he was.

It's very much a 'topless woman at the French Riviera' scenario -- illegally downloading games in Korea is nothing if not completely and utterly normal, so much so that purchasing a game at full price can be seen as something of an oddball behavior. Where possible, the same applies to console games, but that's for another article.

The second reason for the lack of any major retail presence for new PC games in Korea is the fact that most popular online titles from domestic developers -- and it must be noted that if a PC game isn't online, it generally won't find much of an audience here at all -- are free to download and play; some operating on a micro-transaction system of customization, some with a subscription fee to play, and others just plain free.

The companies and individuals that took risks and made use of such systems from the beginning generally went on to reap huge rewards. While a rather recent example, Nexon's *Kart Rider* became such a huge phenomenon because of the fact that, despite being a rather blatant rip-off of *Mario Kart,* it was free, for the most part well designed, and immediately accessible to players of any and all age groups. Though it's now significantly lessened in popularity, the game was a true national phenomenon in its heyday, one that's going to be remembered for years to come.

Central in all of this is the role of the internet cafe, or as it's called here, the PC Bang (that's 'ah' as in 'on'), meaning 'PC Room'. While there are many gamers who also play at home, the PC room is where the real action is at, largely because of the fact that you can find them virtually anywhere, they always feature a good selection of the most popular online titles, and perhaps most importantly, subscription fees to the games that require them are already taken care of.

Rates are very reasonable for non-members, around 1000~2000 Won an hour, which corresponds to about a dollar or two USD. The hardcore, however, mostly have paid memberships to their bang of choice, and whenever possible, they vegetate all through the

night, subsisting on a not-so-healthy diet of spicy ramen ('ramyun' as it's called here), cigarettes, and the ever popular canned coffee, either hot or cold.

Years back, I gave this this witch's brew a try, minus the cigarettes, and it left me feeling so awful the next day that I had to go to the doctor. Not recommended.

So now let's take a look at the list that matters -- the top ten online games at PC rooms in Korea -- and break down each of the titles and their respective developers. Here they are as of 7/24, this time courtesy of Gametrics, Korea's leading online gaming information tracking service. Also, take note of each entry's item sales ranking, provided by ItemMania.

1. *Sudden Attack*

Genre: FPS

Developer: GameHi

Publisher: NetMarble (CJ Internet)

Item sales ranking: 5

A massively popular online FPS, this one's been at the top of the list for thirty-six weeks. One of the game's main draws is its upgrade system, which operates on both cash and points earned in-game. There are a variety of payment methods, including home phone/cell phone billing, and tie-in promotions with mobile carriers SK Telecom and KTF enable in-game 'cash' to be acquired through the voluntary submission of a users' private info -- phone numbers, etc. -- for pesky advertising schemes.

2. *StarCraft*

Genre: RTS

Developer: Blizzard

Publisher: Blizzard

Item sales ranking: N/A

Nearly ten years old and still showing no sign of letup, it seems that the only game capable of replacing *StarCraft* will be its sequel, announced in Seoul this past May. And yes, you can still watch professional matches on TV any hour of the day.

3. *World of WarCraft*

Genre: MMORPG

Developer: Blizzard

Publisher: Sonokong

Item sales ranking: 17

As with *StarCraft*, not a whole lot to say here. Koreans love all things *WarCraft* almost as much as they do *StarCraft*, and though this MMORPG hasn't been around as long as its RTS counterparts, it shows no sign of slowing down any time soon. Let's just hope we don't hear any more stories of child neglect due to WoW addiction in the near future.

4. *Special Force*

Genre: FPS

Developer: Dragonfly

Publisher: Neowiz Games

Item sales ranking: 16

Not to be confused with the anti-Israeli first-person shooter from Islamic organization Hezbollah, this popular Korean online FPS features upgradeable characters and weapons for a highly customized play experience. As is the trend with many popular online games, items and upgrades can be purchased via mobile phone.

5. *Lineage 2*

Genre: MMORPG

Developer: Hanbit Soft

Publisher: NCsoft

Item sales ranking: 6

The sequel to NCsoft's massively popular original, *Lineage 2's* subscription-based nature makes it a good fit for PC rooms. Though Lineage 2 is more popular than its predecessor, its item sales trail behind by three places, according to ItemMania.

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6. *Lineage*

Genre: MMORPG

Developer: NC Soft

Publisher: NC Soft

Item sales ranking: 3

Like *StarCraft*, Lineage is another online title that's been going strong for nearly ten years. While it may not have seen much success in the West, the game was at one time subscribed to by over three million gamers, mostly Korean.

7. *WarCraft 3*

Genre: RTS

Developer: Blizzard

Publisher: Hanbit Soft

Item sales ranking: N/A

The same goes for *WarCraft 3* as for *StarCraft* and *WoW* – no amount of Blizzard action is enough for Koreans. Kudos to the company for repaying its most loyal fans with the Worldwide Invitational it threw in May at Seoul's Olympic Park.

8. *Dungeon & Fighter*

Genre: RPG

Developer: Neople

Publisher: Samsung Electronics

Item sales ranking: 2

This awkwardly named RPG, very popular among mid-teens, features 2D sprite graphics and real-time action combat. Like most popular online Korean games, pay-to-customize options and product cross-promotions abound.

9. *Audition*

Genre: Arcade/MMO

Developer: T3 Entertainment

Publisher: Yedang Online

Item sales ranking: 31

Based on a massively popular Korean comic book series, *Audition* has become quite a gaming phenomenon as well, with editions now available for the PSP and cell phone.

It's basically a dancing game with MMO features and microtransactions for the purchase of clothing, accessories, etc. Recently, there have been news reports of this game being used by middle-aged men to try and lure in female middle and high school students.

10. *FIFA Online*

Genre: Sports

Developer: EA / Neowiz

Publisher: Neowiz Games

Item sales ranking: 14

Koreans love soccer, and while Konami's *Winning Eleven* holds more popularity on the console scene, EA's FIFA Online -- made in Korea in collaboration with Neowiz/Pmang – continues to be quite popular for online play.

Elaborating on a few points from the above list, the prevalence of microtransactions – selectable and payable through diverse means, with a large emphasis on cell phone transactions – and product cross-promotions cannot be overstated. Go to any of the above games' official sites, and you'll be met with a dizzying array of flashy links and logos begging for your attention, money, and/or personal information.

This style is very much in the same vein as that of the average busy nighttime street in Seoul – thousands of flashing neon lights and bright signs against a black background, all fighting to be seen and trying desperately lure in the passerby. Visitors find excitement and charm in such

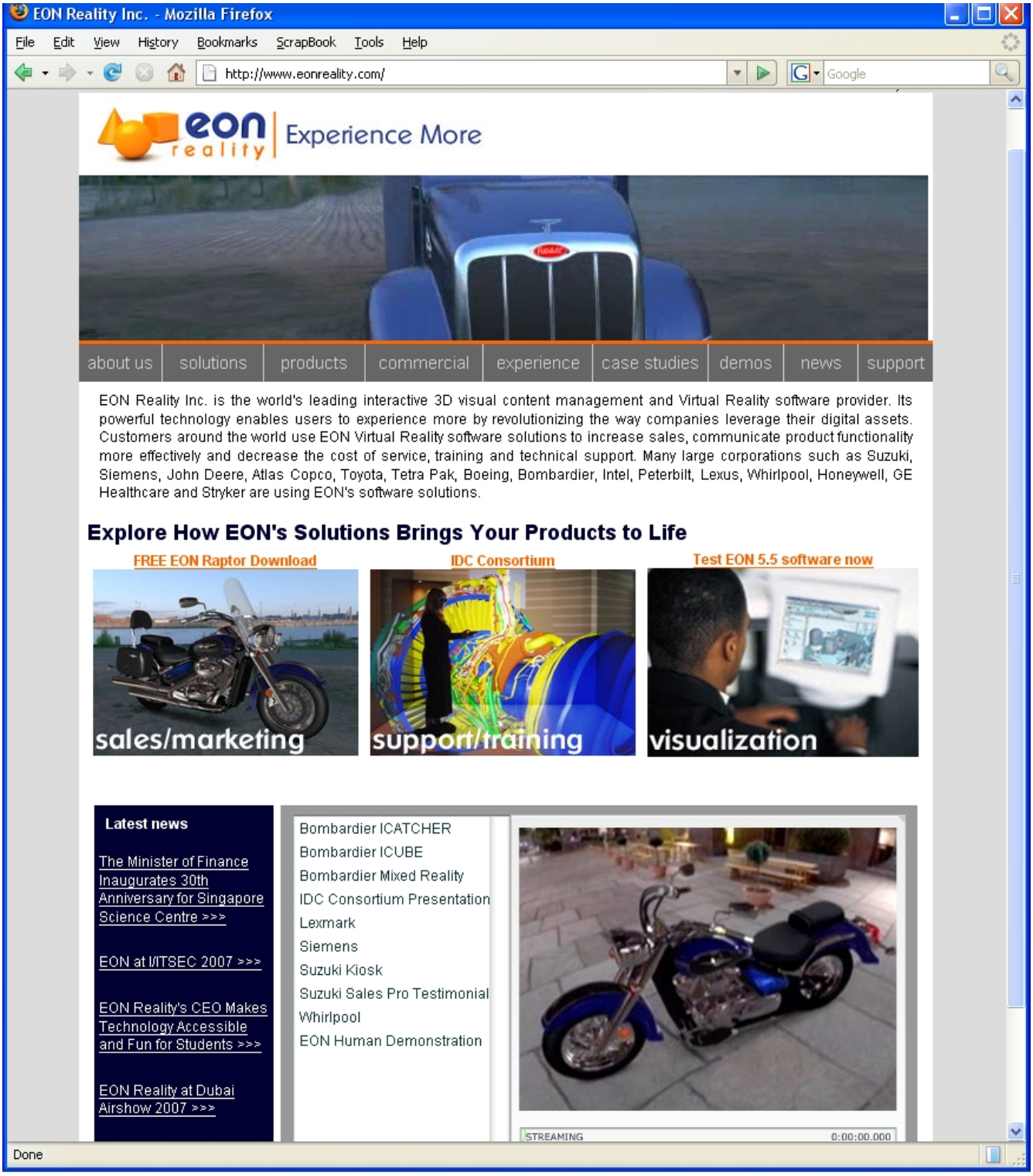
scenes, but when it comes to online gaming, this kind of attack on the senses is really quite a turn-off for the average Western gamer.

That, in a nutshell, is where the PC gaming industry in Korea currently finds itself. Physical retail is dead, and while that isn't going to change any time soon, it's a rather insignificant issue, because the online market is the only one that really matters here.

Piracy is obviously here to stay, but the industry wise have gotten around that issue and found phenomenal success through subscriptions and microtransactions, the former of which has been massively aided by PC rooms, and the latter of which has found a convenient host in the cell phone.

The world of PC gaming in Korea may massively dwarf that of consoles, but Sony, Nintendo and Microsoft are engaged in their own little war on the peninsula, as well. Stay tuned for an upcoming report on the details of that war, as we analyze the state of the console industry in Korea.

Materials identifying Web sites for Research and Development Centers related to the future of computer game culture and technology at or near UC Irvine



EON Reality, Inc., World Headquarters, Irvine, CA, Dan Lejeskar, Chairman of the Board

http://www.eonreality.com/

UCI GameLab, Robert Nideffer, Director, Walt Scacchi, Research Director, Alex Szeto, Lead Game Programmer and Artist

http://www.ucgamelab.net

Discovery Science Center, Santa Ana, CA, Joe Adams, President

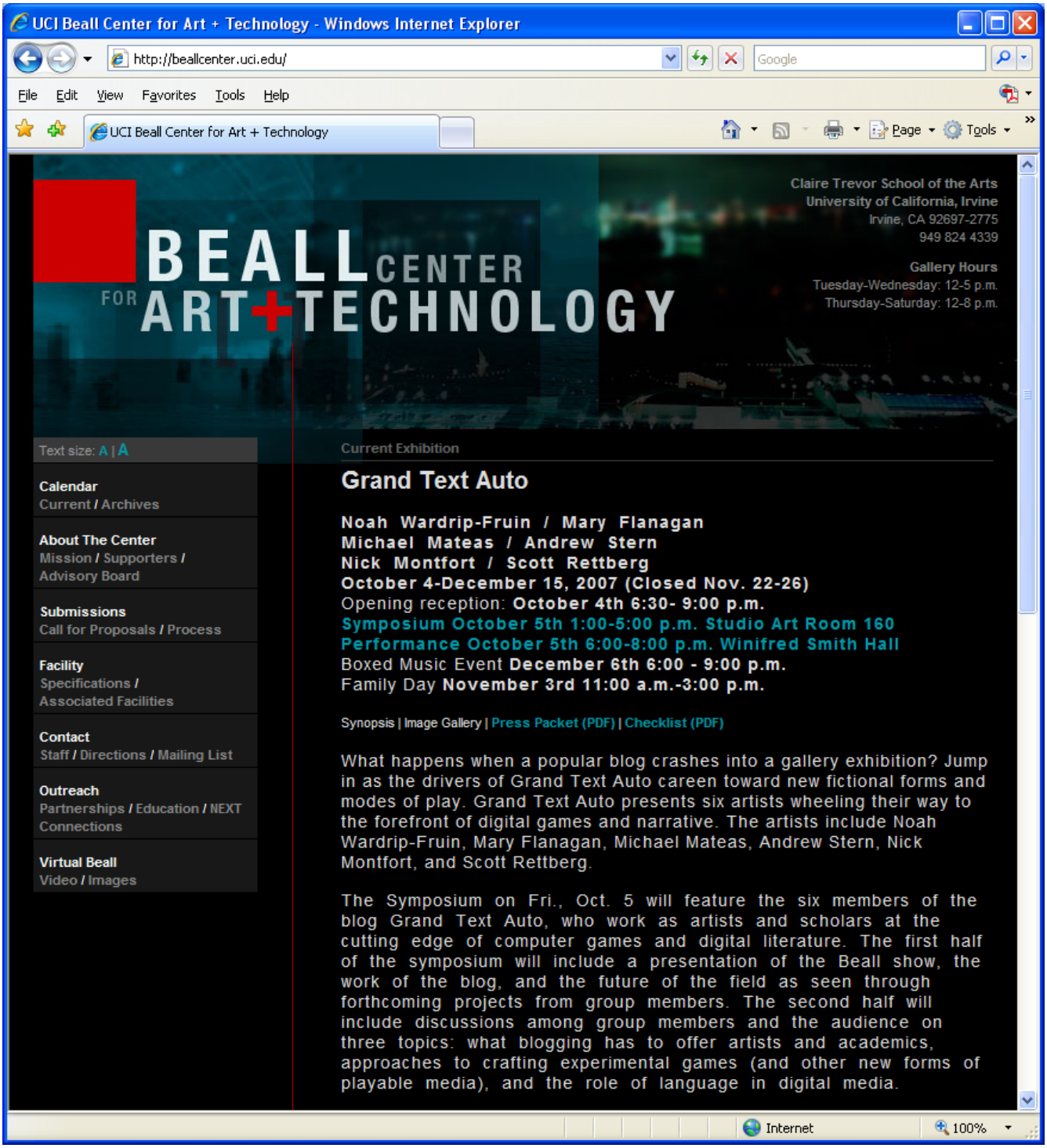
http://www.discoverycube.org

EcoRaft Project, UCI Interactive Animation Laboratory, directed by Professor Bill Tomlinson

http://orchid.calit2.uci.edu/EcoRaft

UCI HIPerWall Project, directed by Professor Steve Jenks, assisted by Dr. Sung-Jin Kim

http://hiperwall.calit2.uci.edu/

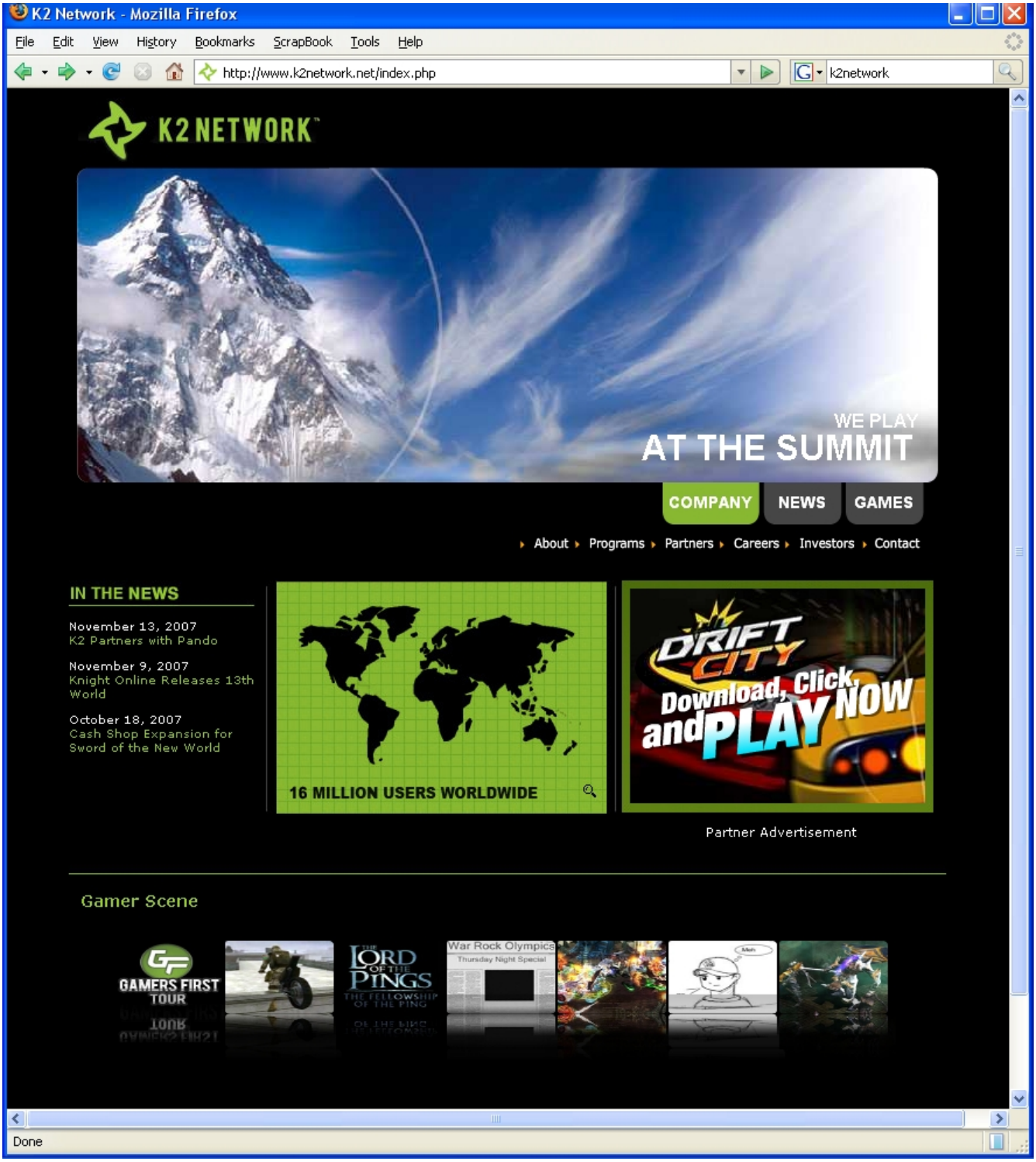


UCI Beall Center for Art+ Technology, Eleanore Steware, Director, David Familian, Associate Director

http://beallcenter.uci.edu/

UCI Active Space Laboratory, Professor John Crawford, Director

http://www.embodied.net/activespace



K2Network, World Headquarters, Irvine, CA, Jeff Hwang, President

http://www.k2network.net