The Future of Research in Computer Games and Virtual Worlds

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Overview

- Background
- Future CGVW research and challenge topics
- Recent CGVW research project topics
  - Advance CGVW development technologies
  - Media, Art, Culture, and History (MACH) learning games
  - Science, Health, Environment, Energy, Defense CGVWs
- Emerging CGVW problem areas

Background

Computer games and virtual worlds (CGVW) have emerged as a core problem domain for Informatics and Computer Science research.

CGVW as ICS domain

- Development of modern multi-player CGVW requires expertise in:
  - Software engineering, human-computer interaction, (programming) language interpreters and compilers, operating systems, artificial intelligence and data mining, database management, computer graphics, networking, computer-supported cooperative work (play), social computing, algorithms, etc.
  - Also, CGVW level/world design, work/play mechanics, avatar identity management, socialization experiences, CGVW history, balanced play interaction experience, etc.

Selected CGVW research findings and results

-- Viable group presentation, communication, and social interaction
-- Prototyping and review of virtual objects, composite systems, etc.
-- Training, education, rehearsal, learning
-- New commercial product demonstration
-- Identity role-playing, team building, and other social processes
-- Multi-media storytelling
-- Avatar control and choreography
-- Mirrored worlds and memorialization
-- Enterprise game development and modding
-- Semi-automated socio-technical process discovery
-- Modeling, analyzing, and developing complex intellectual property regimes accommodating multiple heterogeneous IP licenses
-- Enabling human behavior transformation (health care)

Future CGVW research topics: NSF-UCI Workshop

- CGVW systems platform technologies
- Advanced CGVW development tools and techniques
- Anthropological, behavioral, and sociological studies of CGVW use and social practices
- Media, art, culture, and history (MACH) practice
- K-12 learning and education through CGVW
- CGVW as R&D and education platforms in science, health, environment, energy, and defense studies

Advanced CGVW development tools and techniques

- **Programming**
  - Dominant approach in CGVW industry and CS education
  - *Game jams:* software development as team sport
- **Modding** (includes remixing, mashup, DIY)
  - Dominant approach for CGVW to user-created content or CGVW experience
  - Informed by *open source software development*
- **Generation** (emerging future dominance?)
  - Procedural, knowledge/rule-based, database driven, or hybrid via very-high level specification language(s).

MACH Challenge Domain: *Classical Music*

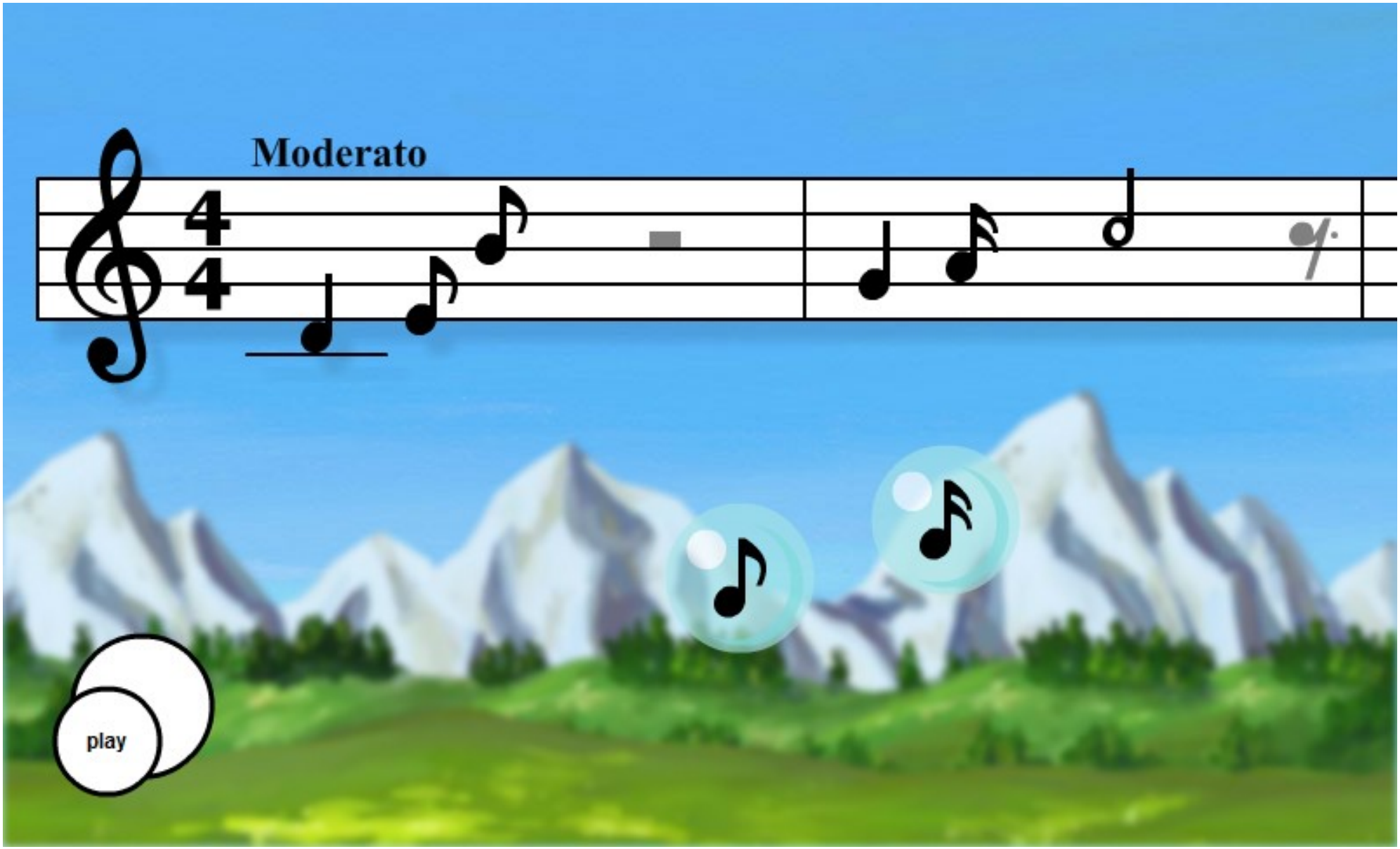
- Develop an *informal music learning environment* targeted to 8-13yr. old users
- *Music learning experience* should provide basis for music literacy and knowledge of classical music and symphonic performance
- Address *National Music Education Standards*
- Engage users across gender, cultural and socio-economic diversity
- *Contributors*: Alex Szeto (ISR), Walt Scacchi (ISR), Robert Nideffer (Studio Art, ISR), Garnet Hertz (ISR, LUCI Lab).
- *Sponsor*: San Francisco Symphony

Software development challenges

- Music game R&D dominated by explicit, non-functional requirements, but no functional requirements.
- Validation and acceptance via experiential criteria:
  - music enjoyment, fun game play, balanced play mechanics, repeated discretionary usage, recognition of music literacy/standards concepts,...
- Compatible with modest, low-cost (older) Web-based computing platforms as well as contemporary mobile devices
- Assure real-time, interactive music/audio integrity while allowing end-user music creation, playback, and manipulation

Conducting

Composing

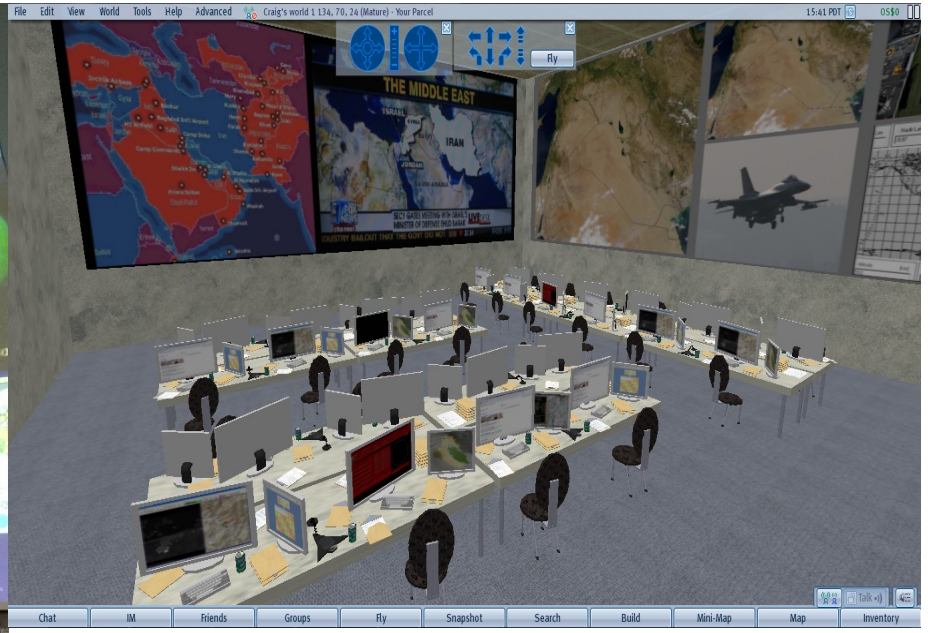


Science, Health, Environment, Energy, and Defense

- Health
  - CGVW for self-managed chronic asthma care
  - Persistent, online CGVW-based social world
  - *Contributors*: Yunan Chen, Alfred Kobsa, Kari Nies, Walt Scacchi, and Jill Berg and Jung-Ah Lee (Nursing Science)
  - Demo today of *Asthma World* prototype
- Defense
  - Decentralized command and control – radically transforming the cost of creating, securing, and deploying C2
  - *Contributors*: Walt Scacchi, Craig Brown, Kari Nies

AsthmaWorld (concept demo)

VW for experimental studies in decentralized command and control centers



Future CGVW research problem areas

- Heterogeneous CGVW interaction devices
  - Medical sensors and medication delivery devices
    - *AsthmaWorld:* WiFi spirometer (sensor) and WiFi, GPS inhaler (medication delivery) as asthma care game play
- Social media-driven CGVW play or work
  - *SPEW*: (Robert Nideffer and Alex Szeto)
    - Geo-politically located Twitter, news, stock markets that shape events and contextual information within game world.
- (Deleting) boundaries between work and play
- Immersion vis-a-vis verisimilitude
  - Drivable arcade game system: *Outrun* (Garnet Hertz)

Game-based VW incorporating real-world news feeds and geopolitically located Twitter feeds

Recent CGVW research projects at ISR

- *National Science Foundation*:
  - CGVW for Asthma Care (pending);
  - CGVW for Ocean Acidification Science Education (pending);
  - Decentralized Virtual Activity Systems (2008-2012)
  - Workshop on Future of Research and Challenges in CGVW (2010-2012)
- *San Francisco Symphony*: Informal music learning game environment (2010-2012)
- *Navy, Northrop-Grumman*: CGVW for Decentralized Command and Control Studies (2010-2011).

- No review, approval or endorsement implied.