# Game-Based Virtual Worlds for the Internet of VR/AR Things

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# The Virtual/Augmented Reality Legacy

- Imagined physical, everyday socio-cultural worlds
- Symbolic worlds: literary, cosmological, musical, gustatory, etc.
- Dreams and lucid dreaming
- Hallucinations via brain injury or psychoactive drugs
- Cinema, theater, concert venues
- Panorama, cyclorama, dome venues (“circlevision”)
- CAVE room, wall, or table-top interactive visualization
- Head-Mounted Displays (audio, haptics?) for PCs, mobile devices
- Physical fantasy worlds (Disneyland, *Burning Man*)

# The Virtual/Augmented Reality Legacy

- What is a *virtual (augmented) reality*?
  - Computer-mediated immersive presentation that encapsulates one or more senses that renders (overlays) a virtual world (objects) for play, work, or learning activities
  - VR/AR is:
    - Embodied as *technological mechanisms*
    - Engaged and rendered as interactive *content*
    - Recognized as immersive and present *experience* (“it's like being there”)
  - VR is <u>not</u> one technology, content, or experience

# Games, Virtual Worlds, Virtual Reality/Augmented Reality Projects

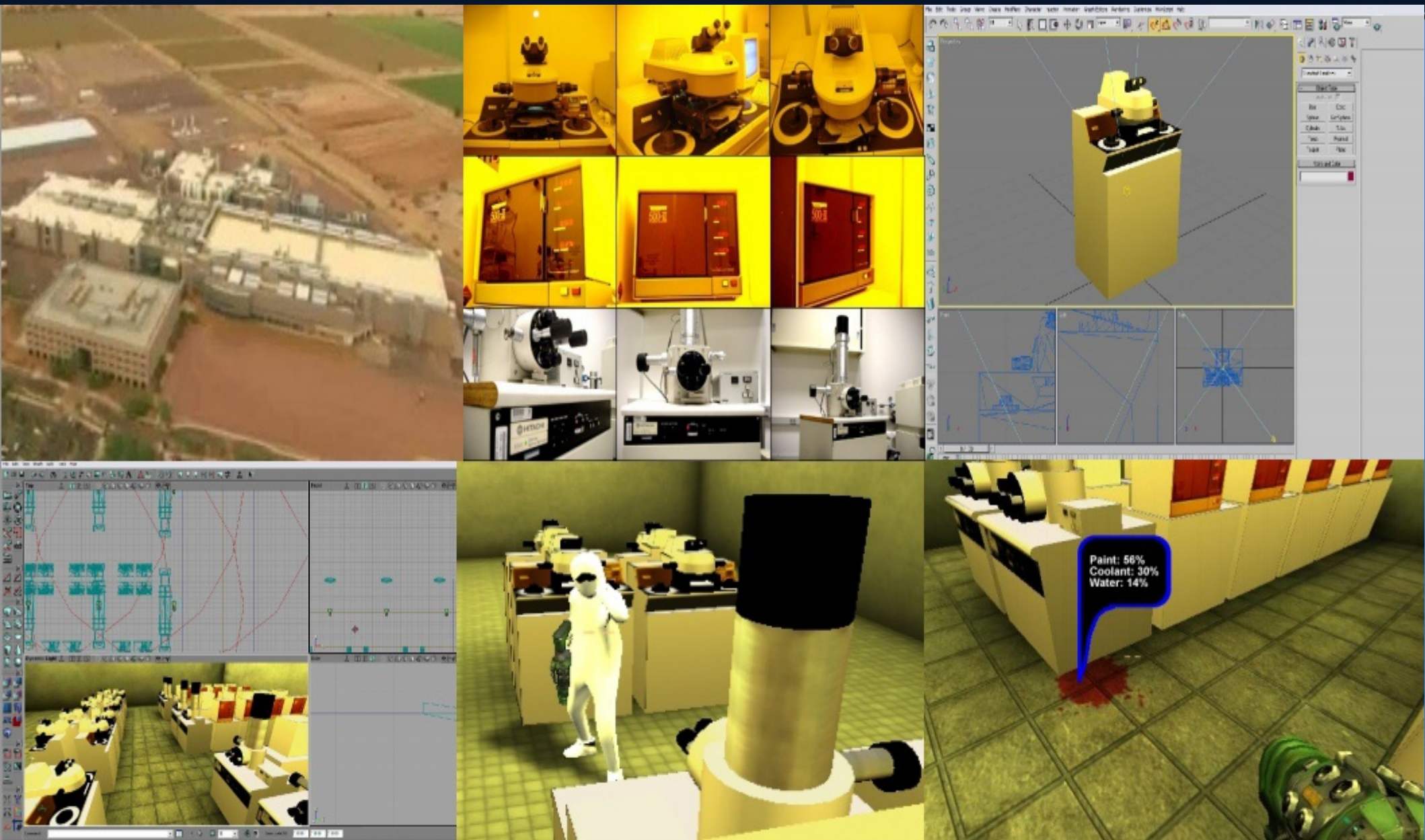
- Game-based virtual worlds (GBVW) for research, education, and training applications [Sca12].
- Networked AR and body-worn sensors for Smart Workers (Advanced Manufacturing).
- Massively multi-user virtual worlds for STEM research/education using *hypergrids* (multi-VR world interoperation platform) [DVL15, Lop11].

# Embedded sensor network-based science learning game environment for K-6th students and families

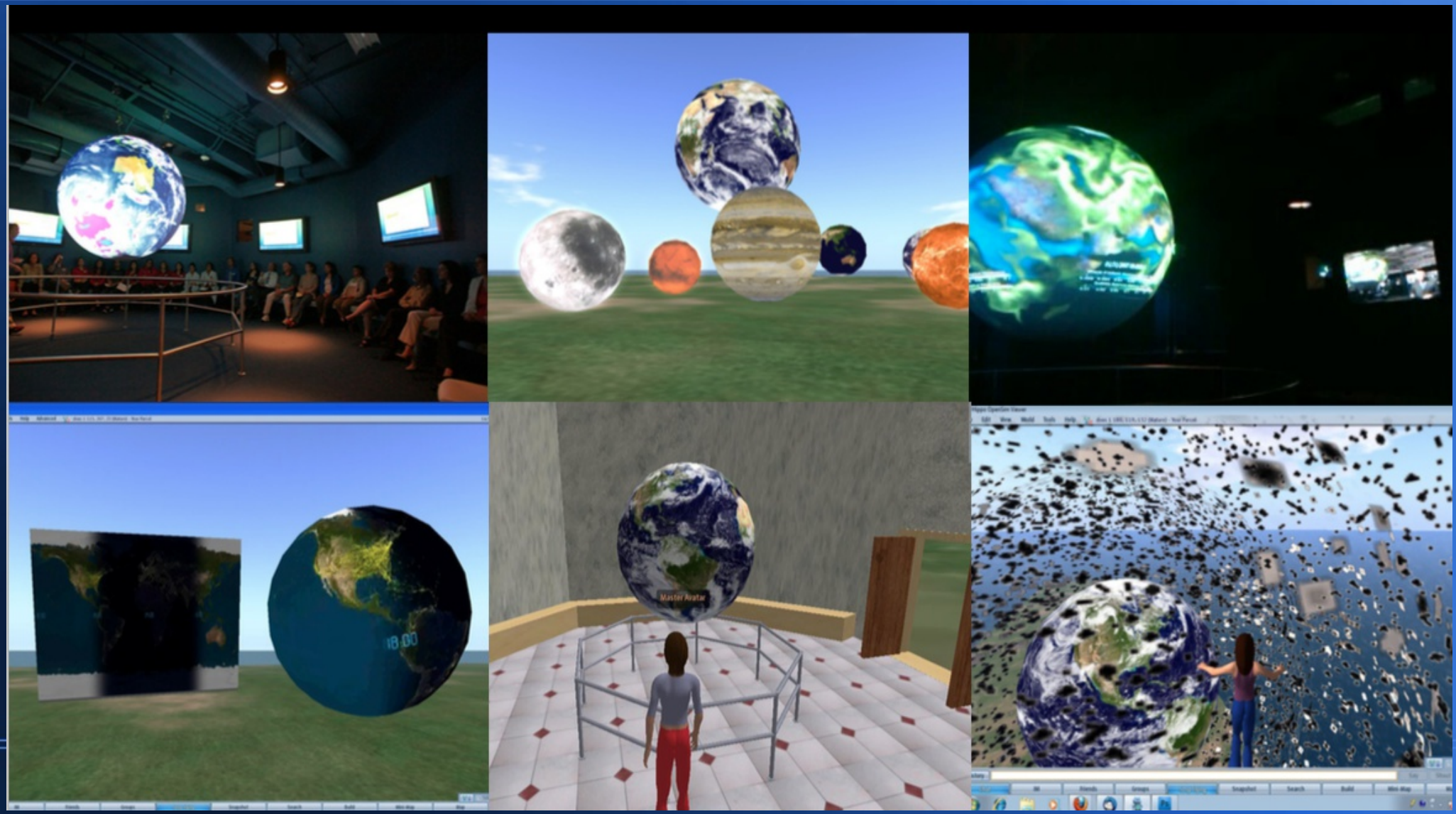

Scacchi, W., Nideffer, R., and Adams, J. (2008). Collaborative Game Environments for Informal Science Education: DinoQuest and DinoQuest Online, *IEEE Conf. Collaboration Technology and Systems*, (CTS 2008), Irvine, CA 229-236, May 2008.

# Online science learning game research labs for informal life science education for K-6th grade students and families [Sca10]

# *FabLab*: Semiconductor/nanotechology fabrication operations and diagnostics training game world [Sca10]



# Planetary science data visualization and “spherecasting” support for *NOAA Science on a Sphere* interoperation in a networked GBVW platform (OpenSim).



# *DECENT*: GBVW for experimentation in secure decentralized command and control



# Informal Classical Music Learning Game Environment: *SFSKids.org* (STEM+Arts=*STEAM*)

SFSKIDS
FUN & GAMES WITH MUSIC

## Discover Music

Under the Sea of Knowledge.


## Play with Music

Above the Musical Skies


## Perform Music

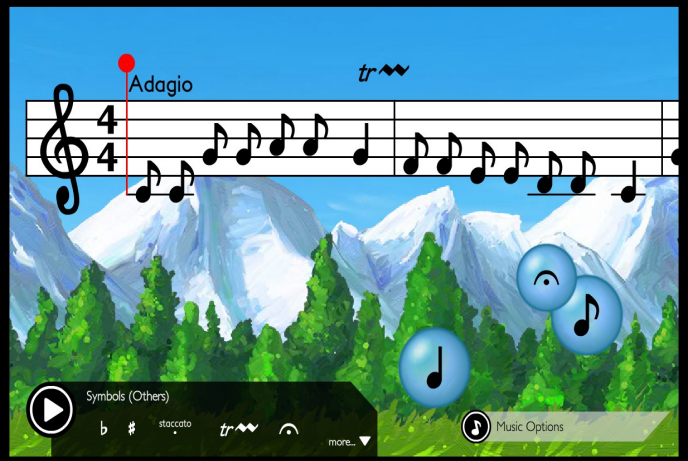
In the Instrument Garden


## Conduct Music

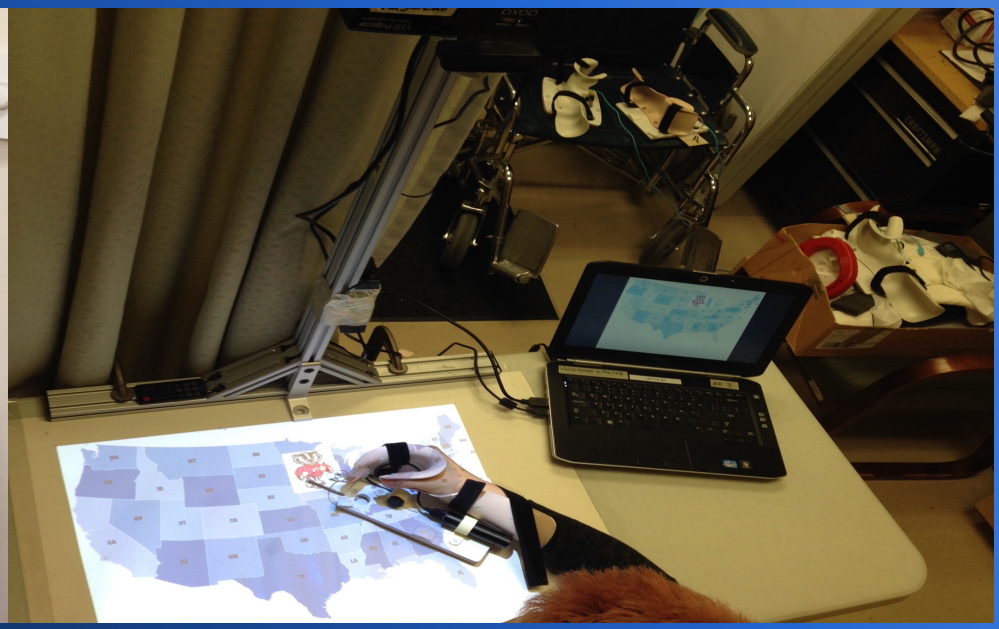
At the Symphony Hall


## Compose Music

Atop the Mountain of Muses



# UCI Game-Based *Stroke TeleRehabilitation* workstation and AR Telerehabilation Testbed



*UI devices*: Game console buttons (large, small), continuous dial, Myo armband, touchpad, joystick, WiiMote, PS Eye, finger pressure force sensor.

All devices integrated to act like PC mouse/keyboard inputs.

Workstations currently deployed in nationwide clinical trail.

Images: Cramer Group, UCI Med.

# *Future:* IoT-based AR for Smart Workers in Advanced Manufacturing (Calit2)

# Large Group Virtual Research Conferences


Image credit: C. Lopes/Diva Canto

# *Future*: GBVWs transforming undergraduate science/STEM education (e.g., personal virtual labs)


Images: Labster.com

# Conclusions: Into the Future

- Game-based virtual worlds, virtual reality and augmented reality concepts, techniques, and technologies will *transform* STEM research and education.
  - More personal, more participatory, more open.
- IoT-based industrial internet will further extend the reach of GBVW and VR/AR applications to *transform* manufacturing and health care.

# Research Collaborators

*Faculty*

– Robert Nideffer (RPI), Thomas Alspaugh, Jill Berg, Yunan Chen, Steve Cramer, Garnet Hertz (Emily Carr U), Alfred Kobsa, G.P. Li, Jung-Ah Lee, Crista Lopes, Gloria Mark, Bonnie Nardi, Andrea Nicholas, David Redmiles, Richard Taylor, and many others.

*Research Staff*

– Craig Brown (NomNom Games), Yuzo Kanomata (IGB), Kari Nies (ISR), Alex Szeto (American Honda, ISR), and others.

*Students*

– UCI Video Game Developers Club

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- More information at: http://www.ics.uci.edu/~wscacchi

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