3D In The Home: Trends and Products

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An Explosion of 3D Products

- TVs (plasma, LCD, OLEDs)
- Projection (DLP, LCoS)
- Glasses (Passive, paper, active shutter)
- Real-time processing (2D to 3D)
- Content sources (DVRs, Blu-ray)
- Cameras (professional and consumer)

3D at CES 2010: Selected Highlights

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3D Challenges: HDTVs

- LCD HDTVs and Monitors:
  - Motion blurring (120Hz, 240Hz processing)
  - Off-axis shifts in brightness and contrast
- Plasma HDTVs and monitors:
  - Phosphor lag (Short duration formulations)
  - High ambient light environments
- Both Technologies:
  - HDMI 1.4 interfaces are required (legacy a problem)
  - IR emitters or other sync systems for active shutter glasses

Panasonic 3D Demos

The only cables you see are Kensington locks!

- **Many demonstrations in the Panasonic booth**
  - All use active shutter delivery systems
  - Demos included DirecTV channels, 3D from Blu-ray, 3D on 103” plasma
- Shown: 3D delivered over a wireless HD (high bandwidth) connection

Panasonic 3D Products

- Plasma monitors and TVs used exclusively
- Two new models launched (in Japan)
  - P54VT2 (54 inches, 1080p) ≈ $5,900
  - P50VT2 (50 inches, 1080p) ≈ $4,800
  - Each comes with one pair of active glasses
- New 3D Blu-ray players/recorders (in Japan)
  - DMP-BDT900-K (player only)
  - DMR-BWT3000 (2TB), DMR-BWT2000 (1TB), DMR-BWT1000 (750GB)

Sony 3D Demos

- **Sony showed LCD and OLED 3D demos**
  - 120Hz and 240Hz refresh rates for active shutter 3D
  - Also 3D playback from Blu-ray disc
  - All LCD demos used LED backlighting

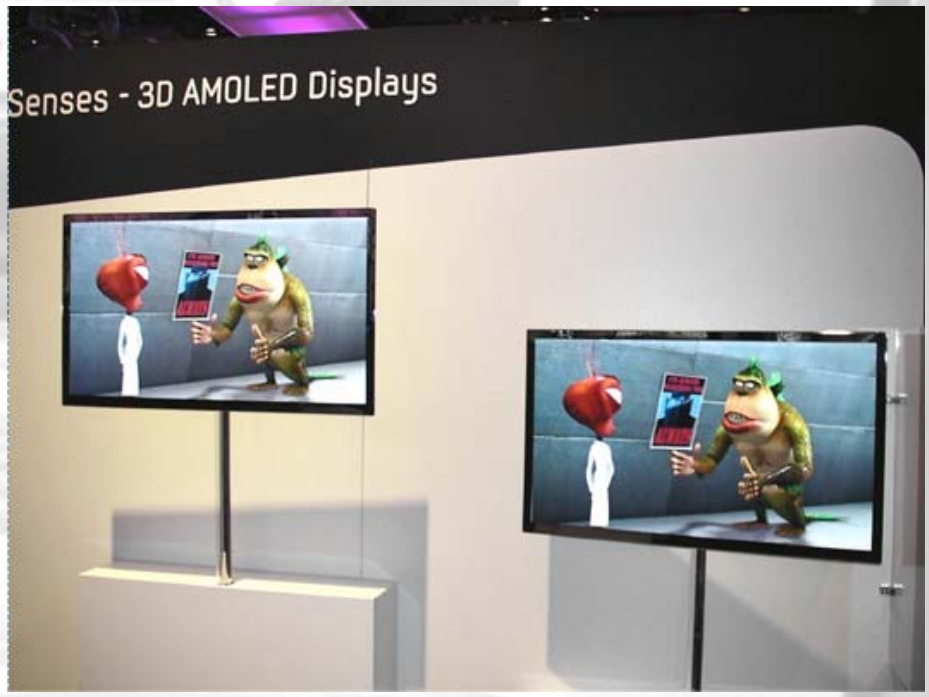
Can you strike out twice on one pitch?

Sony 3D Products

- Bravia Edge-lit LED LCD TVs (3D-ready)
- Four new models (summer 2010)
  - XBR-60LX900 (60”), XBR-52LX900 (52”)
  - XBR-46LX900 (46”), XBR-40LX900 (40”)
  - Active shutter glasses and transmitter are extra
- New 3D Blu-ray players
  - BDP-S470 ($200, requires firmware update for 3D)
  - BDP-S570 ($250, requires firmware update for 3D)
  - BDV-E770W HT system ($650, firmware update for 3D)

Samsung 3D Demos

- **Samsung booth was stuffed with 3D**
  - OLEDs, LCD, plasma
  - New plasma TVs 3D-ready
  - Also demonstrations of 3D from Blu-ray
  - Showed real-time 2D to 3D format conversion
  - Now, Samsung OLED TVs can do 3D (even though you still can't buy any)!



Thin, big, and 3D – a triple play!

Samsung 3D Products

- Samsung 7000-series and 8000-series plasma TVs have 2D/3D processing
- Series 7000, 8000, and 9000 LED LCD TVs also have 3D processor onboard
  - Compatible with Blu-ray 3D content
  - Works with active shutter glasses
- One new 3D Blu-ray player
  - BD-C6900 (no prices yet)

Sharp 3D Demos

- **Sharp showed LCD demos**
  - 120Hz and 240Hz refresh rates for active shutter 3D
  - 3D playback from BD
  - New pixel structure for LCD TVs allows faster twist time and reduced crosstalk with 3D images
  - No actual 3D products were announced

Toy Story in 3D!

LG 3D Demos

- **LG showed LCD demos**
  - 240Hz refresh rates for active shutter 3D
  - INFINIA 9500-series edge-lit 47-inch and 55-inch TVs are 3D-ready
  - Also showed CF3D dual LCoS projector
  - Demos included a live 3D feed from DirecTV

Cloudy with a chance of DirecTV…

JVC 3D Demos

- **JVC had LCD and D-ILA 3D demos**
  - XPol system allows use of passive glasses
  - Real-time 2D to 3D format conversion also shown
  - 4K D-ILA 3D projection was highlight of booth
    - Used low-cost passive glasses
    - Had problems with crosstalk

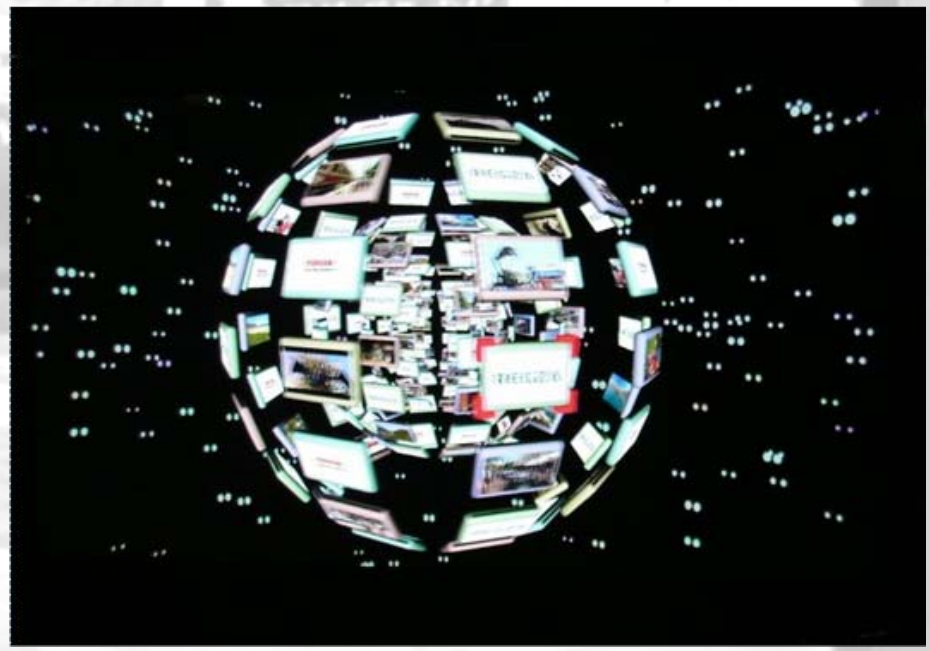
It's all in the glass.

2D to 3D Conversion

- **JVC IF-2D3D1 stereoscopic image processor**
  - Supports four formats
    - Line-by-line, side-by-side-half, above-below, and checkerboard
  - Can also output discrete L/R images through HD-SDI or HDMI
  - Available March 2010

Toshiba 3D Demos

- **Toshiba focused on Cell TV demos**
  - 240Hz refresh rates for active shutter 3D
  - Real-time 2D to 3D format conversion
  - Cell TV demo for gesture recognition operation
  - Also showed 4K LCD



Wave when you walk by!

Vizio 3D Demo

- **Vizio XVTPRO720SV TV**
  - 72-inch S-IPS panel
  - Full 1080p resolution
  - 3D-capable
  - 480Hz image processing
  - Wireless 802.11n connectivity
  - WHDI for wireless HD
  - Price: $3,499

S-IPS + 3D = Awesome

Hisense 3D Demo

- **55-inch LCD HDTV**
  - LED edge backlight
  - 240Hz refresh
  - 2D/3D switchable
  - Active shutter demo
  - Full HD (1920x1080)
  - 500 nits brightness
  - Response time < 4 ms

3D, brought to you by Hi – WHO??

Samsung SSI 3D Demo

- **14-inch AM OLED**
  - Concept demo for portable gaming console
  - Uses active shutter glasses with 120Hz refresh
  - OLED screen is less than ½" in thickness
  - Brightness >150 nits
  - IR emitter is separate

3D gaming to go…just add power

3D Challenges: Projectors

- DLP Projectors:
  - Single-chip systems easily handle 120Hz refresh
  - Use DLP-Link to synchronize to glasses
  - Color breakup artifact is distracting
- LCD and LCoS Projectors:
  - Both can handle 3D refresh rates (120 Hz)
  - Motion blur can occur
  - Require separate sync process for AS glasses

ViewSonic 3D Projection Demo

- **ViewSonic PJD6220-3D**
  - Single-chip DLP (.55”)
  - 1024x768 (XGA) resolution
  - 2200 lumens
  - 120Hz frame rate for active shutter glasses
  - Use with nVidia 3D Vision kit
  - Sync through TI’s DLP Link
- MSRP: $1,499

3D projection for the masses

Optoma 3D Projection Demo

- **Optoma GT720**
  - Single-chip DLP
  - 1280x800 (WXGA) resolution
  - 2500 lumens
  - 120Hz frame rate for active shutter glasses
  - Sync through TI's DLP Link
- MSRP: $699

3D gaming looks better projected

3D Challenges: Glasses

- A wide range of glass types and prices
  - Passive glasses can cost as little as $0.65
  - Active glasses cost $50 and up
- Everyday issues:
  - Recycling passive glasses – sterilization?
  - Active shutter – expensive in quantity
    - What if they break? Warranties? Replacing batteries?
  - Buy wraparounds, or get prescription glasses?
  - Interference to IR sensors (sunlight, CFLs, etc.)

XpanD 3D Glasses

- **XpanD X102 glasses**
  - Active shutter operation
  - Pi-cell LCD lenses
  - Syncs through TI's DLP-Link
  - Battery life:
    - 80 hours in normal use
    - 40 hours with sensor on
  - "Sterile" model coming
- MSRP: > $150/pair

XpanD X102 DLP-Link

iZ3D 3D Glasses

- **Co-developed with Gunnar**
  - Passive operation
  - Linear polarization used
  - Designed to reduce eye fatigue common with dual panel LCD monitors
  - Prescription model also being developed
- MSRP: Starts at $90/pair

iZ3D (Gunnar) polarized glasses

MicroVision 3D Glasses

- **MicroVision Optical 3D**
  - Passive operation
    - Circular polarization used
    - 99.9% polarizing efficiency claimed
    - Also block 100% of UV-A/B, suitable for outdoor wear
  - Used at *Avatar* world premiere
  - Work with JVC, Hyundai, LG X-Pol LCD TVs
- MSRP: Starts at $32.50/pair

MicroVision Optical 3D

Bit Cauldron 3D Glasses

- **Bi Cauldron BC5000**
  - Active shutter operation
  - Uses RF (ZigBee 802.15.4) link to sync shutters
  - Works with multiple projection and direct-view displays
  - Free of IR, fluorescent, and sunlight interference
- No prices announced, targeting OEM sales

Bit Cauldron BC5000 glasses

3D Challenges: Cameras

- Price points (particularly for consumers)
- Useful to have corrections for:
  - Horizontal and vertical displacement
  - Convergence
  - Otherwise done in software
- Displays for viewing footage and stills
  - Fuji has 3D print service (www.SeeHere.com)
  - Also offers a small LCD viewer

Fuji 3D Camera

- **FinePix Real 3D W1**
  - 10 MP resolution from each of two 2/3” CCD sensors
  - Video resolution 640x480
  - 3x optical zoom (3D)
  - 3D file formats:
    - MPO+JPEG, MPO (still)
    - 3D-AVI (video)
  - Real 3D V1 Viewer available
  - SRP $1100.00 (for both)

Double vision is a good thing!

DXG Submersible 3D Camera

- **Prototype CMOS design**
  - Yep, that's actually an underwater 3D camcorder!
  - 1920x1080p recording
  - MPEG4 recording and playback
  - 10 MP still camera
  - No other details were available at show

Oh, it's a sailor's life for me!

Panasonic 3D Camcorder

- **Consumer / professional model**
  - Twin-lens design
  - Full HD (1920x1080)
  - Convergence point plus horizontal and vertical displacement correction
  - Uses P2 SS memory
  - SRP $21,000
  - Available Q4 '10

Ready when you are…

HDMI and 3D

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HDMI Updates

- Version 1.4 released in June 2009
  - Version 1.4 of the specification defined common 3D formats and resolutions for HDMI-enabled devices
- Further 3D Requirements Announced
  - Added a 'top/bottom' format in late January 2010
  - Clarified backwards-compatibility for legacy STBs
    - Can support Appendix H formats without implementing the mandatory 3D formats – must comply with signaling standard
    - Legacy STBs that do not support mandatory 3D formats cannot claim 3D functionality as defined in HDMI trademark/logo guidelines
  - Public can download 3D specs at www.hdmi.org

Thank You!