Future Platforms
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- PS9 commercial shows what people think is “futuristic”
  - Blurring of distinction between real and virtual
  - Sensory enhancement
  - Gaming anywhere and everywhere
  - Experiential
Level of interaction

- **Games now....**
  - “L1 □ △”
  - PS2

- **Future games....**
  - Cameras
  - Microphones
  - Gamepad
  - Inertial
  - Etc.
  - PS?
  - “42”
Interface Modalities

- Inertial (accelerometers, rate gyros)
- Touch (haptics, force-feedback)
- Audio
  - Speech (speech recognition, speaker id)
  - Waveform (frequency, amplitude, rhythm)
- Video
  - Familiar
  - Fast
  - Physical
  - Personal
  - Multipurpose
Voice Input

- Voice recognition
  - Command/control, user-independent, isolated word, text authored
  - Used in NFL GameDay, NCAA Gamebreaker, NBA Shootout
  - Online adaptation to user’s voice

- Far-microphone voice input in noisy environments
  - Acoustic Echo Cancellation
  - Multi-microphone techniques

- Speaker identification

- Voice fonts
Video interface categories

- Video As Input (VAI)
  - joystick replacement
  - user does not see video
  - applicable to existing games

- Enhanced Reality (or augmented reality)
  - live video mixed with computer graphics
  - movie-like special effects
  - new entertainment genre

- Real-time Motion Capture
  - direct interaction; enables physical interaction
Video As Input

- User does not see the video
  - Video quality only important for processing
  - Only need to capture/process useful info
- Frame rate and latency are critical
- Immediate and obvious visual feedback is important
Enhanced Reality

- Augmented reality, but with an entertainment focus
  - Minimize encumbrance
  - Utilize common hardware
  - Simplify setup/calibration
  - Create an enjoyable user experience
Video interface design goals

- Accessible
  - Affordable
  - Easy-to-use
  - Unobtrusive
- Targeted
  - Lens good for low light
  - Compression specific to PS2 hardware
  - Video size appropriate for PS2 processing power
- Multi-purpose
  - Communication (e.g. EyeToy: Chat)
  - Snapshots
EyeToy: research to product

- **1999-2000**
  - initial research and prototyping

- **2001**
  - join the London game team for 3 months
    - learn about their world
    - I transfer my technology, but more importantly, they absorb how I think, so they can extend the ideas

- **2002**
  - experienced game team creates games, not technologist

- **2003**
  - EyeToy launches globally

- **2004**
  - 5 million EyeToys shipped to date
EyeToy: Play

- Easy to jump in and play
- Not too serious
- Very social
- Amazing demographics
  - Young children, parents, girls, grandparents
Mature video technology

- Motion detection
- Color segmentation
- Simple-object pose recovery
  - Sphere, position only
  - Cylinder, position+orientation
- Gesture recognition
- Pattern matching
- Basic video/graphics compositing
Recent video technology

- Freeform mouse-like input (e.g. *Minority Report*)
  - Retro-reflection
  - The “Clam” deformable input device
- Face detection
- Face tracking
- Better color tracking
- Demos (clam, view tracking)
Just around the corner

- **PSP + camera**
  - PSP is your window to an enhanced world
  - Mobile augmented reality
  - Mobile video communication
  - Face tracking for animation communication

- **Next generation console + camera**
  - Much more CPU
  - Much higher input bandwidth
  - Camera should be higher res, faster, more sensitive
  - New interfaces an important design criterion
Future video technology

- Per-pixel distance measurement
  - RGBZ video
  - Allows true mix of graphics with video using Z buffer
  - Easy per-pixel background/foreground (user) segmentation
  - Video: Enhanced Reality special effects – play movie
  - Video: Real-time motion capture – play movie
Conclusion

- Interface a key element of design
  - Blend of technology and psychology
  - Impacted by real-world considerations
- Entertainment is a great way to try new technology
  - Especially the game industry
- A revolution is already underway
  - Now, my 4-year-old waves his hand in front of the TV, expecting it to turn on
  - Next year, he’ll be talking to it
  - Soon, all this will fit in his pocket
  - And he thinks nothing of it….