SLIDES FOR VR SOFTWARE DEVELOPMENT
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PRELIMINARY CAVEATS

*   too much content, so use course outline approach
        one week of content every three minutes
*   very modern material, no historical survey
*   work I have been personally associated with,
            no survey of other's work
*   overemphasis on lecture, no hands-on experience

SLIDE INTERLUDE I (after VR: Doing Business in Cyberspace)

*   Telepresence in nuclear reactor

*   Paraplegic virtual body

*   Mandala drum overlay

*   W Industries VR cab

*   Virtual Interface Schematic

*   VR System Software
        device interfaces
        construction and editing tools
        simulation languages
        world interaction tools
        hardware resources

VIDEO INTERLUDE

*   Boeing VSX Osprey Tour

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SLIDE INTERLUDE II  (after Viewpoint Transformations)

*  Wand drawing in space

*  Wand Physical Characteristics
      3D evolution of the Mouse
      spatial sensor (6df) on a stick
      hand held
      voice command interface
      tactile feedback

*  Wand Functionality
      emanates a ray in virtual space
      changes virtual form with function
      used for
            viewpoint control
            object manipulation
            information gathering

*  Wand Object Manipulation
      GRASP:      anchor end of ray to object
      NORMAL:     turn object toward participant
      COME:       bring object to participant
      CONNECT:  establish linkage between objects
      CUT:        the ray is a knife
      FEEL:       tactile feedback from ray collisions

*  Wand Viewpoint Control
      SIGHT:      attach ray to head orientation
      MOVE: travel along ray    (FASTER/SLOWER)
      JACK: jump to object
      SCALE:      travel in size

*  Wand Information Gathering
      IDENTIFY:   show properties of object
      DISTANCE:   measure distance to object
      COUNT:      compute environmental complexity

*  Wand Other Uses
      DRAW:       the ray is a pen
      LIGHT:      the ray is a light beam
      SELECT:     the ray is a menu selection tool
      BATON:      the wand directs sound events
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*   The Virtual Hand
        Much mechanism with little functionality.
        currently disembodied
        pointing not linked to direction
        limited reach and orientation
        orthogonal gestures
        rest position

*   The Virtual Body
        A tool that attaches
                arbitrary sensors of physical activity
                        to
                arbitrary virtual entities.

*   Swivel Virtual Bodies

*   Swivel Polygon Heads

*   Virtual Body Presence
        a reference point for perspective
        the tool for direct interaction
        source of behavioral history
        sense of coherence

*   Virtual Body Mapping Variants
        super binocular vision
        head in hand
        rubber arm
        bird neck
        extra arms

*   Virtual Body Inhabitation
        Any entity can be inhabited.
        Map components of physiological model
                onto structure of virtual entity.

*   Multiple Participants
        Consistency is not necessary.
        negotiated communality
        ambiguous worlds
        no exclusion principle
        composite virtual bodies

*   Multiple Participant Group Space
        build mutual context rather than global truth
        each participant is unique
        credible rather than valid
        comprehensible rather than consistent
        inconsistency maintenance
        uniqueness enforcement

*   Entity Organization
        sense-process-act loop
        input buffer   (senses)
        priorities
        internal disposition   (choices)
        internal knowledge
        output buffer   (actions)

*   Entity Internal Processes
        pattern matching
        prioritization
        substitution
        constraint enforcement
        memory storage and condensation

*   Entity Types
        Inert: display only
        Data: sense
        Process: act
        Reactive: map senses directly to actions
        Responsive: include internal state
        Deliberate: inference and statistics
        Coordinated: time and communication
        Autonomous: goals and metarules
        Inhabited: controlled by a participant

*   Entity Self-determination
        Assimilate:
            internal state influences sensory input
            (filter, amplify, seek)
        Accommodate:
            behavioral output influences internal state
            (model, constrain, dream)

*   Entity Autonomy
        initiate sensory activity to gain information
        decide which goals to pursue when
        focus attention on part of the world
        reason about actions and consequences
        summarize knowledge
        act on hypotheses

SLIDE INTERLUDE III

*   Flocking Birds
*   VIrtual Seattle
*   Puget Sound with Orca
*   Puget Sound with Large Virtual Body
*   Octopus' Garden
*   Octopus' Desert
*   VSX Terrain Stage I
*   VSX Terrain Stage II
*   VSX Terrain Stage III
*   VSX Terrain Perspective
*   VSX Abstract Terrain
*   VSX Abstract Terrain with VSX
*   Green Valley
*   Green Valley Egg Opening
*   Virtual Valley
*   Inca Cliffs
*   Mr. Mountain distant
*   Mr. Mountain close
*   Mr. Mountain top transparency
*   Mr. Mountain Ghost
*   Mr. Mountain Pig
*   Mr. Mountain Bear