Tangible Play:
Appealing to the Tactile

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Found Objects Drive Meaning

- Meaning inheres in the world as we find it (Dourish, 2001). For children, the objects that spill over the tops of toy boxes is the world as they find it.

- "Seamless couplings" (Ishii & Ullmer, 1997) between everyday playthings and videogames could make it possible for children to connect with familiar objects and to play more creatively and meaningfully in virtual spaces.

- A child's perception of the degree to which they control an environment and are free to make choices impact on technical skill and creativity (Stoll Lillard).
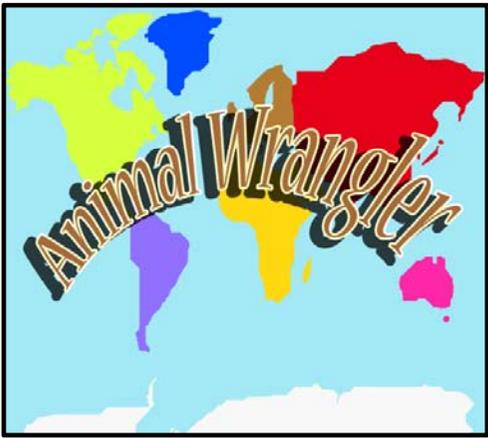
Experimental Mixed Reality Game

The game is designed to:

- Liberate players from controllers, keyboard, and mouse

- Introduce "real" objects into virtual play environments

- Appeal to children with diverse learning styles

- Demonstrate how play using "found" objects might unfold in an educational videogame
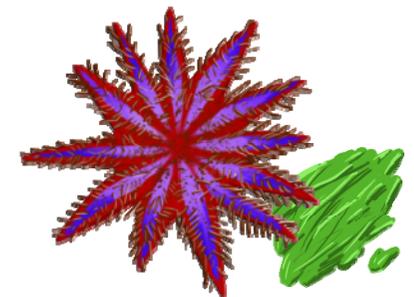
Game Premise

- Players are "animal wranglers" who travel to different regions of the world to capture and remove invasive animal species.

- As they play through the levels, players learn about various types of *introduced* or *invasive animals* and how these impact the environment.

- Players use objects to lure, herd, and capture animals.

- Play ends when all animals are captured and removed from the environment or when time runs out.

- Each level offers new challenges and new information as players race a clock to capture and remove harmful species.

The Prototype

- A 2D, top-down PC-platform videogame including a tutorial and two sample play levels

- Uses a digital camera as mediator between screen and physical world during gameplay

- Physical objects – "*KidBits*™"– are custom-cut wooden shapes textured and/or covered with various materials (i.e., felt, netting, etc.)

- Written in C# using XNA and Aforge.net for motion detection

Motion Detection

- Relies on Aforge.net third party image processing library for motion detection.

- Images streamed from a digital camera pass through multiple mean and color filters.

- Camera works asynchronously from rest of the game and is multi-threaded, each color filter having a separate thread.

- Objects are recognized by color, thus when physical objects are moved in any direction, the movement of corresponding virtual objects occurs onscreen.

Video Demo

Early Play-Test Feedback

- ✓ Five play testers (girls ages 9, 11, and 14; boy age 13) played solo and in pairs. When working in pairs, children strategized and coordinated object movements to capture invasive species.

- ✓ At first, children began moving objects on the horizontal play area, as if using a mouse. They quickly realized shapes could be moved vertically and diagonally, and that the game could be played using both hands.

- ✓ The nine-year-old girl commented, "I like not using the mouse and using the blocks...It was easier, I think, to have more than one object to capture animals."

- ✓ Overall reactions to playing the video game were favorable. Girls ages nine and 11 were the most enthusiastic about the possibility of playing a video game using "real" objects or toys.

Research Questions

What happens when the material world intrudes upon the virtual to drive meaning, rather than vice versa?

- Are there significant differences in how children interact with a video game and also with each other based on how the game is played (i.e., with mouse and keyboard versus physical objects)?

- Does having a choice of objects to play with influence a child's perception of control over virtual play and alter his or her feelings of self-efficacy? Do feelings vary by gender?

- Will a child's ability to choose a favorite object or toy when interacting with a virtual environment lead to more imaginative, self-directed play, thus provide greater opportunities to enrich learning?

- Does the use of physical objects when interacting with virtual environments have an impact on the reception and retention of informational content overall?

Potential Research Methods

- Participatory action research characterized by intervention experiments that operate on problems or questions [sic] within a particular context. This method can be particularly useful when working with children, where instruction or guidance is essential (Baskerville, 1999).

- Ethnographic observation and note-taking.

- Verbal and visual data collection and coding of child interactions with physical and virtual objects as well as mixed reality environments.