CoolPaint: Direct Interaction Painting

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Problem
Computer drawing packages have several sources of indirection:
- One input device maps to several virtual tools, creating modes
- 2- or 3-degree-of-freedom input device controls a conceptually 6-dof virtual tool
- Spatial disconnect between input device and display
These add to the user's cognitive load.

Approach
1. Use real paint brushes for prop-style input
   - **Props**: passive physical objects that directly manipulate virtual objects
2. Model virtual tool to match physical paint brush
3. Interact directly on display surface

User Evaluation
- Informal evaluations with 6 users
- CoolPaint vs. Adobe Photoshop + tablet
  - Easy to use
  - Collaborative: No hesitation in picking up a spare brush and joining in
  - Expressive: full six-degree-of-freedom movement
  - Fun: encourages creativity, and all users wanted to use CoolPaint further

Future Work
- User evaluations with amateur and professional artists
- Incorporate better brush and paint models, and digital tools (e.g. copy/paste)
- Provide a wider range of physical tools

Conclusions
- Painter can focus on the task, rather than on the mechanics of interaction, because computer is 'hidden'
- Keeping high fidelity between physical input devices and virtual tools allows skill transfer from the real world, intuitive interaction, and expressiveness

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Setup
- LCD projector
- Mirror
- Table
- Fastrak transmitter

Interaction
- Physical paint brushes (with 6-degree-of-freedom trackers) control 3D models - the painter gets exactly the brush stroke she expects

Brushes
- Real and virtual brushes

Canvas
- Custom colours: Color mixing is performed by picking up a color and dabbing the brush in a mixing circle

Related Work
Some examples:
- DAB - 3D haptic painting on virtual canvas (Baxter, 2001)
- CavePainting - 3D painting in immersive CAVE environment (Keefe, 2001)