

## **Two Worlds Apart: Bridging the Gap between Physical and Virtual Media for Distributed Design Collaboration. Everitt, et al. CHI. 2003.**

### **What are the core research questions addressed by the work?**

- Address the tension between designers' comfort with digital artifacts and the need for effective remote collaboration

### **What motivates the work?**

- Designers currently forced to choose between physical tools they prefer and the electronic mechanisms available

### **How does the work understand the usage, capabilities, and limitations of paper?**

- Specific to the design process
  - Pen and paper, walls, and tables are central artifacts to developing and communicating ideas the early phases
  - Currently remote collaboration in design is conducted as follows:
    - Whiteboard, video, email
    - Two whiteboards and video conference
    - Collocated meetings
    - Visio (GUI diagramming tool) and e-mail
- Capabilities of paper: tangible, portable, readily manipulable, editable
- Limitations of paper: unable to support remote collaborations effectively

### **What is the target application domain of the work?**

- Collaborative design

### **What are some proposed extensions to paper proposed by the work?**

- Paper as an input device to the electronic world for collaboration between remote users

### **What design constraints or objectives guided the work's implementation of the proposed extensions?**

- It should provide a unified workspace with support for spatial gestures between remote colleagues
- It should provide presence and awareness mechanisms to help remote participants establish common ground
- In supporting the two requirements above, also it should maximally retain the traditional means of interaction and a calm interface

### **How are the proposed extensions implemented?**

- SMART board for interaction background
- Vision and tracking with cameras
  - Front-facing camera to capture physical note content
- Rear-projection camera displaying notes placed by remote hosts
- Data transfer with peer-to-peer protocol
- Using the SATIN toolkit for software infrastructure
- Transient ink displays annotations in all spaces
- 'Shadow capture' conveys approximate location & gesturing of remote collaborators

### **What findings have been obtained from either the implementation process or an evaluation of the proposed system?**

- The proposed system has the following limitations:
  - Conflicts occur, though infrequent and easily corrected
  - The system is somewhat jumpy and distracting
  - The system needs better visual feedback for interactions
  - Participants from the evaluation suggested integrating audio