Integrating Paper and Digital Information on EnhancedDesk: A Method for Realtime Finger Tracking on an Augmented Desk System. Koike, et al. TOCHI. 2001.

What are the core research questions addressed by the work?

- Providing smooth integration of paper and digital information on a desk and direct manipulation with digital information with the hands and fingers of users

What motivates the work?

- Development of more natural and intuitive interfaces
- Need to discuss and develop alternative interfaces

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

- Paper's limitations: Unable to publish and transfer computer graphics (CG), digital images, or audio
- Paper's capabilities: Easier to carry, strong enough to survive dropping and bending, offers higher resolution
- People use the appropriate media depending on their situation
    - People usually prefer reading from paper in crowded social spaces
    - People prefer using computers in offices or homes to view animations or movies
- Few ways to link paper and digital

What is the target application domain of the work?

- Prototype addresses needs of computer-supported learning
- Additional application domains include: media arts, museum support, public installations

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

- Notes issues in a computer-supported learning environment
    - Difficult to learn to pronounce a language correctly by only relying on a textbook
    - Difficult to understand dynamic behaviour
    - Use of supplementary material represents additional tasks
        - Potentially unnatural interactions involved
        - Overall, discourages learning
- Prototype using the desk system developed addresses need for dynamic behaviour demonstration

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

- The work details the implementation of two prototypes, the second one improving on the first. In the description of the first system, the work details the following issues:
    - Color thresholding for detection of fingers is not always reliable
    - Finger-tip recognition computationally expensive
    - Marker size restricted by camera resolution

How are the proposed extensions implemented?

- Graphics workstation (SGI Indigo2), LCD Projector (SHARP XV-E500)
    - CCD camera (SONY EVI-D30) in first prototype
    - Infrared camera (NIKON Thermal Vision LAIRD-3A) and a pan-tilt camera (SONI EVI-G20) in updated prototype: Enables higher fidelity tracking
        - Addresses limitations found in first prototype

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

- Limitations with projection-based augmented desk set-up:
    - Brightness a limitation of the projector: Requirement of dark room environment