FACT: Fine-grained Cross-media Interaction with Documents via a Portable Hybrid PAper-laptop Interface. Liao, et al. MM. 2010.

What are the core research questions addressed by the work?

- Bridging the gap between paper and computers

What motivates the work?

- The gap between paper and computers causes low efficiency and degrades the user experience
- Prior work fails to bridge the paper-computer gap completely
    - Existing systems focus on interaction with a whole page or document as opposed to supporting fine-grained manipulations within the page
    - Existing systems only support limited digital functionality on paper, and lack a general framework to address the paper-computer gap
    - Existing systems may interfere with existing workflows due to their inflexible hardware configurations

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

- Capabilities of paper: comfortable to read, annotate, light to carry, flexible in space, robust to use in various settings, well accepted in social settings
- Limitations of paper: lacks capabilities of multimedia presentation, document editing, archiving, sharing, search
- Technical difficulties and cost efficiency concerns about completely replacing paper with computers

What is the target application domain of the work?

- Document reading and editing with digital note taking

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

- Allow users to use pen gestures to specify fine-grained paper document contents for digital operations
    - Keyword search, hyperlink generation, copy & paste from paper to word doc, word lookup, dynamic computer application interaction (camera on map coordinates w. Google street view)
- Enable cross-media (paper-digital) interaction

How are the proposed extensions implemented?

- Three key components: A camera processor, a projector processor, and a paper-computer coordinator
    - Camera processor: Captures and analyzes camera video frames to recognize and track paper documents and to detect and trace the user's pen tip
        - Content-based document recognition
    - Paper-computer coordinator: Interactions between paper documents with other documents and views
    - Projector processor: Generates the projection precisely aligned with the paper document for direct visual feedback

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

- Suggestions for future work:
    - Ensure the user interface is portable and easily configurable
    - Ensure the user interface does not require the use of special paper, reading devices, printing
    - Future systems should support general document content and applications
    - Future system should exploit user adaptation