FLIPPIN': Exploring a Paper-based Book UI Design in a Public Space. Yoshino, et al. CHI. 2017.

What are the core research questions addressed by the work?

- Designing a paper-based book UI for information systems in public spaces that is accessible, engaging, and usable

What motivates the work?

- There are few works examining the design of paper-based UI devices for public space applications
- Current electronic displays have difficulties in retaining user interest and maintaining high usability in a public setting

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

- People increasingly obtain information via digital devices rather than traditional paper-based books
- Digital device usability problems, particularly with respect to reading, are caused by the lack of physical book interaction with the device
- E-book usage: Swiping and touching to move to the next page, bookmarking, highlighting, determining user position
- Paper-based book usage: Physical operations like turning pages, folding, making notes, determine reading position by looking at the book or touching piled page-papers of the book
- Usability of paper-based book superior to physical book: Faster reading speed and comprehension
- Digital technologies have advantages in terms of information retrieval and flexible representation over paper

What is the target application domain of the work?

- Public space applications, especially museum exhibition use

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

- Enables interaction with content on an LCD using a book UI device
    - Book UI as a controller
        - Manipulations mimic usage of a real book
    - LCD as a supplementary display device that visualizes various operations, like switching sketches, scaling, and providing additional information about sketches

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

- Provided the following design guidelines for paper-based book UIs:
    - Mimic the look, feel, and usability of a real book
    - The UI should allow simultaneous users
    - The UI should be edited to be able to be read from anywhere based on user's interest
        - Users are accustomed to freely navigating around with actual books
    - Content design
        - Content progression should not be limited by preset times

        - Explanatory information should be presented as feedback to user operations
        - Instruction description of the operation should be kept to a minimum
        - Device roles should be clearly specified: e.g. book as a controller that guides the experience

How are the proposed extensions implemented?

- A page-sensing function embedded in the book device that does not require radio frequency or camera-based recognition technologies to enhance the robustness of the UI
- A wiring and sensing-pad pattern on paper using a thin conductive film or conductive ink to retain the look and feel of a real book
- The exhibition-installed system comprised of a 80-inch LCD (SHARP PN-H801), a camera sensor (Microsoft Kinect v2), PC (HP Z840) with content application, and the book UI device
    - Book UI device:
        - Electronic components such as an Arduino, a capacitance touch-sensor controller (MPR121 x 4), an acceleration module, a bluetooth module (RN-42), and a Li-Po battery were integrated into the inside of the face cover
        - Sensor controllers for page detection: Detects the variation of capacitance as sensor pads come closer to each other
        - Dual-layer structure with a conductive-ink-dedicated paper for electronic wiring sandwiched between “Japanese paper”

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

- The prototypes enabled smooth participation. The book UI was intuitive, and users could instantly start operating the device.
- The prototypes enabled a high degree of user cooperation.
- After users became accustomed to the controller, their attention became redirected to the content on the digital device.