PaperSketch: A Paper-digital Collaborative Remote Sk

What are the core research questions addressed by the work?

- How to enable collaborative remote sketching?

What motivates the work?

- Lack of support for collaborative activities and gestures that are naturally part of a face-to-face interaction in a remote scenario

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

- Sketching used extensively to express emotions, ides, thoughts, theories, as well as recording content and information use for later
- Often used to promote discussion and collaboration in brainstorming sessions
- Sketching in collaborative environments can have some limitations due to the physical displacement of different parties
- Sketching is a very descriptive form of communication
- Sketches quick to make, timely, inexpensive, disposable, generative, personal
- Drawback of paper-based sketches: Drawings hard to modify as the design evolves and most of the time they must be copied and redrawn on new paper sheets

What is the target application domain of the work?

- Collaborative remote sketching scenarios: design, ideation, etc.
- Design sketching

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

- Allow organic pen-and-paper sketching interactions to be communicated synchronously & asynchronously with expanded audience

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

- The introduction of tangible metaphors based on the natural usage of pen and paper interfaces are highly effective in increasing the interaction with users and should be introduced in paper-digital interfaces, replacing classical digital metaphors like for instance buttons
- Since interactive paper is not yet mature enough to present visual feedback, applications should be implemented in a way that minimizes the need for such feedback
- The introduction of a multimodal prototype combining novel interaction techniques and existing tools has demonstrated to be effective in terms of understandability and general usability

How are the proposed extensions implemented?

- (1) digital pen and paper interface
    - Anoto digital pen & paper, iPaper framework
    - For sketching and annotation
    - Creation or retrieval of a sketch by means of simple positioning the pen over the paper sheet and the colour and style functionality bound to the selection of different physical devices
- (2) GUI
    - Bluetooth communication

        - For communication, collaboration, and visualizing in parallel the remote and the local sketch
- (3) An underlying communication layer based on Skype
    - Support remote synchronous collaboration, bridge between digital and paper interfaces, support sketching on paper in both synchronous and asynchronous situations
- (4) Link to printer for accessing physical copies of remote sketches

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

- Limitations of the system:
    - Lack of dynamic feedback, which may ease the collaborative process
        - Naturally overcome by users: Define spatial constraints for collaborative drawing regions
    - Some desired features (undo/redo, cancel) impossible to organically implement in physical design space
        - Mismatch between digital version and paper version of a sketch
- When introducing new augmented paper technologies into working environments, the solution should not replace existing tools but rather be integrated with them