Video Mosaic: Laying out Time in a Physical Space. Mackay, Pagani. MM. 1994.

What are the core research questions addressed by the work?

- Supporting the creation and management of temporally-based information

What motivates the work?

- Despite the availability of flexible online video editing systems, many video producers continue to use paper storyboards for initially sketching out their ideas and communicating them to their colleagues

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

- Paper storyboard use is still a central tool used in video production
    - Used to refine ideas, generate "what if" scenarios for different approaches to a story, communicating with others, etc.
- Storyboards make it easy to jot down notes and get a quick overview of a length visual presentation. If the elements of the storyboard are placed on separate cards, the designer can easily experiment with different linear sequences and insert or delete video clips with ease.
    - Portable, easy to annotate, change, easy to lay out over a large area to compare alternatives and view relationships
- Limitations of paper storyboards:
    - No link between paper and video: Once paper storyboard created, producer has no easy way of taking advantage of the paper storyboard to create a video production
    - Hard to visualize the final result: Still difficult to communicate ideas to others
    - Difficult to rearrange storyboard elements: Resulting document may be difficult to rearrange - must be copied, cut into sections, rearranged, recopied
    - Difficult to search for a particular element
- Online video editing systems enable easier rearranging of video clips, searching
    - Facilitate searching, make it easier to generate alternative sequences, store and reference related online data, can sometimes handle multiple video sources
- Limitations of online video editing systems:
    - Display space limitation
    - Difficult to compare multiple versions: Comparing collections of video clips to each other
    - Poor video quality
    - Lack of portability
    - Difficult to annotate

What is the target application domain of the work?

- Video production, specifically in the early planning stages

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

- Development of the Video Mosaic system
- Video Mosaic is designed to take advantage of the best features of both, to enable users to move smoothly between temporal and spatial views of video and other time-based data. Users can annotate and manipulate their individual storyboards as well as share

them electronically with others, checking how different segments fit together or commenting on each other's work. Users can make associations among different media (video, audio, subtitles, notes, and control information) at a particular point in time. They can also make associations among different clips over time, either in a linear fashion or in more complex arrangements, such as within a hypermedia document.

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

- Determined from system description that it requires the creation of two basic objects:
    - A storyboard: specifies a video production created by editing and composing several video clips
        - Must have a unique identifier, an author and contact information, list of related storyboard elements
    - A storyboard element: What a storyboard is composed of, one for each video clip to be edited
        - Must have a unique identifier, a video "best frame" or hand-drawn sketch representing the clip, a script of the clip, hand-written notes specifying the scene or shot type
- Both storyboards and storyboard elements have to have both electronic and paper representation
- Identifies following design requirements
    - Identification of paper storyboard elements
    - Recognition of user commands
    - Capture of user annotations
    - Storage of video information
- Identifies the following design issues
    - Video overlays: Unclear what behavior should be when there is overlapping video windows
    - Erasing information: What does it mean when to erase when physical and digital environments are mixed? What happens when the information is erased on paper but not on the electronic version, or vice versa?
    - Issuing commands: How to enable flexible input

How are the proposed extensions implemented?

- Two implementations:
    - Unix Video Mosaic: Video camera mounted above the desk, LCD video projector mounted above the desk, Video TV monitor installed in the desk, Desktop ink-jet printer (to generate paper storyboard elements), write-once video-disc recorder or player, microphone mounted below the desk for identifying when the camera should grab a new image, a sun unix workstation
    - Macintosh Video Mosaic: Video camera and associated pointer, LCD projection panel, Desktop ink-jet primer, hand-held scanner (for quick capture of storyboard elements), video digitizing and compression board, barcode reader (identify storyboard elements and issue commands), Apple Macintosh

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

- Key questions to consider when building paper-electronic systems: For what purposes is paper best suited? For what purposes is a computer and/or computer network best suited? Are there situations in which each has characteristics that are beneficial, and using only one or the other provides a less useful system?