Spatial context as an aid to page layout :
a system for planning and sketching
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A page layout system is created that recognizes the designer's current design process and reliance on spatial cues for visual development and decision. This system provides programs to construct, view, and evaluate serial pages simultaneously.

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A system has been developed to enable a user/designer to create a spatial context as an aid in page composition. Its primary purpose is to provide the tools that support a holistic approach to design. The individual parts as illustrated in this system by the pages of a book can be developed simultaneously. This encourages designers to consider unity and pacing in their work. Spatial context describes the area where serial pages are made, arranged, and evaluated. "Placing pages in a context provides a mechanism for making visual comparisons. A spatial dimension makes it possible to have many pages accessible at all times. As pages are designed they can be ordered, stacked and rearranged.

Overview and Design Specifications

Composing page layouts requires both the design of individual pages and the development of a structure for an entire work. Successfully designed books are easy to read because they have a visual rhythm and consistency. Designers faced with complex problems require the ability to make changes on a global level during the design process.

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The first stage of the design process, that of producing a rough plan for the work, requires visualization of as much of the work as possible. Compositions for individual pages can be developed in the context of other pages. However, completion of a page composition requires a more detailed visualization of specific text and images.

Environment and process

Traditionally, a graphic designer works in a tangible space. Studio, desk and tools are an integral part of the design process. Computer graphic systems bring many new tools but more fundamentally bring a new environment for the designer. In creating an environment for designers to implement ideas, it is important to address the established methodologies used by designers. An understanding of their methods, tools and conventions is fundamental to producing a useable tool. The way the system appears to work must reflect the way the user expects it to work and not the way it performs operations.

Comparing and revising work is basic to any design methodology. Working at a desk a designer has a flexible working process. One or more sketches may be developed at one time. A similar position of papers on a desk may refer to an organizational grouping of similar ideas. A designer may spread out a collection of solutions on a desk or pin them up on a wall in order that the sketches can be viewed simultaneously. By increasing the distance from the work a designer is able to view it in an unfamiliar way. Distance provides a way for a designer to gain objectivity and apply established criteria. Distance also provides a larger field of vision so that many parts may be viewed at once.

With greater specialization a designer often becomes dependent on other trained personnel for the reproduction of their work. The ability to design becomes dependent on the ability to clearly describe ideas to others. Conventions have been developed to minimize ambiguity in production specification. Similarly, computer systems require users to describe their ideas through the selection of menu buttons. Designers make menu selections in an effort to communicate their ideas. These selections instruct the computer to produce the work. Advances in technology have made the designer coordinator of various activities.

Designing is a visual process that is greatly aided by tactile experiences. For example, in developing a page composition, a designer may physically move small pieces of paper around a page. The act of pushing the elements around helps to generate more solutions. Originally a designer may have had one idea. In moving the pieces to a secondary position he becomes aware of the intermediate positions. Physical interaction with computer systems is not a "real" experience but rather a simulation of an experience. As designers work in the absence of traditional tools and materials, design conventions may change what are now simulated design experiences.

The Work Environment

Attempts to create user-friendly environments usually begin by simulating familiar experiences and places. However, the kinds of spaces in which a graphic designer works are varied and cannot be literally translated into a computer space. Display devices inherently lack spatial cues. The boundaries of the screen are finite and define a two-dimensional surface. Computer-based information does not have discernible physical properties and yet it can be enormous in quantity and accessed in many different ways. Often informational groupings (pages, chapters, and charts) cannot be displayed at one time. An accepted solution is to divide the data in time, successively displaying screens of information. Unfortunately screen divisions do not always correspond to informational divisions and the user does not have a feeling for their location in the work. Similarly, informational groupings that are recorded on paper may fall on discrete pages; the ability to hold and view several pieces of paper simultaneously compensates for this problem. Spatial references are used to organize large amounts of information.

Proximity, similarity, color and proportion are visual cues which elicit intuitive responses; what elements are important, dominant, or in conflict when combined with spatial connotations.

The appearance of objects close to one another signifies a relationship between them. Depth disparity connotes time or quantitative disparity. For example: the alphabetic ordering of a telephone book is easy to use because of its inherent spatial organization. A user of a phone book is able to quickly locate an entry even though he did not previously know its location.

In a book, for example, there are inherent spatial references. One can feel or see the current location relative to the whole.

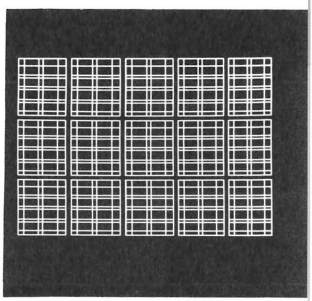
Developing a work space for designers requires a way to view separate pieces of the work simultaneously. The earlier stages of design requires developing several pages at one time. Working on them consecutively is awkward. This system, therefore, has to compensate for having a limited area and large amounts of information to display. Pages are layered in space. Simple shapes are used to represent text. Pages are small in scale; symbolic representations of text and image are adequate in detail.

Communication between the system and the user is based entirely on tablet input.* The physical movement of the puck corresponds directly to events: pages move as the puck is dragged. Choices are indicated through a menu structure which is arranged so that programs with similar functions are located at the same levels. A selection from the menu may be located at the

same levels. A selection from the menu may be made at any time and the user has the ability to go to any point (place) in the menu structure. A generalized working process is implied by a left-to-right reading of the menu choices.

Page Definition
Typically the user would proceed by defining a page. The user can choose any location within the workspace for a page and define both its size and proportion. Once a page is defined it can be used as a rubber stamp for subsequent pages. A series of pages of various proportions can be developed. When the best page proportion is determined it can be duplicated for the entire work.

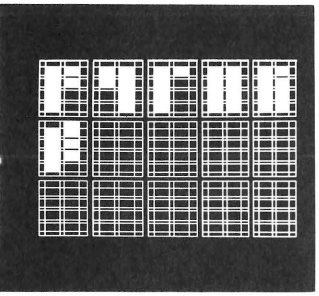
There are two aids that assist the designer in defining page proportions. One option is to define the size of the page based on a set of predetermined standard proportions, 6×9, 8.5×11, 9×12, and European A series. As the user defines the size of the page its proportion will remain locked to the appropriate format. A second option displays the current proportion of the page as the user modifies its size.



Grid Definition
A grid structure can be defined at any point after a page has been made. Users have the option to define several pages first (of varying or similar size) and then apply grids to one or many pages in any order. A page and a corresponding grid can also be defined before defining subsequent pages. There are two procedures for defining grid structures. The first option is a way to make fast, simple grids. A number ranging from one to twenty is chosen and a grid containing n modules in *x* and *y* is placed on the current page. The second option requires adjusting a ruler alongside a designated

page. The frequency of the markings on the ruler are determined by the user. As the user moves a slider, the ruler is immediately updated. These increments are then used to create the grid. By pointing to locations on the ruler, lines can be either erased or drawn. Symmetrical and asymmetrical grids can be made. Any grid structure, like any page, can be used as a rubberstamp. A grid can therefore be developed for a book and reused to design every page.

There are several options for making duplicate pages. All of the options require identification of the page to be copied. To place a single copy, the user has to choose a new location for the page. Double spreads can be made in two ways; by reflection and duplication of the first page. A location for the first page is chosen anywhere in the workspace. The four possible locations for the second page are determined by the sides of the first page. The user simply points to the general locations in reference to the first page. The second page is drawn with its grid oriented accordingly. A matrix of multiple copies can also be made. This is useful when the page and grid structure have been developed. Repetitive information, such as a page heading, is automatically copied onto every page.



Page Composition

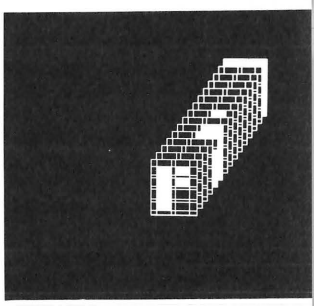
Composing individual pages requires the identification of a specific page. Once a page has been chosen, text areas or image areas can be placed in the predetermined grid modules. A location within the page is chosen and becomes attached to the nearest grid intersection. A box is then stretched to indicate the size of the area. As it stretches, it jumps to the grid intersections. Any number of modules can be enclosed in an area. This allows a designer to quickly map out areas on a page that adhere to the greater grid structure. Text and image areas can be erased by pressing a second button on the puck. The workspace is redisplayed after an area is erased.

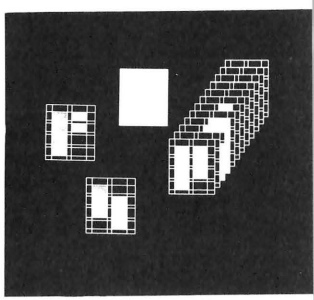
Pages in context

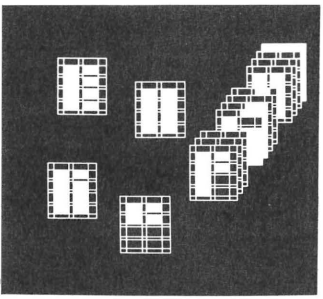
Several procedures operate on the page as an individual unit. These procedures include moving, deleting, choosing, and identifying pages. Such operations can be executed on pages at any stage. Choosing a page produces the mechanism for changing the status of the current page. The user points to pages which become highlighted and unhighlighted accordingly. When the user stops pointing, the last page to be highlighted remains the current page. This procedure is embedded in many operations. It is also available to

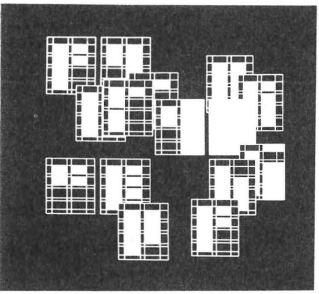
the user as a way to move through the workspace and visually identify existing pages. To delete a page, the user moves through the workspace identifying pages. When the page to be deleted is identified, it is eliminated from the record and the display is updated. The move operation is similar to the delete operation. It first requires identification of the page. By moving the puck, the user can move the page around the workspace. When its new location is chosen, the display is updated. In addition to visual identification, pages can be identified by an associated numerical value. The numeric value represents the page's position in the sequence of total pages. A list of existing page values is displayed. Pointing to the page value causes the corresponding page to be highlighted. For example: a user can inquire, "Show me page five."

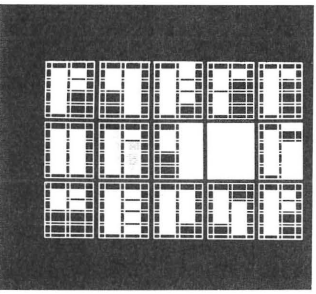
Pages are located by their position in the workspace. The relationship between pages can be modified by moving individual pages. Mechanisms also exist to modify the general characteristics of the workspace. Pages can be displayed in a two-dimensional matrix format. The numerical value associated with each page determines its position in the matrix. A second possibility is to display the order of pages in a matrix on a secondary display. The arrangement of the workspace is maintained and the order of the pages is illustrated. The third method for organizing the workspace involves stacking pages in a linear sequence. Pages only partially overlap so that they can be distinguished from one another. By stacking pages, several goals are accomplished. Pages occupy a smaller area of the screen. This provides more room for a work area. Pages that are not currently being worked on may be temporarily placed aside and yet remain accessible. Stacking pages also shows the page

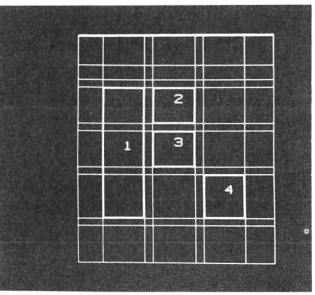


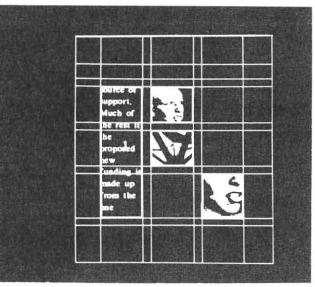












sequence. A page can be easily located by its location in the stack. The numeric value associated with each page determines its position in the workspace regardless of the arrangement of the workspace. This value can be changed by the user, who points to pages and consecutively assigns the page order. A user can easily move between the various configurations of the workspace. Additionally, pages can be rearranged by moving individual pages.

When the planning of pages is finished, page compositions can be refined using *Pager*, a page composition system written by John Thompson at the Visible Language Workshop. The user points to a page and the associated data is packaged and sent to the required data file. When a designer uses *Pager*, a list of existing pages is displayed. Pages sent from the sketch system are identified by their file name and their numeric value in the sequence. When the page is loaded, the grid and existing regions defined in the sketch system will be indicated. Specific text files and images can then be resolved.

The spatial environment and its manipulation forms an integral part of the designer's decision-making process; designing is the process of evaluating visual relationships. Computer systems do not inherently provide a spatial context conducive to such decision-making. The program described creates a spatial context by creating spatial illusions. Stacked and ordered book pages are used to produce the designer's required points of reference.

*Hardware configuration at the Visible Language Workshop consists of a Summa-graphics bit pad and puck, a Grinnel 27 bit frame buffer, color monitor, and a Perkin Elmer 32 bit mini-computer.