Fly: An Organic Presentation Tool

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Abstract

In this paper, we present Fly, a prototype presentation system that adds a visual structure to presentations. Current presentation software, like PowerPoint, structure slides in a linear sequence. The Fly design introduces a spatial organization that is based on Mind Maps. Using colour associations, spatial relations, and fluid movement, we show how presentation software can structure a meaningful overview of the underlying content.

Keywords

Organic Interfaces, Presentation Software.

ACM Classification Keywords

H.5.2. [Information interfaces and presentation]: User Interfaces.

Introduction

Presentations are a fundamental activity in academic and professional life. Software plays a central role in this process. PowerPoint, introduced in the late 80s [10], reduced the burden of authoring a presentation's slide transparencies. With its ease of use, its popularity steadily grew; Microsoft claims 30 million presentations are made using PowerPoint every day [10].

The Mind Maps represents the interaction space of a Large Public Display. Its visual richness and non-linear arrangement structures content meaningfully. Credit Anna Lea Dyckhoff.
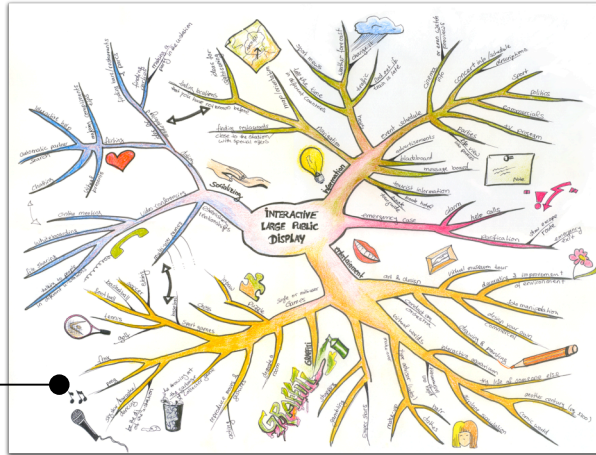

Figure 1. An example Mind Map.

Popularity aside, critics suggest PowerPoint has contributed to an increase in poorly given talks. Edward Tufte, its most vocal critic, argues that its format emphasizes style over content. In *The Cognitive Style of PowerPoint* [14], he claims that PowerPoint:

- is used as a crutch to guide the presenter, instead of educating the audience;

- generates content that is arranged in a complex hierarchy that leads to disorientation;

- enforces a linear progression through the complex hierarchy, one that is often confusing;

Although critics of Tufte's views suggest his perspective is overzealous (see Norman's response in [11]), his criticisms elicit areas where presentation software can be improved. Although PowerPoint has evolved since its introduction, its underlying design has remained

unchanged. Slides are presented, one after the other, like they were with hand drawn transparencies.

In the Fly paradigm, a spatial structure has been added to a presentation's visual design. In general, spatial structures help in the absorption and recall of presentation content [4]. In this context, Mind Maps are used to guide the visual parameters of the presentation and communicate its spatial structure. Mind Maps are particularly useful in this way — they incorporate Gestalt principles and Bertin's visual parameters [2] (see Figure 1). Its structure, as opposed to PowerPoint's hierarchal organization, represents information associatively. Using colour, weighted edges, and spatial location, the Fly presentation software communicates the underlying structure visually. Revealing this structure reduces presentation disorientation and can guide the audience through its complex hierarchy.

Related work

Resent research addresses designs issues raised by Tufte (and critics in general). Good et al. [6] use a Zoomable User Interface (ZUI) to improve navigation and reduce presentation disorientation. Applying a Pad++ [1] interaction to presentation slide shows, their CounterPoint system supports non-linear sequencing and graceful transitions between varied levels of detail. Good et al. suggest the inherent spatial structure of ZUIs help to increase the retention of presentation content. Like PowerPoint, CounterPoint is firmly rooted in the concept of a slide. In the Fly system, we envision moving away from this design choice. As shown in Figure 1, Mind Maps utilize spatial grouping, colour, weighted edges, and labeling of subtopics. This relates

The spatial structure is arranged by dragging thumbnails onto the canvas. When dropped on a parent node, a new child node is generated in that group. At present, PowerPoint presentations are exported to images and loaded in the Fly system.
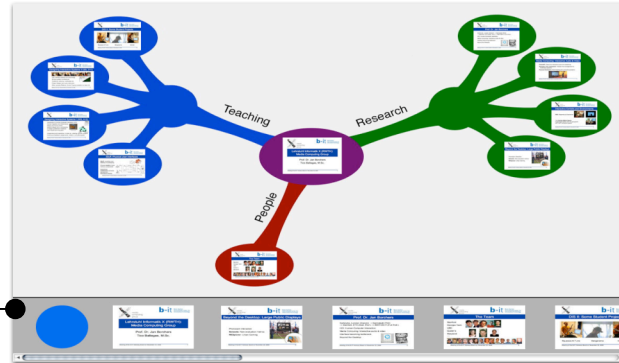

Figure 2. The Fly system. The lower panel contains an empty node and thumbnails of slides.

information associatively, as opposed to discretely chunked slides. Furthermore, to support more advanced animations, The Fly system will draw on Cinematographic techniques to improve the production value of presentations (something difficult with previous graphical hardware).

For space restrictions, we limit discussion of related work. Li et al. [8] support interactions for sketching informal presentations. Nelson et al. [9] use index cards that are digitally linked to slides. Rekimoto et al. [12] augment a presentation with real-time chat. Sinha et al. [13] support authoring with a speech and pen interface. Zongker et al. [16] present new animations that harness recent improvements in graphic computing power.

Design Concept

The typical scenario for presentation software involves two distinct users: the presenter and her audience. The audience's task is to make sense of the presentation.

This is done by watching, listening, and making annotations for later review. The presenter's task is to author, revise, and present the topic clearly. This involves not only speaking, but answering questions and making the talk available after it is over. Presentation software is an interface between these two user groups. It affects the flow of communication from the presenter to the audience.

The addition of a spatial context in the Fly metaphor introduces two new design challenges for the presenter. First, compared to the linear structure of PowerPoint, including a spatial structure adds a step in the authoring process. Presenters could spend unnecessary time defining the spatial structure. Second, during a presentation, it is unclear how a spatial presentation should be traversed. Typically, Mind Maps are reviewed casually, at the discretion of the viewer. In a typical presentation, order is critical. The presenter should structure the material in a way that maximizes its impact.

Authoring
To aid in authoring, the Fly system automatically arranges a presentation's spatial structure. When a slide's thumbnail is selected from the panel below and dropped on the stage, it is iteratively distributed around the parent node, like hours on a clock (see Figure 2). For example, to add a node to the Research sub-group, a user drops a thumbnail over the empty placeholder in the center of the group. When dropped, the structure is rearranged and the nodes are redistributed to balance the space. Collisions with other groups are detected and nodes avoid this by moving slightly. At times, the presenter may wish to customize the layout. To support this, automatic layout mode is deactivated. Thus, user's
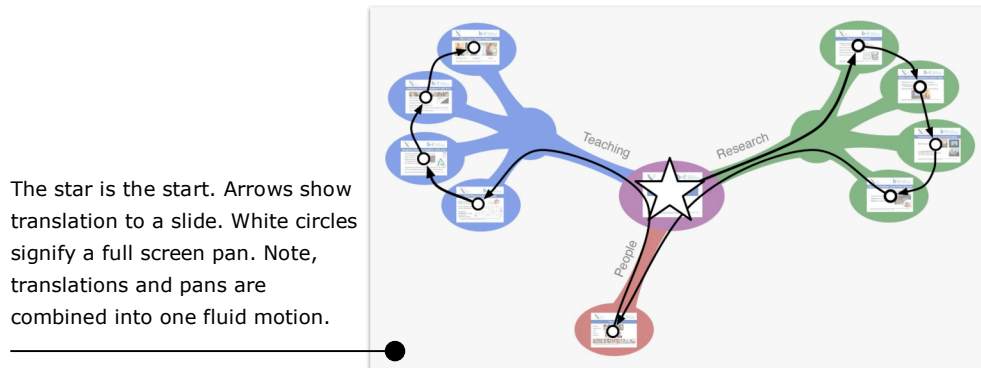
The star is the start. Arrows show translation to a slide. White circles signify a full screen pan. Note, translations and pans are combined into one fluid motion.

Figure 3. Traversal of a Fly presentation.

can generate an initial structure and adjust it manually by selecting and dragging nodes to a new position.

If the users re-activates automatic layout, the Fly prototype will naively attempt to readjust the graph. In future versions, this limitation will be phased out. We envision a more fluid layout interaction that respects interactive user input as just another force to consider when relaxing the graph layout.

Once the structure is determined, the presenter adjusts the visual parameters to associate content. Like a Mind Map, colour is varied relative to sub-group. In Figure 3, the central theme of the talk is purple, 'Research' is green, 'People' is red, and so on. To reinforce associations, textual labels are placed on incoming edges. As discussed in [4], both of these design approaches offer landmarks that reduce presentation disorientation.

Presenting
One question that needs to be addressed is the traversal of nodes in a Fly presentation. What is the natural order in which humans look at such a graph? We will study this phenomenon to inform the design of Fly (see Future Work); our initial prototype uses a heuristic of clockwise placement of sub-nodes starting at the incoming edge. During a presentation, nodes are visited in a clockwise order, beginning from the center node (see Figure 3). This process is repeated for all subgroups and acts like a depth first search. Like a camera panning over a scene, the movement between each node is smooth and continuous. In parallel, a node is zoomed in on until its contents occupy the entire screen. To enter a new subgroup, the camera path follows the incoming edge. For nodes in the same subgroup, the camera moves to each sibling in a clockwise order.

Audience
The Fly design supports interactions that help the audience absorb content. The spatial structure of the presentation aids information retention [4]. Random slide access, often needed at the end of talks, is triggered by clicking on a node. The camera will pan and zoom to that node. To provide either an overview or a detailed view, Fly supports the zooming interactions discussed in [6].

Prototype Implementation
The Fly prototype is implemented in Java. It contains a Node Manager and a Drawing engine. The Node Manager maintains links between groups of slides in the presentation and all parent/child relationships between nodes. In addition, the Node Manager handles

presentation flow and user modifications of the Tree structure, like position, colour, and edge labeling.

The Drawing engine handles the panning and zooming of the animation. Using information from the Node Manager, it zooms and translates through the entire tree structure.

Currently, a presentation is exported to a set of images and imported into the Fly system. This results in the loss of typical animations found in PowerPoint, and more importantly, makes editing content and spatial structure disjoint. In future versions, presenters will move between Fly and PowerPoint seamlessly. Consequently, this interaction will remove the need for the lower thumbnail panel (see Figure 2).

Early Evaluation

We compared the Fly system versus PowerPoint in a typical presentation setting. The introductory HCI class at RWTH Aachen University was divided into two separate groups of 10 subjects. Ages ranged from 23-28 and gender was balanced across groups. Each group was given a five-slide presentation on the Canadian 2006 election [5]. The talk lasted 10 minutes. The first group was given the talk in PowerPoint. In the PowerPoint presentation, an initial slide was added to show the structure of the talk (similar to Figure 2). This helped to reduce advantage of Fly's spatial structure. The second group was given the presentation using the Fly system. Each group was asked to leave the room while the other attended the presentation. We wanted to know if the camera panning and constant visualization of the Fly presentation structure helped the students to retain content. We measured retention using a six question multiple-choice quiz based on the

presentation. Initially, subjects were not told they would write the quiz. We stated the purpose of this exercise was to gain feedback in the design of Fly (which was true).

The Fly system slightly outperformed PowerPoint. On average, the PowerPoint group answered 68.33% correct ($\bar{X}$ = 4.10/6, σ = 1.13). The Fly group answered 70.33% correct ($\bar{X}$ = 4.22/6, σ = 1.39). However, the difference in the result was not statistically significant. Future evaluations are required.

Discussion

The Fly system raises an interesting question relevant to presentation software. It may be that PowerPoint is better for particular situations (like storyboarding). When should we choose one software tool over the other?. Initially, we envisioned Fly and PowerPoint coexisting as a presentation tool. However, as seen in Figure 1, Mind Maps represent information differently than PowerPoint. The use of a slide is not a necessity. Complex topics, dense in related information, might work better in Fly. In PowerPoint, the same presentation would have numerous slides, with many bullets, and more importantly, no visual structure relating the information hierarchy. This suggests there are advantages of one format over the other. Although the underlying hierarchy of the information present in each interface is organized similarly, its representation varies. Whereas PowerPoint offers a high level overview, Fly visually navigates this information structure and makes its relations more explicit. As we move further down this spectrum, the concept of a slide dissolves and ideas are represented with simple pictures and text, like they are done with Mind Maps.

Future Work and Organic Interfaces

We plan to evaluate how humans process graph structures visually. This knowledge will aid the design of the Fly traversal heuristic. To determine a rough idea of this, participants will be presented with a set of Mind Maps and asked to write down the order they look at the map. These results will guide a similar evaluation that will use an eye tracker. We suspect there may be common visual patterns that humans follow. However, specific words or content can influence eye movement, as Yarbus shows in [15]. Future work will comment on this topic.

The Fly system is one example of an Organic Interface. It represents part of a larger research goal of our group. While Computer Science has looked at biologically inspired algorithms [7], this idea has not been carried over to the user interface. Fly is a first step in the study of interfaces that respect, and are inspired by, laws found in physics, biology, and human cognition. The movement of a school of fish, a highly complex structure, appears calm, continuous, and fluid; it is 'organic'. We label this research area *Organic Interfaces*.

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