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Sketch Presentation for Product Design

Présentation de Produits par le Dessin

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Industrial designers present their concepts at different stages of the design process. While they produce sets of sketches sparsely illustrating different aspects of the design in early stages, presentations targeting end-users or finalizing the design benefit from more polished and animated presentations, providing continuous transitions between the illustrated aspects and guiding the audience through a specifically crafted story, presenting the product in a lifelike, compelling manner. Such animated presentations are kept for final stages as they are costly to create and may require the creation of 3D models and renderings. Our goal is to enable the creation of dynamic presentations from the sparse sets of freehand sketches.

To this end, we study current practices of designers, their visual language, typical techniques and how they serve storytelling, through the analysis of existing presentation sketches and the organization of interviews and workshops with professional design practitioners.

Les designers industriels présentent leurs concepts à différentes étapes de leur processus de design. Les étapes préliminaires nécessitent la création d'ensemble de dessins illustrant séparément différents aspects du design, alors que les étapes plus avancées peuvent consister en des présentations plus travaillées et animées, reliant les différents aspects du produit par des transitions continues de sorte que le produit soit perçu comme prêt à être utilisé. Cependant, ces présentations nécessitent une plus grande quantité de travail et la création de modèle 3D et de rendu, supposant une idée assez précise du produit final. Notre but est de proposer un outil permettant la création de présentations dynamiques dès l'étape d'idées illustrées par des dessins.

Pour cela, nous étudions les pratiques de designers, leur langage visuel, techniques courantes et les fonctions de celles-ci pour l'expression d'un fil conducteur pour la présentation. Cette étude se compose d'une analyse de dessins de présentation compilés et commentés dans un ouvrage de référence ainsi qu'une série de workshops avec des designers professionnels.

Additional Key Words and Phrases: Industrial design, Sketch, Presentation

Mots Clés et Phrases Supplémentaires: Design industriel, Dessin, Présentation

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1 INTRODUCTION

Designers, freelance or in agencies, work for different clients or companies. They need to convince them of the value of their concepts and sometimes that they should continue working with them. This rhetoric exercise mostly comes at play during presentations where designers present and discuss their ideas with clients.

Different stages of the design impose different constraints and practices: at the start, the concept is not fixed, so the designer's response should reflect that. They thus rely on sets of sketches, which they can iterate on quickly. These sketches each illustrate different aspects of the design (like its shape, feel, material, some details' configuration) sometimes in different versions. This set of sketches helps in forming a global rough idea of the design in the mind of all stakeholders and in making decisions on some of its aspects. Once parts of the design is fixed, designers may move on to higher-fidelity representations and spend more time creating compelling effects giving the impression of an actually existing 3D object (for example final presentations targeted towards users like this website by Apple [1]).

Such effects can entail animated transitions which explicit the link between the aspects of the design that were represented separately through sketch, or at most linked by a transitional arrow. With this sketch version, relationships and transitions between the sketches is left to be induced mentally by the viewer.

Our end goal is to design a system to create dynamic presentation with sketches. We describe in this document our study of current practices of sketching for presentation and how it will shape our system design.

2 RELATED WORKS

Our work is inspired by two main areas of research: sketch-based interactions to author dynamic effects and presentation tools

2.1 Sketch-based tools for dynamic effects

Many works explored sketch-based tools to create dynamic effects supporting storytelling, explaining or ideation. In an educational context, systems such as ChalkTalk [14], RealitySketch [17] or MathPad2 [11], draw and animate diagrams, linking their behavior to equations, graphs, other diagrams or physical phenomena using AR [17]. Kitty [6], building up on Draco [7], enables users to create interactive animated illustrations: behaviors of animated elements can be tweaked and linked to that of others.

Closer to our industrial design context, DreamSketch [8] combines sketching and constraint definition to explore and optimize product shape at an earlier stage. Lee et al. [12] also proposed an interactive workflow of sketching, parting, rigging and posing the sketch in 3D to produce multi-pose product concepts.

We are inspired by the various interactions and workflows proposed in these sketch-centric settings, however we focus on the activity of preparing presentations using sketch as an industrial designer. This setting entails questions around content management and structure, as well as the crafting of a story fitting the constraints of content, audience and context of the presentation. Those questions were more closely addressed in the research literature on presentation tools.

2.2 Presentation tools

Alternative solutions to traditional slidewares such as Microsoft PowerPoint or Keynote have been explored in the literature. These approaches have focused on improving various aspects of presentation creation, such as collaborative use [10] or content reuse [2, 9]. New presentation formats have been proposed to respond to critics of the slide-deck format. Zoomable User Interfaces [5, 13] and approaches such as NextSlidePlease [16] and HyperSlides [3] propose formats that are not restricted to the linear format of the slide-deck.

To our knowledge, no tool for sketch-based presentation in an industrial design context has been proposed yet.

3 STUDYING PRESENTATION SKETCHES

3.1 Protocol

To inform further design choices, we studied the current approach of creating presentation sketches from a reference book in the domain, *Sketching product design presentation* [4]. This book compiles techniques and rules followed by professional designers to make effective presentations, as well as 15 design cases describing the design process of projects lead by various design studios across the world. Our analysis of the presentation sketches structure and components, as well as their motivations in this communication-focused context, has been iteratively refined through discussions with two design teachers collaborating on this project. The analysis consisted in identifying common visual patterns and elements across the design cases from the book. We grouped visual elements (separate views of the products or additional elements like annotations) based on their similarity both visually and in their communication purposes, as described in the book. We thus distinguished a set of types of view and additional elements (see Section 3.2 and Table 1).

Moreover, we conducted design workshops with professional designers (currently two, but we plan to hold more workshops) to learn more about their experience with preparing presentations and have them brainstorm around the idea of a tool to create dynamic presentation artefacts from sketches. More precisely, each workshop was carried with one designer and lasted about one hour. The first part consisted in an interview where we asked them about a recent project which they could share visuals from, their workflow in preparing it and usual tools. In the second part, we let them brainstorm over the concept of sketch-based dynamic presentation: we ask them to envision what the presentation could look like if they had the means to make it dynamic easily by storyboarding it with sketches. Then, we encourage them to elaborate on the storyline they imagined for conducting their presentation.

3.2 Findings

Concerning the use of sketches in presentation, our observations are three-fold:

- Designers draw several sketches, which we call *views*, to represent a single product under different angle, or to underline specific properties.
- This set of views forms a network, with each view having a semantic *relationship* to at least one other view. We list out three types of relationships, which can describe the structure of most of the presentation sketches examples found in the book. We list out additional components that are ubiquitous in presentation sketches and play a significant role in the communication. We summarize all the types of visual elements which we identified in Table 1.
- Finally, using this set of views as support for presentation implies narrating the audience through the network of views, following semantic relationships linking them together and addressing details and labeled components when they fit the storytelling timing-wise. We call the order in which the views are presented, the reasoning behind it and the ideas developed orally and visually for each view at presentation time, the *story*.

3.2.1 Views and Relationships. A typical presentation sheet (see Figure 1) is a composition of several sketches showing each complementary viewpoints and information of the designed product. We call separate sketches of the same product, a *view*. Each view has an underlying communication goal, such as expressing the 3D shape more precisely in a different angle or illustrating a feature of the object. This goal is tightly linked to the *relationship*, or operation that would

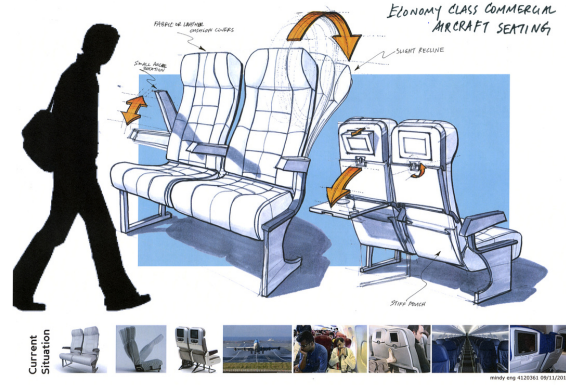


Fig. 1. A single sheet composition of views presenting the object under different angles, in different states and in the context how it compares to the user in height. Sketch by Mindy Eng (IDE TU Delft alumnus), from IDE course of PCP and shown on TU Delft's website of Delftdesigndrawing.com: <http://www.delftdesigndrawing.com/product-communication-and-presentation.html>

be required to go from one view to another: this relationship encodes the missing information which the new view provides.

We describe three relationships between views, which can be combined to analyze most of the observed presentation compositions: perspective change, state change and alternative design.

Perspective change. Given the two-dimensionality of sketches, several views are required to communicate the 3D shape of objects. Viewpoints can be in perspective or orthographic. They can be chosen either to render how the object would be seen from the user's perspective or to accurately show precise features such as size or the location of subparts. In Figure 1, both front and back views of the seats are illustrated as the user may interact with the two sides.

Perspective changes can be complex, involving a combination of rotation to show different elements and zooming to detail a part of the object.

State change. Products can have different physical configuration states, for example a laptop can be closed or open. Designers thus need to represent these different states to give a good grasp of the product to their audience. Such sketches with state change have been studied by Shao et al. [15]. They proposed to model them with a junction graph, where links can correspond to "fixed", "slide" or "hinge" junction types. Following this terminology, the aircraft seats are depicted in a superposition of various states in Figure 1. The state change corresponds to a hinge around the base of the backrest of the seat.

Alternative design. At the concept stage of the design process, designers usually present several design alternative ideas to their clients to leave possibilities open, make them choose one or express their preferences more precisely. Different concepts should thus be presented in a similar manner to not bias comparisons. In Figure 2, various designs for the same object are presented, with different shapes and colors, but in a similar type of view, style and level of detail.

3.2.2 Other common components and techniques. In addition to the product itself, other visual components appear in views or anchored to the views:

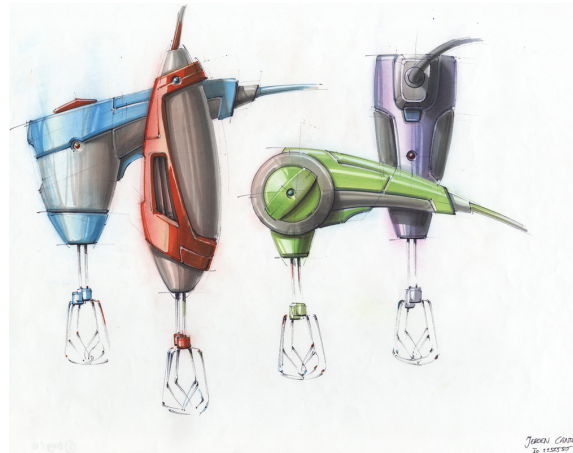


Fig. 2. Alternative designs of the same object. Sketch by Jeroen Canton (IDE alumnus), from IDE course of PCP and shown on TUDelft's website of Delftdesigndrawing.com: <http://www.delftdesigndrawing.com/product-communication-and-presentation.html>

- *Annotation.* They label parts of the product. They are represented by an arrow pointing to a part of the view and a caption text.
- *Context.* Context elements are drawn environments, entities or persons that can interact with the product. They aim at implicitly giving additional information about the product in context, like if it fits in the hand or if it stands on the floor.
- *Underlay.* Another drawing or an image is commonly used as underlay for various purposes, such as creating coherent visuals by having a reference or providing context. They may need to be shown or hidden in the final visual. It is both a technique and a visual element that can be found in the presentation preparation workflow and artefact.
- *Arrow.* In addition to being used for annotations, arrows can also indicate salient relationships between views or the dynamics of the object. These arrows usually have a different style: they are wider and take in account the perspective of the object. In Figure 1, such wide arrows highlight mainly dynamics of parts of the seat (e.g. how the armrest rotates).

3.2.3 Story. To present their concept, designers need to select a set of views to cover its main aspects, in an order that will make sense and build a compelling *story*. For example, during our workshop, a designer expressed that he would first think about the aspects he needs to address when discussing his cargo-bike concept with clients. He produced a set of sketches (Figure 3) illustrating these aspects: location of the bike with respect to the container part (in front of or behind it), steering mechanism, container opening, rain protection and battery compartment. This story is thus supported by an ordered set of views and the transitions or relationship between them.

To tell their story, designers need to re-organize a subset of views in a way that helps in transitioning from one to the other. This can be done on a single page, indicating transitions with arrows and guiding their audience through the views by commenting and showing the view they are talking about using gestures. Another solution is to separate the set into a slide deck, where each slide can bear one or several views together.

	Type	Communication Purpose
View Relationship	Perspective change	→ Express the shape in 3D → Show features in viewpoints that illustrate them best
	State change	→ Explain the dynamic features of the product
	Alternative design	→ Express different possibilities → Provide ground for an objective comparison
Other Components	Annotation	→ Highlight the main features
	Context	→ Provide information in relation with the product's environment or user
	Underlay	→ Context or reference for drawing coherently
	Arrow	→ Guide the audience's attention → Annotate dynamics

Table 1. Types of visual elements identified through the analysis of design cases from Eissen and Steur [4].

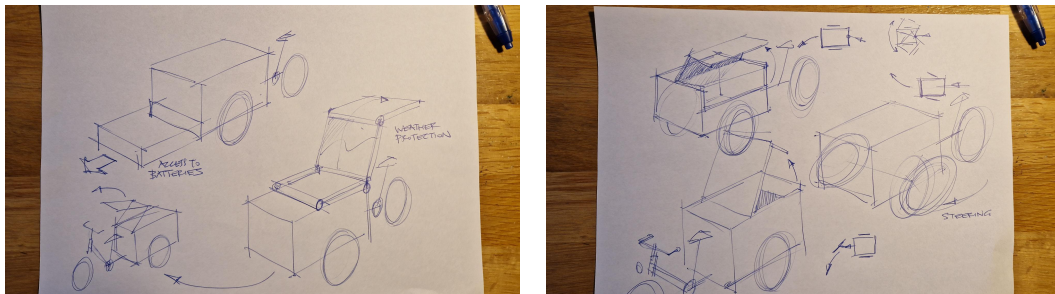


Fig. 3. Sketches produced by a design practitioner during our workshop: they were asked to think about how they would present a past project (here a cargo-bike concept) if they could easily create a dynamic presentation artefact.

4 FUTURE WORK

First, we will further our study by doing additional workshops with professional designers. Secondly, following this study of current practice in sketching for presentation, we are currently designing and implementing a tool to author dynamic presentation artefacts using such sketches. We envision the main types of sketches identified in this study as structuring elements in a canvas-focused interface: sketches should be distinguished into *views*. *Relationships* should be apparent and easy to input. The *story* should use relationships as cue to create dynamic transitions between views. More precisely, we envision three interface elements:

- Views can be sketched on the infinite content canvas (in a similar manner as miro and other board based apps). Sketch can be performed freely or using widgets corresponding to the relationships we described 3.2. Using these widgets enables the system to implicitly record precise relationships' types and parameters, as well as provide guidance to produce coherent views. The user can also input relationship data a posteriori.
- The network of views and relationships is abstracted into a "View Structure" layer. The user can interact with the layer to select and edit views and relationships.
- Finally, elements from the "View Structure" layer can be dragged-and-dropped into the "Story" panel to build storylines: a sequence of views, with transitions deduced from the relationship data stored in the "View Structure".

5 CONCLUSION

We described findings about current practices of sketching for presentation: the types of sketches or *views* used and what they are meant to express. The structure emerging from the *relationships* that views have with one another serves as a network of options to build the *story* to tell at presentation time. We identify two representations of the sketched material: the view structure consisting of all the potential content in a network of views and the storyline, e.g. a list of ordered views, with transitions corresponding to the relationships from the network. We plan to use these observations to design an authoring tool for dynamic presentation artefacts using sketches.

REFERENCES

- [1] Apple. [n.d.]. Apple Vision Pro Website. <https://www.apple.com/apple-vision-pro/>.
- [2] José H. Canós, María Isabel Marante, and Manuel Llavador. 2010. SliDL: A Slide Digital Library Supporting Content Reuse in Presentations. In *Research and Advanced Technology for Digital Libraries*, Mounia Lalmas, Joemon Jose, Andreas Rauber, Fabrizio Sebastiani, and Ingo Frommholz (Eds.). Springer Berlin Heidelberg, Berlin, Heidelberg, 453–456.
- [3] Darren Edge, Joan Savage, and Koji Yatani. 2013. HyperSlides: Dynamic Presentation Prototyping. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (Paris, France) (CHI '13)*. Association for Computing Machinery, New York, NY, USA, 671–680. <https://doi.org/10.1145/2470654.2470749>
- [4] K. Eissen and R. Steur. 2014. *Sketching product design presentation*. BIS Uitgevers.
- [5] Heiko Haller and Andreas Abecker. 2010. IMapping: A Zooming User Interface Approach for Personal and Semantic Knowledge Management. In *Proceedings of the 21st ACM Conference on Hypertext and Hypermedia (Toronto, Ontario, Canada) (HT '10)*. Association for Computing Machinery, New York, NY, USA, 119–128. <https://doi.org/10.1145/1810617.1810638>
- [6] Rubaiat Habib Kazi, Fanny Chevalier, Tovi Grossman, and George Fitzmaurice. 2014. Kitty: Sketching Dynamic and Interactive Illustrations. In *Proceedings of the 27th Annual ACM Symposium on User Interface Software and Technology (Honolulu, Hawaii, USA) (UIST '14)*. Association for Computing Machinery, New York, NY, USA, 395–405. <https://doi.org/10.1145/2642918.2647375>
- [7] Rubaiat Habib Kazi, Fanny Chevalier, Tovi Grossman, Shengdong Zhao, and George Fitzmaurice. 2014. Draco: Bringing Life to Illustrations with Kinetic Textures. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (Toronto, Ontario, Canada) (CHI '14)*. Association for Computing Machinery, New York, NY, USA, 351–360. <https://doi.org/10.1145/2556288.2556987>
- [8] Rubaiat Habib Kazi, Tovi Grossman, Hyunmin Cheong, Ali Hashemi, and George Fitzmaurice. 2017. DreamSketch: Early Stage 3D Design Explorations with Sketching and Generative Design. In *Proceedings of the 30th Annual ACM Symposium on User Interface Software and Technology (Québec City, QC, Canada) (UIST '17)*. Association for Computing Machinery, New York, NY, USA, 401–414. <https://doi.org/10.1145/3126594.3126662>
- [9] Ali Khalili, Sören Auer, Darya Tarasowa, and Ivan Ermilov. 2012. SlideWiki: Elicitation and Sharing of Corporate Knowledge Using Presentations. In *Knowledge Engineering and Knowledge Management*, Annette ten Teije, Johanna Völker, Siegfried Handschuh, Heiner Stuckenschmidt, Mathieu d'Acquin, Andriy Nikolov, Nathalie Aussenac-Gilles, and Nathalie Hernandez (Eds.). Springer Berlin Heidelberg, Berlin, Heidelberg, 302–316.
- [10] Clemens N. Klokose, James R. Eagan, Siemen Baader, Wendy Mackay, and Michel Beaudouin-Lafon. 2015. Webstrates: Shareable Dynamic Media. In *Proceedings of the 28th Annual ACM Symposium on User Interface Software & Technology (Charlotte, NC, USA) (UIST '15)*. Association for Computing Machinery, New York, NY, USA, 280–290. <https://doi.org/10.1145/2807442.2807446>
- [11] Joseph J. LaViola and Robert C. Zeleznik. 2006. MathPad2: A System for the Creation and Exploration of Mathematical Sketches. In *ACM SIGGRAPH 2006 Courses (Boston, Massachusetts) (SIGGRAPH '06)*. Association for Computing Machinery, New York, NY, USA, 33–es. <https://doi.org/10.1145/1185657.1185794>
- [12] Joon Hyub Lee, Hyung-Gi Ham, Myung-Sung Kim, and Seok-Hyung Bae. 2020. 3D Sketching for Multi-Pose Products: An Interactive Showcase. In *ACM SIGGRAPH 2020 Labs (Virtual Event, USA) (SIGGRAPH '20)*. Association for Computing Machinery, New York, NY, USA, Article 5, 2 pages. <https://doi.org/10.1145/3388763.3407759>
- [13] Leonhard Lichtschlag, Thorsten Karrer, and Jan Borchers. 2009. Fly: A Tool to Author Planar Presentations. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (Boston, MA, USA) (CHI '09)*. Association for Computing Machinery, New York, NY, USA, 547–556. <https://doi.org/10.1145/1518701.1518786>
- [14] Ken Perlin, Zhenyi He, and Karl Rosenberg. 2018. Chalktalk : A Visualization and Communication Language - As a Tool in the Domain of Computer Science Education. *CoRR* abs/1809.07166 (2018). arXiv:1809.07166 <http://arxiv.org/abs/1809.07166>
- [15] Tianjia Shao, Wilmot Li, Kun Zhou, Weiwei Xu, Baining Guo, and Niloy J. Mitra. 2013. Interpreting Concept Sketches. *ACM Transactions on Graphics* 32, 4 (2013), 10.
- [16] Ryan Spicer, Yu-Ru Lin, Aisling Kelliher, and Hari Sundaram. 2012. NextSlidePlease: Authoring and Delivering Agile Multimedia Presentations. *ACM Trans. Multimedia Comput. Commun. Appl.* 8, 4, Article 53 (nov 2012), 20 pages. <https://doi.org/10.1145/2379790.2379795>
- [17] Ryo Suzuki, Rubaiat Habib Kazi, Li-yi Wei, Stephen DiVerdi, Wilmot Li, and Daniel Leithinger. 2020. RealitySketch: Embedding Responsive Graphics and Visualizations in AR through Dynamic Sketching. In *Proceedings of the 33rd Annual ACM Symposium on User Interface Software and Technology*

(Virtual Event, USA) (*UIST '20*). Association for Computing Machinery, New York, NY, USA, 166–181. <https://doi.org/10.1145/3379337.3415892>