

Half-day Tutorial on Sketching Designs for Data-Visualization using the Five Design-Sheet Methodology

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Abstract— When developing visualization software, developers and researchers need to plan what they are going to build. Low fidelity methods, such as sketching, can be used to explore different ideas. This tutorial leads the attendees through sketching designs with the Five Design-Sheet methodology. (Part 1) think through ideas, (part 2) prepare and then (part 3) sketch plans for visualization tools. The tutorial will include some practical aspects, and attendees will be given the opportunity to work through a Five Design-Sheet plan for themselves.

Index Terms—Five Design-Sheets (FdS), Sketching, Visualization Design, Low-fidelity designs

1 THE LEVEL OF THE TUTORIAL (BEGINNING)

The tutorial will be useful for anyone who has to create visualization interfaces, and needs to think through different potential ways to display their data. At the end of the tutorial participants will understand techniques to help them be more structured in their ideation. They will be able to sketch interface designs using the Five Design Sheet methodology (FdS).

While we know that some developers have started to use the Five Design-Sheet methodology, but this tutorial will start from the beginning and be suitable for any attendee. More information and resources are found on <http://fds.design>.

2 BACKGROUND

Especially when developing visualization computer interfaces, software engineers need to consider different alternative solutions before they start to program. But also in other situations it is useful to work through different permutations in your mind, to decide which one to actually implement. It is often difficult to know which design is best, and how to proceed. This tutorial uses sketching to enable developers consider different ideas and make plans (in sketch form) that captures the interface layout, operations and underpinning algorithms.

The Five Design-Sheet work was first published in 2011 [1] at the education stream of the EG EuroVis conference. Then published in IEEE Transactions on Visualization and Computer Graphics, in the 2016 issue [2]. It has been used in Higher Education in various classes (from information visualization, computer graphics and web design), the method has been used in industry and research. In brief, the FdS methodology is as follows: after thinking about the problem itself, and the goals of the tool, the FdS process has five stages (see Figure 1). Five design sheets are generated from one run, and each sheet has a structure of five parts. This helps you think about the challenge in greater detail and consider how the design will appear and how users will interact with it.

3 OUTLINE SCHEDULE

Introduction & Welcome

The Five Design-Sheet methodology enables you to consider different ideas, to think through many potential design solutions and sketch them

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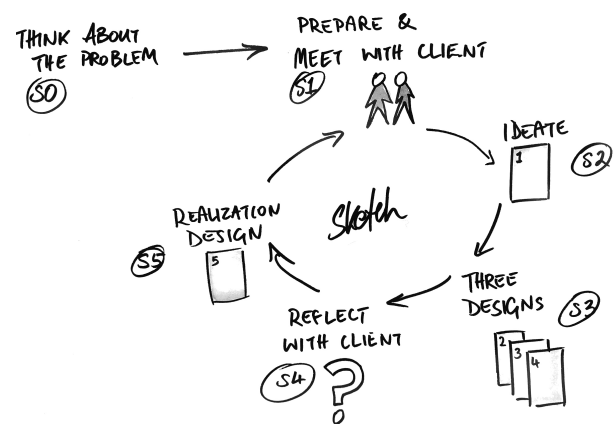


Fig. 1. The FdS process: Think about the problem, prepare and maybe meet with the client, create new designs, consider three principle designs, reflect on the designs, generate the final realization design.

on paper. This section presents sketching as a tool for design planning, explains the sketching method and what resources you'll need and explores techniques to improve your skills of sketching for design. We briefly introduce each sheet. Sheet 1 of the five sheets provides a space where creativity can flow. You can imagine, and so draw, lots and lots of different ideas. Sheets 2, 3 and 4 then develops those ideas further, while the final sheet (sheet 5) provides a more refined solution of one of the major ideas. It is through sketching that a user will understand more about the issues, opportunities and challenges of the design task.

In this section we introduce the main concepts explored in the tutorial, and the different skills that we wish attendees to learn.

- Overview of the methodology.
- The five stages.
- The five sheets.
- Thinking holistically.
- Who has used the FdS?
- Background to the FdS.
- Where can it be applied?

Exercise 1. Sketching ideas. Free-form sketching covering basic techniques.

Generation of ideas

Where do design ideas come from? How can you create something novel? What helps you be creative. What is the art of thought? All these are questions that psychologists, philosophers, artists and inventors have pondered in the past. While there may be no single answer to all these questions there are things that can help generate creative ideas.

This section explores thinking and provides a list of techniques to help users get started with thinking up new designs.

- Being a convergent critical thinker.
- Divergent thinking.
- Idea Generation.
- Where do ideas come from?

Data & Task Analysis

Understanding data is an important aspect of designing any data-visualization tool. To use the FdS method, users need to be able to understand different components of the data. In this part of the tutorial we will cover data analysis, mapping information and retinal variables.

- Understanding data variables and parameters.
- Tasks and purpose for the data visualization.
- Understanding which data components are important their characteristics (component analysis).

Sketching Ideas (Sheet 1 of the FdS)

Sketching is a powerful technique. Just the act of putting pen to paper, and working through many different visualization design concepts, helps developers to work through their visualization ideas. The sketches on sheet 1 act as mini prototypes. We would encourage about 20 for sheet 1. This part of the tutorial will go through techniques to help people sketch ideas on this sheet, and also follow the five stages of sheet 1.

- Why is sketching useful?
- Getting started with sketching Sheet 1.
- Improving your sketching skills.
- Other mediums (eg., using tablet such as an iPad).
- Sketching alone or in group?

Exercise 2, A dataset scenario will be explained, and then attendees will do their own sketches (completing a Sheet 1). Feedback will be given individually by the educators. Resources will be provided by educators.

Sketching the main designs: Sheets 2,3,4 (and 5),

This section looks to structuring and generating the main visualization interface in sketch form. This is the content of Sheets 2,3,4 and 5. This section first presents the concepts of the 5 parts of the sheet: the Layout/big picture, Operations/components, the Parti (main underpinning algorithm of the visualization) and Disadvantages/Advantages. Following presentation of the concepts, the educators will present a scenario and the participants will sketch their own Sheet 2.

- The goals of the designs.
- How many designs?
- The Big Picture.
- Operations and Components of the system.
- The Parti (the main focus).
- Discussing the pros and cons.

Exercise 3. Sketching the different designs.

Finish & Wrap-up

This final section will present related work and further reading, and conclude.

- Related work and further reading.
- Conclusion and questions.

REFERENCES

- [1] J. C. Roberts. The Five Design-Sheet (FdS) approach for Sketching Information Visualization Designs. In S. Maddock and J. Jorge, eds., *Eurographics 2011 - Education Papers*. The Eurographics Association, 2011. doi: 029-036
- [2] J. C. Roberts, C. Headleand, and P. D. Ritsos. Sketching designs using the five design-sheet methodology. *IEEE Transactions on Visualization and Computer Graphics*, 22(1):419–428, Jan 2016. doi: 10.1109/TVCG.2015.2467271