Exploring Handmade Soap as a Visualization Medium

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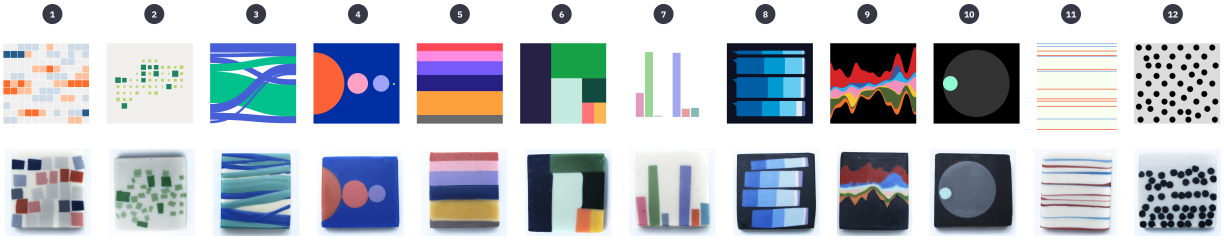

Figure 1: All visualizations and their corresponding handmade soaps.

Abstract

We ordered handmade soaps to visually reflect 12 digital visualization designs in our previous work. The soap colors precisely matched the designs while the shapes varied. Our expectations of the 12 designs did not match the soap maker's evaluations. Their comments were noted for picking designs suitable for soap making in the future. This can be helpful for further explorations of other physical materials for visualization, especially in every objects.

Index Terms: Human-centered computing—Visualization;

1 Introduction

Physical visualization or data physicalization has a long history in many forms from arranged clay tokens in Mesopotamia to 3D-printed data artifacts [1]. Data physicalization can intersect other domains such as open government data and public visualization [2,3]. To the best of our knowledge, we have not found any prior research work on soap as visualization medium. Our scope is limited to handmade soaps of small scale production, which excludes additive manufacturing (3D printing) and other techniques available for industrial design. Although there are no particular data reading or understanding tasks in visualization soaps, beyond just novelty items, they can remind people of a particular data project or the fact that data is everywhere.

2 Design and Implementation

As a quest to look for a new material for data expression, a visualization designer in our team saw made-to-order soaps in square tablets in a shop and decided to order a set of soaps as new year gifts based on the team's visualization designs. The designer contacted the soap maker and picked 12 designs in various visualization types such as heatmap, tile grid map, bubble chart, treemap, bar chart, stacked bar chart, mosaic plot, alluvial diagram, and streamgraph. They were all adapted from a list of selected digital visualizations made by her team in 2020. The colors were taken directly from the original designs.

The initial design list includes a choropleth map and a 3D chart but the soap maker mentioned their production difficulty. As explained by the soap maker and confirmed by another person who indepedently has soap making experience, patterns of complex details, especially of recognizable shapes, were hard to make and predict the final results.

The ingredients of soap mixture are mainly oil, water, and glycerin (sodium hydroxide). They are combined in a so-called cold process, whose crafting period can take up to a day. Soaps of a singular color and a simple geometric shape are done by pouring soap mixture into a mold. Soaps in square shapes are made in a rectangular cuboid or prism and cut along the longest side into pieces. One block can create 15 soaps.

Techniques to create specific non-random patterns in a soap can be generally categorized into two main groups: embedding and layering. The first method adds hard soaps into soft mixture while the second method pours mixtures of different colors on top of each other. Since a soap maker cannot see the soap patterns while making them, intricate outputs require experience.

The soap maker also noted that the soaps might not precisely match the visualizations. For example, the positions or the number of marks may look slightly random. We permitted some mismatches and did not give further instrucitons regarding chart types or their visual grammars.

The soap maker received our designs via instant messaging over a few days and delivered the soaps to us in three weeks. At 30 soaps per design, each soap excluding shipping cost around 30 Thai baht or one United States dollar.

3 Results and Discussion

The designs and their corresponding soaps are shown in Fig. 1. Some soaps looked notably different because of their pattern intricacy and unfamiliar visual encodings.

Most designs, specificaly design 1, 2, 4, 7, 10, and 12, were made with the embedding technique. Soap design 10 needed two embeddings to create a pattern of a circle inside a circle. Four designs i.e. design 3, 5, 9, and 11 were made with the layering technique. Design 3 or alluvial diagram was the only soap pattern that was made after cutting into tablets due to its self-intersecting nature of the curves in the diagram. Finally, design 6 and 8 required both embedding and layering techniques.

All soaps were the first try except ones for streamgraph, which we sent back for a new batch that should more closely follow the original design. We investigated the problem and found out that the soap maker simply did not understand the underlying visual grammar; she assumed the streams were random colorful lines across the tablet. It is noteworthy that the soap maker did not even consider the streamgraph as the most difficult visualization to replicate.

Some soaps showed the limitations of soap making. For instance,

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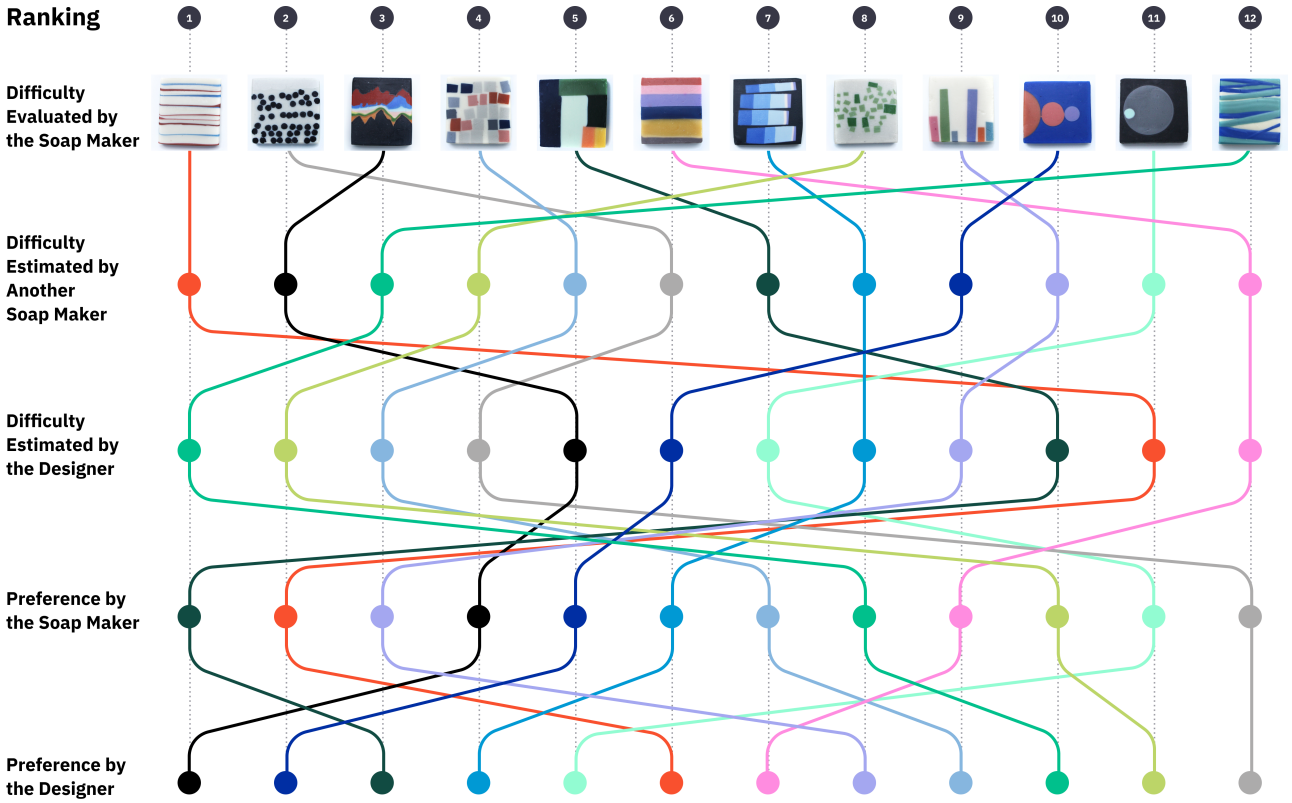

Figure 2: A bump chart showing the rankings of all soap designs in difficulty and visual preference by various stakeholders.

the bars in the mosaic chart soap (design 8), the squares in the heatmap soaps (design 1) and tile grid map soap (design 2) rarely aligned. Circular or curvy objects looked better in general and visually resembled their designs.

The soap maker later rated the results based on production difficulties and visual preferences, as shown in Fig. 2. Note that the difficulty ranking matched the soap maker's initial evaluation that only the stacked bar charts, treemap, and streamgraph would look similar to the designs.

We also asked an indepedent soap maker to rank the designs by how hard it is to make them. The rankings of two soap makers mainly align except the designs of a tile grid map, an alluvial diagram, and a stacked bar chart. The limitations of the production of the first two visualizations have been discussed. On the stacked bar, we inquired further and they answered that the number of required soap layers and embedded soaps naturally affected the implementation difficulty; the more layers or objects a design has, the more time and experience it needs.

The preference ranking did not reflect visualization faithfulness. There are visualizations that the soap maker considered them as attractive but they did not represent their respective visualizations well. This was mainly because the soap maker did not understand their visual languages. This can informally reflect how common the visualizations are used. Some notable designs that are preferred by the designer and also generally easy to make are the circular designs, namely design 4 and 10.

As data physicalization possesses many aspects beyond visual form, we also evaluated the results' tactility. The soaps had mild milky fragrance and felt soft when pressed. They dissolved easily in water. Submerged in water at room temperature for 24 hours, all colored parts seemed to dissolve at the same rate and did not disintegrate.

4 Future Work

If our budget allows, we would like to commission a more exhaustive list of visualization types to at least two independent soap makers. A different soap shape may allow other techniques more suitable for specific visual patterns. If possible, we would like to accurately encode data into a soap, plausibly through a more industrial process. Time-varying features such as wrapping one visualization into another, which will dissolve over time and reveal the interior, have been discussed but never implemented.

Visualization specification in another medium is realted to visual literacy problem. We do not know the population's visualization knowledge so we cannot be sure if our soap design description is detailed enough or not. In addition to improving visual literacy, we need a survey on a national scale of current visual literacy level. We hope this work sparks an exploration of other physical visualization mediums, especially ones that can blend data into everyday items.

Acknowledgments

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