A DESIGNER'S APPROACH TO SCIENTIFIC VISUALIZATION: VISUAL STRATEGIES FOR ILLUSTRATING MOTION DATASETS

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ABSTRACT

This is a case study incorporating the process of ideation of an experienced graphic designer into the workflow of a team of programmers to improve scientific visualization methods. This work highlights the current opportunities and reports on the process adopted for beneficial collaboration between designers, computer scientists, and other collaborators. The specific design problem that is addressed is creating illustrative visualization rendering algorithms for describing complex motion data, such as those analyzed in studies of human biomechanics.

PROCESS OF IDEATION

1. Introductory session to specific problem

2. Questions & areas of interest clarified for designer

3. Designer uses current visualizations as reference for alternate strategies

4. Designer uses Adobe Illustrator to produce as many viable graphic solutions, ideas, sketches to the problem as possible (weekly average 63 sketches)

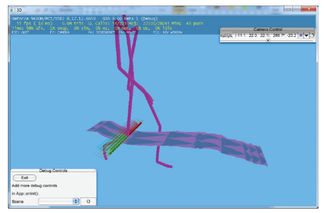
5. Group critiques sketches and determines one example sketch that would be interesting to explore

6. With a very clear visual specification, the programmers are able to implement the idea within a few days

The designer's role in this process is to create an abundance of visual imagery, to spark conversation, inspire solutions, and identify positive and negative visual representations. This design process saves countless hours of programming, while still beingable to produce conversations and achieve visual representations that can be critiqued for the specific dataset. After an introductory session to a specific problem, in this case the axis of rotation of the knee joint (fig. 1), a conversation including many questions and areas of interest are clarified for the designer. Current visualizations that have been created (fig. 1) are given to the designer to use as reference when creating alternate strategies.

From the information collected, the designer uses the knowledge in graphic communication as a whole to create as many 2D graphic visualizations as she finds applicable to the problem. The illustrations were developed using Adobe Illustrator, averaging about 63 illustrations a week to be critiqued. This is along with compiled visual imagery, to be shown as inspiration to the team, in solving similar visual problems. This quantity of visual inspiration excessively speeds up and gives variety to the process of visualizing the scientific dataset. Thus, we have found that the most radical change from our more traditional design processes is the speed at which the designer can create (so that we may all discuss and critique) many illustrations (e.g., fig 1), without having to wait for an idea to be programmed.

Fig. 2 shows one example sketch that we determined would be interesting to explore. With this very clear visual specification set out on paper in front of them, the programmers on the team were able to implement the idea within a few days, connecting it to the underlying dataset to create the animated visualization shown in Fig. 3. Reducing the timeframe of ideation to development to about a week, compared to the multiple months reported previously.



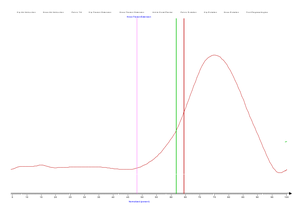


FIG 1 - Current visualizations done by programmers, accompanied data

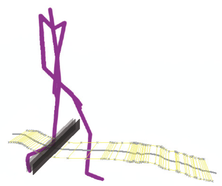


FIG 02 - one example sketch that we determined would be interesting to explore.

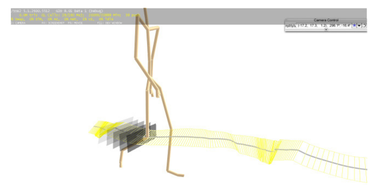


FIG 03 - animated visualization done by programmers from the designer's sketch

CONCLUSIONS & FUTURE WORK

Design is a cross-disciplinary tool and way of thinking. In this research, design has proven beneficial as a method for rapid and expansive production of graphic design illustrations. There are ideas in art and design—creative intuitions—that relate directly to problems in scientific visualization, but that researchers in other disciplines would not necessarily connect. We report in this poster on the processes we have researched to harness these insights in the context of motion visualization. These ideas can expand to address major current challenges in this area, such as understanding the impact of pain and disease on neck kinematics.

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