2021-04226 - Graphical Languages for Creating Infographics

Type de contrat : Convention de stage
Contrat renouvelable : Oui
Niveau de diplôme exigé : Bac + 5 ou équivalent
Fonction : stagiaire de la recherche

A propos du centre ou de la direction fonctionnelle

Located at the heart of the main national research and higher education cluster, member of the University Paris Saclay, a major actor in the French investments for the Future Programme (Idex, LabEx, IRT, Equipe) and partner of the main establishments present on the plateau, the centre is particularly active in three major areas: data and knowledge, safety, security and reliability, modeling, simulation and optimisation (with priority given to energy).

The 450 researchers and engineers from Inria and its partners who work in the research centre's 28 teams, the 60 research support staff members, the high-level equipment at their disposal (image walls, high-performance computing clusters, sensor networks), and the privileged relationships with prestigious industrial partners, all make Inria Saclay Île-de-France a key research centre in the local landscape and one that is oriented towards Europe and the world.

Contexte et atouts du poste

The internship will be funded by the ANR project GLACIS, which studies novel design tools for creative visualizations. The project brings together experts in Human-Computer Interaction, Information Visualization, and Computer Graphics from Inria Saclay (Université Paris-Saclay), Inria Sophia Antipolis, the École Centrale de Lyon, and the University of Toronto (Canada). Depending on the interests and skills of the student, there are many opportunities for collaboration with these research centers.

Mission confiée

Context

This project will investigate interactive tools and techniques that can help graphic designers, illustrators, data journalists, and infographic artists produce creative and effective visualizations for communication purposes, e.g., to inform the public about the evolution of a pandemic or help novices interpret global-warming predictions.

Professionnels communément switch between sketches on paper and computers to reach a new visualization design [Landers and Heller, 2014]. Computer programs are powerful tools that allow professionals to generate solutions keeping a direct binding with the underlying data. But many expert designers first start by exploring visualization solutions through hand-drawn sketches (see Figure 1). Before having access to the actual data, sketches enable them to "visualize the architecture of the infographics and cultivate ideas for shaping the data visually," while later sketching with data can "help raise new questions about the data itself" [Lupi, 2015].

Unfortunately, dominant visualization systems target data exploration and data-analysis tasks and fail to meet communication purposes [Xanana, 2016]. Previous studies [Büttgen, 2014] also suggest that current visualization tools impose a data-to-graphics workflow that hinders visual thinking. As a result, the process of creating an original infographic can be extremely manual, involving multiple tools that are largely disconnected from the underlying data. In contrast, we aim to address the more ambitious goal of computer-aided design that treats infographic creation as a visual-thinking process [Ware, 2008]. This process is driven by the graphics, starting from sketches, moving to flexible graphical structures that embed constraints, and ending with data and generative parametric instructions, which can then re-feed the designer's sketches and graphics.

Figure 1. From sketches to creative data visualizations (by Giorgia Lupi). Left: An early sketch, annotated with custom mappings between visual properties and data dimensions. Right: The final infographic (extract). Our goal is to develop interactive tools that assist this creative process. The National Geographic.

Principales activités

Scope of the Internship

The internship will prepare a fully funded PhD thesis that will study the above problem in depth. A first step, which will be the focus of the internship, is to develop a grammar of expressive visualization structures that accommodates early sketch-based representations and their progressive transitions to formal visualization structures.

Existing visualization grammars, such as Vega [Satyanarayan et al., 2016] and Vega-Lite [Satyanarayan et al., 2017] are well-documented, cover a wide range of visualizations but have major limitations: (1) they are data-driven, that is, they assume that data are already present and have the right format; (2) they do not deal with partly defined visualizations; (3) they support a fixed range of charts in Cartesian coordinates only, and (4) they do not explicitly support sketched graphics. We therefore need to create a new grammar that supports flexible encodings of bespoke visualizations, where these visualizations may consist of informal sketch-based renderings.

To inform our grammar design, we will first look at representative examples of published infographics and artbooks. We will further conduct contextual interviews with infographic artists and graphic designers to identify concrete workflows and techniques that they use to produce creative
visual representations. We will also draw inspiration from existing powerful visualization authoring systems, such as DataInk [Xia et al., 2018], Charticulator [Ren et al., 2019], and StructGraphics [Tsandilas, 2021].

References


Compétences

The candidate is expected to have a Master degree (M2-level for the French system) and background in Human-Computer Interaction, Information Visualization, or Computer Graphics. The candidate must have solid programming skills and be enthusiastic about conducting research (and continue for a PhD thesis) in a topic that combines the above fields.

Avantages

- Subsidized meals
- Partial reimbursement of public transport costs
- Professional equipment available (videoconferencing, loan of computer equipment, etc.)
- Social, cultural and sports events and activities
- Access to vocational training

Rémunération

Gratification