VRG11-010 - Visual Computing: Illustrative Visualization

Abstract

The central focus of our research is to understand visual abstraction. Understanding means 1. to identify meaningful visual abstractions, 2. to assess their effectiveness for human perception and cognition and 3. to formalize them to be executable on a computational machinery. The outcome of the investigation is useful for designing visualizations for a given scenario or need, whose effectiveness can be quantified and thus the most understandable visualization design can be effortlessly determined.

The science of visualization has already gained some understanding of structural visual abstraction. When for example illustrators, artists, and visualization designers convey certain structure, or visually express how things look, we can often provide a scientifically-founded argument whether and why is their expression effective for human cognitive processing. What has not been given sufficient scientific attention to, is advancing the understanding of procedural visual abstraction, in other words investigating visual means that convey what things do or how things work. This missing piece of knowledge would be very useful for visual depiction of processes and dynamics that are omnipresent in science, technology, but also in our everyday lives.

The upcoming project will therefore investigate theoretical foundations for visualization of processes. Physiological processes that describe the complex machinery of biological life will be picked as a target scenario. The reason for this choice is two-fold. Firstly, these processes are immensely complex, are carried-out on various spatial and temporal levels simultaneously, and can be sufficiently understood only if all scales are considered. Secondly, physiological processes have been modeled as a result of intensive research in biology, systems biology, and biochemistry and are available in a form of digital data. The goal will be to visually communicate how physiological processes participate on life by considering the limitations of human perceptual and cognitive capabilities. By solving individual visualization problems of this challenging target scenario, the research will provide first pieces of understanding of procedural visual abstractions that are generally applicable, beyond the chosen target domain.

Keywords:
Scientific visualization, illustrative visualization

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Further links to the persons involved and to the project can be found under
https://wwtf.at/funding/programmes/vrg/VRG11-010/