

Towards Declarative Medical Visualization

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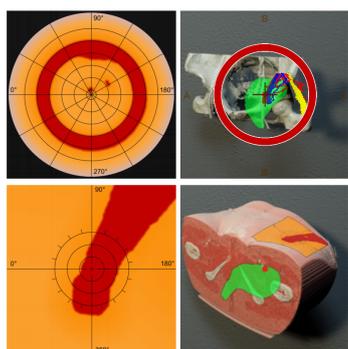


Figure 1: Surgical access planning visualization of risk structures. From left to right, top to bottom: the polar access map, interior patient view, access map and exterior patient view visualize risk along a planned access path. The declarative query for this is “Show me the risk structures on the access path from the skin to a point on the rectum”.

We present the first steps towards Declarative Medical Visualization, a new approach for the specification of visualizations of medical data. Instead of issuing instructions based on the available techniques and their parameters, the intended task is specified, using concepts from an atlas that can be mapped onto the data that is to be visualized. We show two often-occurring examples with our prototype implementation: surgical access planning (figure 1) and anatomical exploration (figure 2). This implementation is based on the Unified Anatomical Human, a growing anatomical atlas of multi-modal and annotated anatomical data, and the ExposureRender visualization system which provides real-time interactive direct volume rendering.

The Declarative Medical Visualization pipeline consists of the following steps (figure 3): First, a patient-specific scan, such as a CT- or MRI-scan, is mapped to the atlas via a co-registration process. This, together with the task and features of interest specified by the user, forms the input for a solver, which then generates a visualization based on this information. It is an ongoing research project, during which

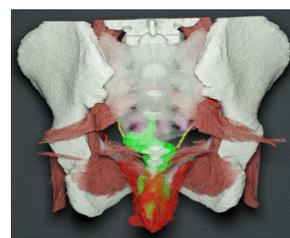


Figure 2: Visualization for anatomical exploration of the rectum (green) and levator ani muscle (red) of a segmentation label volume based on the Visible Korean Human cryosectional dataset. The declarative query in this case is “Show me the rectum and the nearby surrounding musculature”.

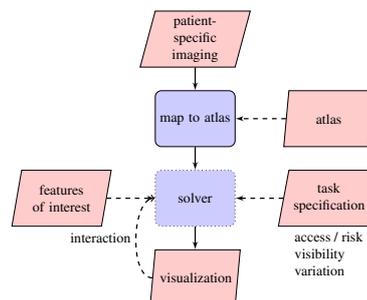


Figure 3: Declarative Medical Visualization pipeline. After one or more mappings have been determined from the atlas to patient-specific data, the solver determines a suitable visualization based on the information that has been mapped to the patient space and the task as specified by the user.

we still have to develop the automatic solver component. We have worked out the two mentioned examples to explore the ideas behind and derive the concepts of Declarative Medical Visualization. Next, we will develop the first working version of the solver. With Declarative Medical Visualization, it will eventually become possible to create an effective medical visualization purely by pointing out features of interest and by formulating one’s task requirements.