The Straightened Mouse: Translating spatial relations between ontologies and geometric models

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Many types of biomedical data have a spatial dimension, e.g. tumours, gene expression patterns and phenotypes can all be associated with a location within a particular organism. This location can be described in natural language, using biomedical ontologies or may be implicitly captured in images. Ideally, we would like to be able to translate between any of these modes of description, primarily for data integration and analysis purposes, but also to enable sophisticated user interfaces.

Biomedical atlases, such as the Edinburgh Mouse Atlas [1], provide a spatio-temporal computational framework that uses both, anatomy ontologies and 3D/4D images. Subsets of voxels in the 3D coordinate space are typically mapped to specific anatomy structure concepts in the ontology. There is, however, limited use of biologically meaningful spatial relations in describing location in an organism.

Particularly challenging is the mapping of locations described in terms of spatial relations based on anatomical axes, such as the dorsal-ventral axis or the anterior-posterior axis[1]. Depending on how much the animal was in a curled-up position when the image was taken, the tip of the nose of a mouse may be depicted only a few pixels away from the end of the tail, although biologically of course these two points are very distant from each other.

In this talk we will present the notion of the straightened mouse, a 3D representation of a canonical mouse embryo that allows the application of anatomical axis, and therefore the use of BSPO-like spatial descriptors, in an atlasing framework. Initial results are presented and future challenges discussed.

[1] See [2] for a description of BSPO, the Biological Spatial Ontology.

References

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