

Automatic interpretation of vasculature

Peter Hall and Paul Mc Kevitt

**Department of Computer Science
University of Sheffield**

Our goal here is to show how the natural language processing (NLP) and the computer processing of visual scenes can be integrated into a single model and computer system architecture. The application domain is that of reconstructing complex blood vessel structures called vasculatures. The proposed architecture incorporates a single knowledge representation for representing knowledge about blood vessel structures. We have developed a knowledge-base which we believe capable of modelling a collection of individual vasculature structures. The vasculature of any given individual is represented by a labelled graph. The input to the system will be in the form of X-ray angiograms and clinical reports associated with those angiograms.

A central advantage of such an integrated language and vision system is the reduction of ambiguity. The Vision component reconstructs angiograms and builds computer models of them. However, the angiograms can include ambiguities on the identification of vessels and will include ambiguities on the spatial relationships of vessels. Also, it is not always obvious where lesions occur on the angiograms. The NLP component will enable the assimilation of written information on peculiarities or the observation of lesions to be integrated within an existing reconstructed model and ambiguities may be reduced. Also, the NLP component will enable the vision processor to constrain its choices during reconstruction and can be used to query the model to obtain further information about it.

Applications of the integrated system will be the tutoring of medical staff on the structure of vasculature, the analysis of particular patient angiograms, and the modelling of effects of treatment on patient angiograms. The integration of language and vision processing within a single model has implications not only for medicine but also for artificial intelligence, psychology, philosophy, and computer science.