# Image Processing for Dynamic Contrast Enhanced Magnetic Resonance Image Sequences

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**Abstract.** Dynamic Contrast Enhanced Magnetic Resonance Imaging (DCE-MRI) is a diagnostic approach which involves to inject a bolus of contrast agent into a patient and to follow the course of the contrast agent with high temporal resolution using advanced magnetic resonance imaging techniques. These advanced techniques require the solution of an inverse problem to reconstruct each image of the sequence. Once the sequence is obtained, the dynamic information is used to reveal potential pathology by solving another inverse problem to estimate distributed tissue transport properties. However, the dynamic contrast agent concentration must be available for individual tissue cites. When there is no motion manifested in the image sequence, as is the case typically for brain imaging, tissue cites can be tracked trivially. However, there is an unavoidable motion manifested in sequences when imaging the abdomen. In this case, the motion must first be removed from the sequence before transport properties can be estimated. Motion elimination is accomplished by aligning each image of the sequence to a selected template. When an explicit coordinate transformation connecting like points is constructed, two images are said to be registered. Defining a notion of like points by means of an image similarity measure is certainly not trivial in the case of DCE-MRI sequences because of the intensity changes which occur. Also, images of the abdomen contain many gradual intensity variations and thus they are far from being piecewise constant, as may roughly be the case for images of the brain. An effective similarity measure may be defined which involves first to identify whole objects which should be aligned accurately one to the other. When an image domain has been divided into subdomains corresponding to meaningfully distinct objects, the image is said to be segmented. PDE based approaches will be presented for the solution of these problems associated with DCE-MRI sequences.