Information about blood flow in the brain is of interest to detect the presence of blockages and ruptures in the vessel network. A standard way of gathering this information is to inject a bolus of contrast agent into the blood stream and imaging over a period of time. The imaging is generally done over an extended period of time (tens of minutes) during which a patient can move which in turn results in corruption of the acquired time series of volumes. This problem is often observed in dynamic magnetic resonance (MR) imaging. Correction for motion after scanning is a highly time-intensive process since it involves registering each volume to a reference volume. Moreover, the injected contrast alters the signal intensity as a function of time and often confounds traditional motion correction algorithms. In this thesis, we present a fast and efficient solution for motion correction in 3D dynamic susceptibility contrast (DSC) MR images. We present a robust, multi-stage system based on a *divide and conquer* strategy consisting of the following steps: i) subdivision of the time series data into bolus and non-bolus phases depending on the status of bolus in the brain, ii) 2D block-wise phase correlation for detecting motion between adjacent volumes and categorizing the corruption into four categories: none, minimal, mild and severe depending on the degree of motion and iii) a 2-pass, 3D registration consisting of intra-set and inter-set registrations to align the motion corrupted volumes. The subdivision of time-series into distinct sets is achieved using Gamma variate function (GVF) fitting. The dynamic non-uniform variation in signal intensity due to the injected bolus is handled by employing a clustering-based identification of bolus-affected pixels followed by correction of their intensity using the above GVF fitting.

The proposed system was evaluated on a real DSC MR sequence by introducing motion of varying degrees. The experimental results show that the entropy of the derived motion fields is a good metric for detecting and categorizing the motion. The evaluation of motion correction using the dice coefficient measure shows that the system is able to remove motion accurately and efficiently. The efficiency is contributed to by the proposed detection as well as the correction strategy. Including the detection prior to existing correction methods achieved a savings of 37% in computation time. Whereas, when the detection is combined with the proposed correction stage, the savings increase to 63%. Notably, the above performance was found to be had with no trade-off between accuracy and computation cost.