

Perfusion data (dynamic contrast-enhanced image data) are used to characterize regional tissue perfusion. Perfusion data consist of a sequence of images, acquired after a contrast agent is applied. Perfusion studies are used for diagnostic purposes in oncology, ischemic stroke assessment, or myocardial ischemia. The diagnostic evaluation of perfusion data is challenging, because the data is very complex and exhibits various artifacts (e.g. motion). Important aspect in the diagnosis of perfusion data is the correlation between perfusion data and derived time-intensity curves (TIC) as well as with other image data, in particular with high-resolution morphologic image data.

The present work is focused mainly on cerebral, brain perfusion studies. The thesis studies their medical background as well as the process and possibilities of their examination. Discusses different ways of processing of perfusion series and designs own approach. The work also includes an overview of possibilities for every single step of the processing procedure (registration, segmentation, analysis and visualization) and selection of the most suitable approach for the particular part of processing in the context of cerebral perfusion studies. Results of the work also include a multiplatform application enabling study and analysis of perfusion data (by using readily available PC) which ensued from implementation of procedures described in the work. It supports different types of visualizations as well as tools for their analysis resulting into more effective diagnostics. It's most valuable advantage is that it solves today's maladroit style of processing of perfusion data: perfusion maps are possible to be created only on CT stations immediately after the respective examination. Counter to results generated by that way, it disposes with wider range of visualization techniques as well as interactive tools for their analysis.