

The renal cancer is one of the most significant malignant disease with still limited success of treatment. In Poland, more than 2500 people suffering from this disease die every year. The question is how we can augment the results of treatment. As usual, the significant problem is in early and proper diagnosis of the patients. From one side we can observe the symptoms of the disease and from the other prior to definitive treatment we need the precise diagnosis. Till now, we rich for image analysis. The most popular and useful are CTA. The data are collected in the DICOM format. The information stocked in this format is of course limited and well established. We propose enlargement of possibilities hidden in this information. The appropriate evaluation of the cancer presence, localization in the kidney structure, mass volume and type are the crucial elements for surgeons.

The proposed project is focused on the new methods of image processing for the renal structure recognition, analysis and modeling based on CTA imaging. In the last years we noticed an initiation of the new research directions such as 3D texture, extended organs modeling (not only their elevations), and new mathematical transformations to the increase of image resolution for better renal structure dimensioning and visual modeling. The project team would like integrate with this current research and proposed new solutions addressed to the biomedical engineering. Also, extended analysis of tissue structure description based on CTA imaging will be realized in the aim to augment the accuracy of renal lesion recognition basing on radiology. The research methodology is based on the expertise of the image processing methods of the team from the Warsaw University of Technology supported by the medical experts from the Military Institute of Medicine, the most recently publication in the international journals, and also few preliminary results in this topics. The study data will be collected and evaluated by the medical experts in radiology, surgery and pathomorphology. Finally, a verification of the accuracy of kidney structure recognition, dimensioning and modeling will be performed basing on the macroimaging and histological diagnosis.

The impact of this project will be the new image processing methods, verification of hypothesis of differentiation possibilities of the renal cancers based on the CTA imaging, as well as creating the novel and promising tools for the future application in medical practice. The main social impacts of our results in the future will be better and quicker diagnosis, objective assessment of neoplastic lesions in the kidney as well as a support the physicians prior to surgery.