In clinical practice cartilage thickness estimates can be used to stage joint disease in a primary diagnosis and in evaluation of pharmacological or surgical procedures.

In literature on image based thickness measurement in both CT and MRI it is generally acknowledged that the finite width of the PSF limits accuracy of measurement in thin sheet structures like cartilage. These methods utilize second derivative zero crossings for thickness measurement. The observed bias in the thickness estimates start to become significant in the sub millimeter regime even in high resolution CT protocols where the FWHM of the PSF is approximately 0.7 mm.

We developed a method for accurate thickness measurements of such small layers by taking into account the effect of the PSF. To this end the orientation of the cartilage layers is estimated using gradient vector information in the cartilage region. Subsequently, a model of the attenuation profile across the cartilage layer is convolved with a measured PSF to obtain an intensity profile that is fitted to the image data.

Results of thickness estimates from simulated image data reveal that our method is unbiased in contrast to the method based on second derivative zero crossings. We illustrate the usefulness of our method by comparing measurement on CT arthrography images with results obtained from high resolution anatomical sections that served as a reference.

We conclude that incorporation of the PSF in the measurement method allows for accurate cartilage thickness estimates even in the sub millimeter range.