The Thesis describes new methods for automatic processing of image data in biology, physics and medicine. The developed methods reconstruct light microscopy images of growing microorganisms in intervals between observations, measure particles in atomic force microscopy images, and evaluate parameters of vocal fold vibrations in videokymographic images. All three problems have been hitherto solved primarily visually. The proposed methods allow automatic or computer-aided processing of the image data, and thus facilitate the evaluation process. Performance of the developed methods was tested on real images; the results were comparable with ground truth or results of visual evaluation. Application of the developed methods is not limited to the specific type of image data; the methods can be used in general for processing of images with similar characteristics.