This thesis deals with the estimation of model parameters of the interacting segments process in plane. The motivation is application on the system of stress fibers in human mesenchymal stem cells, which are detected by fluorescent microscopy. The model of segments is defined as a spatial Gibbs point process with marks. We use two methods for parameter estimation: moment method and Takacs-Fiksel method. Further, we implement algorithm for these estimation methods in software Mathematica. Also we are able to simulate the model structure by Markov Chain Monte Carlo, using birth-death process. Numerical results are presented for real and simulated data. Match of model and data is considered by descriptive statistics.