## Variational Problems of Plastic Surgery

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Plastic surgery is an important area of medicine. Apart from the aesthetic surgery, it also includes many types of the reconstructive surgery. Many of these operations imply massive interventions and need careful preparation and planning. The computational simulation of plastic surgery, that is, the development and use of mathematical models for preoperative planning as well as for postoperative evaluation is becoming quite usual. The most challenging problem in surgery computer simulation is the modelling of soft tissue behaviour, as well as of the knitting conditions. From the mathematical point of view, soft tissue deformation is described by a map from the original domain to its deformed counterpart. Soft tissue can be modelled as a hyperelastic material, that is, a material satisfying the standard thermodynamic axiom of non-negative works in closed processes. In this model, the deformation is a minimizer of the stored energy functional. Consequently, calculus of variations turns out to be a natural tool to describe the soft tissue deformations. General Variational Problem of Plastic Surgery, introduced not long ago, is a problem of calculus of variations with unusual boundary conditions, known as knitting conditions. These conditions model suturing and are fundamental for surgery simulations. In this talk we discuss variational methods in plastic surgery modelling. The main problems addressed are the existence of solutions for problems of calculus of variations with knitting boundary conditions, necessary conditions of optimality, approximation of solutions, numerical methods for the knitting problem, and the optimization problem of data fitting in the framework of parameter estimation.