SUMMARY: This dissertation is focused on the biomechanics of extreme loads. Experiments in this area are very difficult to implement, they are usually based on the extrapolation of the measurements provided with volunteers, PMHS, etc. The project is based on the assumption that traffic accidents generate loads that correspond to a definition of extreme loading. Their mathematical simulations allow us to map and evaluate them. This dissertation covers three areas: pedestrian accidents, side impact of a child and whiplash injuries. The thesis presents a detailed analysis of selected processes including sensitivity analysis of impact conditions and of impactor parameters.
Problem: The main task is to deal with the problem of description and analysis of extreme loads. It is focused on traffic accidents and their analysis is performed by a computer simulation.
Hypothesis: An analysis of accidents by a computer simulation is an adequate tool to determine human body tolerance to extreme loadings.
Objective: Utilisation of available data from selected traffic accidents and of their subsequent simulation to determine extreme loads of people during traffic accidents.
Method: The chosen method is a computer simulation. The multibody dynamics is an analysis tool of a collision with a pedestrian. The finite element method is applied for the side impact of child dummies.
Outcomes and Conclusions: The results are compiled mathematical models of selected accidents and a sensitivity analysis on input parameters. The results show that the loads correspond to the definition of extreme loads. A computer analysis of real accidents is an appropriate research tool in the field of the biomechanics of extreme loads.
Key words: extreme load of human organism, biomechanics of injury, accident, computer simulation, system dynamics, finite element method.