Modeling physical systems usually results in complex dynamic models. It is often desirable to replace these models by simpler ones. In this process of simplification, it is important to design the reduced model so as to capture the important properties of the original model. This thesis redesigns equation-based model reduction method on DAE (Differential Algebraic Equation) or ODE (Ordinary Differential Equation) systems for Modelica models, and then applies this reduction method to two sample models in order to evaluate the results of reduced models and the cost of reduction process.

The equation-based model reduction method consists of three major steps. The first one Labeling used for identifying terms of a DAE or ODE system by adding labels beside of each term. The second one Ranking, estimates the influence of reductions on the solution of the system under consideration. The last one is actual Reduction, to take the sorted terms in increasing order with respect to their influence on the solution in order to perform the reduction as long as the solution of the reduce DAE system remains within a user-defined error bound.