Non-Linear Thermoelastic Analysis of the Nylon Actuator

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Abstract. A new actuator, consisting of two nylon springs, is designed in a form of the von Mises truss system. The nylon spring (an artificial muscle) is produced by twisting of the nylon line. As a result of the twisting into the prestressed spring, a new microstructure of the fibre has been formed. The spring, after its mechanical elongation, exhibits a negative temperature expansion after its warming. This is the main advantage for the practical applications. The heating of the actuator is realized by the electric wire, which is wound on the nylon springs. Semi analytical and numerical methods are used for geometric non-linear thermo elastic analysis of the actuator to obtain its deformation caused by the electro-thermo-mechanical loads. The calculated results are verified by the measurement on the real model. A very god agreement of both the results is obtained.