

## **Mathematical modelling of the flexible one-link robot manipulator by finite element method**

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### **SUMMARY**

This paper deals with a procedure for finite element modelling of dynamics of a robot manipulator with a flexible link. Lagrange's equations are employed to obtain the final form of the mathematical model. The model includes the damping effect of link vibrations and joint geometry effects as well. The obtained model is nonlinear and it reflects the coupling of rigid and flexible modes of manipulator's motion. The expression for link's bending moments calculation is given in this paper for possible measurement and control purposes. The experiments on the flexible robot manipulator were performed in order to verify the obtained model. Experimental and simulation results were compared using the frequency and time domain responses. Due to its accuracy and applicability on computers, the obtained model represents a good basis for advanced control strategies application.

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