Dissertation summary

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title:	Selected problems of stability and observability of Timoshenko beams
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keywords:	Timoshenko beam, asymptotic stability, optimal decay, stability margin, exact observability, Riesz basis, divided differences

The following dissertation is devoted to the analysis of stability and observability of a particular model of vibrations in beams, the so-called Timoshenko beam model.

The structure of the work is as follows: after preface there are four chapters. The first two of them are devoted to the introduction of basic definitions and theorems, which are necessary in the main part of the dissertation.

In the third chapter, we analyze stability of Timoshenko beam model including damping effects. To this end, we carry out spectral analysis of the operators associated with differential equations describing the system under consideration. Then we prove that in some particular cases those operators satisfy spectrum determined growth condition, which means that the location of the spectrum allows us to determine the stability margin of the system. Furthermore, we investigate the existence of an optimal decay rate. At the end we compare the obtained results with other damping operators.

In the fourth chapter, we consider the problem of exact observability of a general class of distributed parameter systems in Hilbert spaces. We prove that the system with some specific assumptions on spectrum and eigensystem is not exactly observable in default topology setting. Then we find stronger topology for state observation for which the system becomes exactly observable. In the end, we show that clamped-free Timoshenko beam system satisfies obtained results.

April 7, 2021 Mateusz Firkowski