Extended Abstract
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ANALYTICAL STABILITY IMPROVEMENT OF THE PERIODIC VIBRO-IMPACT PROCESSES

Jan Awrejcewicz, Krzysztof Tomczak
Division of Automatics and Biomechanics
Technical University of Łódź
1/15 Stefanowskiego St., 90-924 Łódź, POLAND

In this paper an attention is focused on stabilisation improvement of periodic orbits of one- and two-degree-f-freedom nonautonomous vibro-impact systems.

The vibro-impact systems are very important in industry. It turned out that purely theoretical impact models governed by an artificial rule between the velocities just before and just after an impact (joint via the restitution coefficient) had not been satisfactory confirmed with the experiments.

Nowadays, in the field of the vibro-impact phenomena two main directions of investigations are dominating. The first one concerns the mathematical description of a vibro-impact motion including the restitution coefficient. The experimental investigation shows that it depends on many parameters such as material of impacting bodies, their shapes and velocities and therefore it is difficult to define it exactly.

The second direction concerns the control of vibro-impact systems. Many references are devoted to a field of control of the nonlinear systems including the control of chaotic orbits. Among them we mention only the control methods with a delay loop, the adaptive control, the learning control systems and others.

Generally, the aim of those approaches is to control rather complicated systems where mathematical model is not known and their dynamics is tracking numerically. In contrary to those methods, in this work we propose an analytical approach to determine suitable delay loop coefficients to realise the required vibro-impact periodic dynamics in a non-resonance case. The obtained analytical formulas allow for a proper choice of the delay loop coefficients in order to achieve the required vibro-impact periodic motion quicker then in the case without a loop. When the vibro-impact periodic motion is achieved the delay loop is automatically switched off.

To date, in the literature available to the authors, in order to achieve the mentioned objective, the feedback loop coefficients have been adopted in a random way, using the numerical observation. In this paper this problem was solved analytically.