

MATEMATIČKI INSTITUT SANU, ODELJENJE ZA MEHANIKU
Mathematical Institute SANU, Belgrade, Department for Mechanics

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Program of Mechanics Colloquium – FEBRUARY 2012

Start of each lecture is at each Wednesday at 18,00 h in room 301 F at Mathematical Institute SANU, street Knez Mihailova 36/III.

Sreda (Wednesday), 22 februar (February 22) 2012 u 18 sati (18h)

Lecture No. 1179

Prof. dr **Dejan B. Popović**, Professor of Biomedical Engineering, University of Belgrade, Faculty of Electrical Engineering

Corresponding member of the Serbian Academy of Sciences and Arts

Control of Walking in Humans with Disability

Summary:

Exoskeletons are mechanical systems composed of rigid bodies that are interfacing human body with the intention to control posture and movement. The operation of two parallel systems that are not identical is very complex. In parallel, it is possible to externally activate muscles and provide control of posture and movement. The only method to analyze the behavior of these systems is to generate a simplified model in a manner that allows parameters identification. We present the simplified model of the leg with the muscles as the actuators, as well as the considerations for the control of an exoskeleton of the hip, knee and ankle joints. We present a method for optimal control based on the minimization of the tracking error with the penalty function based on over all power requirements. The optimal control was simulated within the MatLab. The implementation of this model based control is not possible, but the results of simulation can be used for the synthesis of rule based control.

Sreda (Wednesday), 29 februar (February 29) 2012 u 18 sati (18h)

Lecture No. 1180

Prof. dr **Dragomir N. Zeković**, University of Belgrade, Faculty of Mechanical Engineering, Kraljice Marije 16, 11120 Beograd, Serbia (Project OI174001)

Dynamics of mechanical systems with nonlinear nonholonomic constraints – II The history of solving the problem of a material realization of a nonlinear nonholonomic constraint

Abstract. That is why are presented the models of the NNC which possess a clear physical sense, on the basis of which certain statements on the method of variation and the reaction of the NNC can be given. With regard to the clear physical sense and the nature of the models cited, the NNC that come out of them are used quite normally in the analysis of motion of such a system.

The cited models, together with standard models of nonholonomic Mechanics (sphere, disk, blade) make a group of basic nonholonomic constraints which can be classified, according to the three criteria, into certain types. Finally, it is shown that the cited model can be used for the construction of “nonholonomic chains”, both open and closed ones.

References

- [1] E. Delassus, Sur les liaisons non lineaires, C.R. Acad. Sci. (France) **153**, 626–628 (1911).
- [2] P. Appell, Sur les liaisons non lineaires par rapport aux vitesses, Rend. Circ. Mat. Palermo **33**, 259–267 (1912).
- [3] Y. I. Neymark and N.A. Fufaev, Dynamics Nonholonomic Systems 519 (Nauka, Moskva, 1967).
- [4] D. Zeković, On the postulate Chetaev and the reaction of the constraint for nonlinear nonholonomic systems, Tehnika (Beograd) **44**(3–4), 251–254 (1989).
- [5] Y.N. Maslov, On nonholonomic system on nonlinear constraints, Nauč. tr. Tašk. Un-ta **242**, 37–47 (1964).
- [6] S.V. Novoselov, Exemple nonlinear nonholonomic constraint, non relate to by type N. G. Chetaev, Vestnik Lenin. Un-ta **19**,

106–111 (1957).

[7] D. Zeković, One Problems Dynamics Nonholonomic Systems on Application to Technic Objects, Dissertation 76, Faculty of Mechanical Engineering, (University of Belgrade, Beograd, 1984).

[8] E. Virga, Un osservazione sui vincoli anolonomi non perfetti, Riv. Mat. Univ. Parma **13**(4), 379–384 (1987).

[9] D. Zeković, On qvasinonlinear nonholonomic constraints in Classical mechanics, Tehnika-Mašinstvo (Beograd) **43**(8–9), 1–3 (1994).

[10] D. Zeković, Exemples of nonlinear nonholonomic constraints in Classical mechanics, Vestnik Mosk. Un-ta, Ser. 1, Mat.-Meh. **1**, 100–103 (1991).

[11] D. Zeković, On types nonholonomic constraints in Classical mechanics, Tehnika-Mašinstvo (Beograd) **48**(6), 11–13 (1999).

[12] D. Zeković, On realization on general dynamical model in Classical mechanics, Tehnika-Mašinstvo (Beograd) **48**(2), 7–10 (1999).

Предавања ће се одржавати средом са почетком у 18.00 часова, у сали 301 F на трећем спрату зграде Математичког института САНУ, Кнез Михаилова 36/III, (зграда преко пута главне зграде САНУ).

Позив научницима и истраживачима да пријаве своја предавања

Пријава потенцијалног предавача треба да садржи апстракт предавања до једне странице на српском језику ћирилицом и превод на енглески језик, као и CV обима до две странице. Пријаву послати на адресу управника Одељења за механику у виду Word DOC на адресу: khedrih@eunet.rs

Announcement and Invitation

Start of each lecture is at each Wednesday at 18,00 h in room 301 F at Mathematical Institute SANU, street Knez Mihailova 36/III.

All scientists and researchers in area of Mechanics are invited to contribute to the Program of Mechanics Colloquium of Mathematical Institute of Serbian Academy of Sciences and Arts. One page Abstract of proposed Lecture with short CV is necessary to submit in world doc to Head of Department of Mechanics (address: khedrih@eunet.rs), one month before first day in the next moth.



Katica R. (Stevanovic) Hedrih
Head of Department of Mechanics