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# A way of human gait modeling

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*This paper presents an algorithm of modeling human gait and gives a description of the planar problem, when the motion occurs in the sagittal plane. The time of the double support phase is assumed infinitesimal. The effect of hand movements is not taken into account. Modeling the human gait (including the forces applied to the end of the supporting leg in the single support phase of the step) leads to the results concerning forces applied in the hip, knee and ankle joints (for a supporting leg) in the process of movement.*

**Keywords:** modeling, step, human walking, single support phase, pendulum, anthropomorphic mechanism.

## REFERENCES

- [1] Bogdanov V.A., Gurfinkel' V.S. Biomekhanika lokomotsii cheloveka. V kn. *Fiziologiya dvizheniy* [Biomechanics of human locomotion. In: Physiology of movements]. Leningrad, Nauka Publ., 1976, pp. 276–315.
- [2] Formal'skiy A.M. *Peremeshchenie antropomorfnykh mekhanizmov* [Moving of anthropomorphic mechanisms]. Moscow, Nauka Publ., the Chief Editorial Board of Physical and Mathematical Literature, 1982, 362 p.
- [3] Belet'skiy V.V. *Dvunogaya khod'ba: model'nye zadachi dinamiki i upravleniya* [Bipedal walking: modeling problems of dynamics and control]. Moscow, Nauka Publ., the Chief Editorial Board of Physical and Mathematical Literature, 1984, 288 p.
- [4] Irving P. German. *Fizika organizma cheloveka* [Physics of human organism]. Dolgoprudnyi, izdatel'skiy dom «Intelekt» Publ., 2011, 992 p.
- [5] Kapandzhi A.I. *Funktsional'naya anatomiya. Nizhnyaya konechnost'* [Functional anatomy. Lower limb], vol. 2, 6<sup>th</sup> edit. Moscow, EKSMO Publ., 2010, 352 p.
- [6] Bernshtein N.A. *Fiziologiya dvizheniy i aktivnost'* [Physiology of movements and activity]. Moscow, Nauka Publ., 1990, pp. 373–392.
- [7] Vitenson A.S. *Zakonomernosti normal'noi i patologicheskoi khod'by cheloveka* [Laws of normal and pathological human walking]. Moscow, LLC Zerkalo-M Publ., 1998, 271 p.

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