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The Use of the Limit Cycles of Dynamic Systems for Formation of Program Trajectories of Points Feet of the Anthropomorphous Robot

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Abstract : The movement of points feet of the anthropomorphous robot in space occurs along some stable trajectory of a known form. A large number of modifications to the methods of control of biped robots indicate the fundamental complexity of the problem of stability of the program trajectory and, consequently, the stability of the control for the deviation for this trajectory. Existing gait generators use piecewise interpolation of program trajectories. This leads to jumps in the acceleration at the boundaries of sites. Another interpolation can be realized using differential equations with fractional derivatives. In work, the approach to synthesis of generators of program trajectories is considered. The resulting system of nonlinear differential equations describes a smooth trajectory of movement having rectilinear sites. The method is based on the theory of an asymptotic stability of invariant sets. The stability of such systems in the area of localization of oscillatory processes is investigated. The boundary of the area is a bounded closed surface. In the corresponding subspaces of the oscillatory circuits, the resulting stable limit cycles are curves having rectilinear sites. The solution of the problem is carried out by means of synthesis of a set of the continuous smooth controls with feedback. The necessary geometry of closed trajectories of movement is obtained due to the introduction of high-order nonlinearities in the control of stabilization systems. The offered method was used for the generation of trajectories of movement of point’s feet of the anthropomorphous robot. The synthesis of the robot's program movement was carried out by means of the inverse method.

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