Swing-up control of the cart-pole system with drive motor by velocity bi-gradient method

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The article considers the problem of swing-up control of the cart-pole with drive motor. A cart-pole is a mechanical system consisting of a pendulum attached to a cart that rolls freely on a flat surface. The velocity bi-gradient method is chosen to design the control algorithmic synthesis. As the control system consists of two subsystems and the control objective depends only on the output subsystem phase variables there is a good reason to consider the first and the third stages of the velocity bi-gradient method. Control of mechanical subsystem is based on the energy approach with partial feedback linearization and energy shaping. Energy approach has proved to be useful in the task of stabilizing the unstable equilibrium position of the pendulum systems and swing-up control. The design procedure and simulation results confirming the achievement of the specified control objective are presented.

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