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HYPERBOLIC FUNCTIONS THAT LINEARIZE INVERTED MANIFOLD SURFACES

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Abstract. In this paper a control law that linearizes inverted dynamics is developed. The equation for inverted circular dynamics is derived from differential method and an integral method. By making alternate approximative assumptions of the inverted circular manifold with hyperbolic functions, an inverting control function is derived. Computer simulation results show that the alternate manifold linearizes the inverted dynamics. Analog simulation results show that the developed control law in this paper linearizes inverted dynamics. The method can be applied other nonlinear systems that have a gain term for the position of the angle in the sinusoid nonlinearity such as the space station. Because of torque requirements of the actual inverted systems such as the space station and inverted pendulum, a nonlinear adaptive gain is added. The adaptive gain is derived from a hyperbolic function which also results in a linearizing inverting function.

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