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A LAZY LEARNING CONTROL METHOD USING SUPPORT VECTOR REGRESSION

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Abstract. *Lazy Learning is a new modeling method using memory-based learning. It is applied to control methods using a modeling technique. This paper proposes a new method that can be applied to position control. This method provides a way of setting the query point. Lazy Learning thus performs as a controller in the proposed method, not as an inverse model of the controlled system as in the conventional method. This paper also describes a new local modeling method of Lazy Learning using Support Vector Regression instead of Linear Weighted Average. The effectiveness of the proposed methods is confirmed by computer simulations for position control using a one degree of freedom robot arm with friction.*
Keywords: Lazy learning, Support vector regression, Query, Position control, Robot arm

1. **Introduction.** To control a certain system, a controller needs knowledge about its physical modeling. The physical modeling is represented by a mathematical model with dynamic characteristics. Although many methods for identification of a certain system have been proposed, it is difficult to precisely represent the latest large-scale complicated system according to a conventional identified model.

Conventional methods comprise one global mathematical model covering the whole range applied to a controlled system. Parameters in this model have to identify using input-output data obtained by the system. However, it is difficult to cover the whole range applied to the system with one mathematical model. Furthermore, a limit of identification performance deals with a previously identified model shape. To overcome these problems, a method is proposed that covers the whole range by combining several local models. This method, called local modeling [1], has the advantages that it is easy to raise the identification accuracy and that the mathematical model for identifying the system becomes simple because it is easy to decide parameter values when only a narrow area of a system needs to be identified.

However, in the method of estimating a mathematical model, whenever data is obtained, the model is updated and the previously obtained data is discarded. As in the opposite method, a new modeling method called Lazy Learning [2, 3, 4] is proposed. Unlike the conventional method, this method utilizes the database. Lazy Learning is a memory-based learning method for estimating the output for a query. The database stores the new data