



Adaptive Control for a Scara Manipulator

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Our Scara robot (as shown in figure 1) can be considered a nonlinear system. To be able to control this nonlinear system effectively, we must linearize this system by using some techniques such as input-output state feedback. One of major problems of such method will occur when some nonlinear terms, used in calculating control signals, are not exactly equal to ones of the actual system. In order to solve this problem, the adaptation of the system parameters in the controller is applied in this research.

The schematic diagram in Figure 2, is an adaptive controller for our Scara robot. Such a controller is formulated by separating unknown constant parameters from known functions in robot dynamic equations. The type of instability for each adaptive control strategy is induced when parameter uncertainty occur in the system. An adaptive control strategy is implemented to enhance tracking performance. Parameters based on estimation are adjusted by an adaptation updating rules. These rules use a function of robot configuration and tracking error.

Our previous work is in developing a dynamic model of this Scara robot. We have implemented input-output state feedback linearization to get a linear model.

The objective of this research is to design an appropriate adaptive algorithm that is used to adjust estimated parameters close to the real values. These algorithms must keep tracks parameter changing and uncertainty in order to maintain robustness. Our research will enhance the performance of the Scara robot while picking up or manipulating different weights. Although our on-going experiment at FIBO is

for two degrees of freedom manipulator, the result will be applicable for higher degree of industrilized robots.

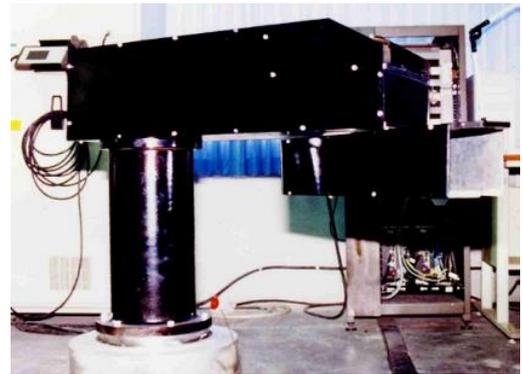


Figure 1 A Scara robot at FIBO lab

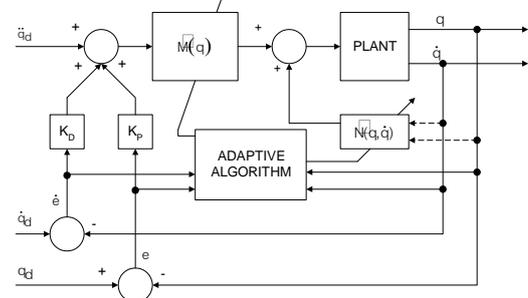


Figure 2 A block diagram indicating the controller and dynamic model of manipulator

Our operation plan is as follow :

1. Study the dynamic model of this Scara robot.
2. Design an appropriate adaptive algorithm.
3. Simulate this new-designed algorithm to verify its effectiveness.
4. Implement the algorithm in actual experiments.