Thesis Title	Adaptive PD Controller Design for CT-Scanner Gantry
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ABSTRACT

CT-Scanner is a machine for performing x-ray computerized tomography, which has long been developed especially in the field of diagnostic medicine. The salient feature of the machine is that it enables doctors to view internal organs without any operation. Transmitted x-ray intensity about the attenuation properties of tissues, that depends on which the x-ray beam has traversed through an object at different angle positions of moving a detector round the same object, is converted into multiple projections of the slice. Then, 2-D image on a certain plane of the related slice is reconstructed from them. Such machine is mainly composed of x-ray system and motion control system of gantry. To prevent any error, the purpose of control system design is required for accurate angle position and velocity.

According to particular control system design in this framework, all plant parameters of the gantry are assumed to be constant quantities with unknow values of them. An available controller that can be employed for compensation over rotation dynamics of such mechanical system is adaptive PD one. As a result of constrast, the novel adaptive PD controller scheme is different from basic adaptive PD controller and previous adaptive PD controller in two ways. Firstly, the new control law especially in feedforward part is extended to include compensation of viscous friction that exists in motion control of the gantry. Secondly, desired angle acceleration of trajectory profile is used as a portion of the on-line parameter estimations in new adaptation law, instead of the actual angle acceleration that be obtained through numerical differentiation of measured angle position with respect to time. The latter distinction contributes to alleviate the effects of noise. By selecting suitable Lyapunov function candidate and performing to derive

stability condition of closed-loop system, these avoid disadvantages of the priori knowledge that may be difficult to determine or calculate their sizes directly or of the off-line parameter estimations before implementation of real time control. Without identifying the exact values of parameters to be also a portion of the on-line parameter estimations, the new adaptive PD controller design is achieved while the previous adaptive PD controller remains disable. Thus, the controller design procedure is reduced reasonably.

Due to the comparison of closed-loop system responses of effective, novel adaptive PD controller against that of conventional PD one, the tracking result of adaptive PD control system indicates better performance than of conventional PD one.