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# 論　文　要　旨

論　文　題　目

A Joint Research of Multivariable Robust Control and Adaptive Wireless Tele-Communication System
(多変数ロバスト最適制御系とワイヤレス適応信号処理の融合)

In this thesis, a research on joint system of robust control and wireless communication has been studied. In the first half of this thesis, control system has mainly conducted and studied and the latter half is joint study on control system and signal processing. Control system categorized to several kind of studies. One of them is robust control that has mostly studied for linear system analysis and design. Unlike robust control system, adaptive control system handled for non-linear system. In this research we have chosen our model for small-scaled wind turbine. The linearized small-scaled wind turbine system considered as control object for robust control and for adaptive control we have analyzed for non-linear model of small-scaled wind turbine. First of all, for robust control system, we have designed Internal Model Controller (IMC) that considers the control object and time-delay uncertainty. Moreover, it minimizes the energy of external disturbance. As well, its stability is guaranteed by small gain theorem. Thus, IMC can minimize the effect of uncertainty and external disturbances, simultaneously. Next approach is adaptive controller design based on non-linear model. Adaptive controller consists of pitch angle control and Adaptive Friction Control (AFC). Pitch angle control is used for performance enhancement and stability preservation is guaranteed by AFC. The main reason to use AFC is to utilize the stall control of angular velocity even in storm status. Therefore, by utilization of these two methods, we could confirm the stability and performance enhancement. Moreover, in order to clarify and distinguish the stability and performances, Phase plane method has been proposed. The significant reason for utilization of this method is stability of non-linear system can be distinguished even for long time frame in distinct scale.

The next half thesis is about the signal processing. Even though we have proposed IMC in order to minimize the time-delay element effects in sensitivity function and also uncertainty of control objects. However, for multipath channel system IMC cannot be realized easily due to utilization of Pade' approximation in model part since closed-loop becomes high dimension. As result, due to this matter performance could be degraded. So, we have studied about signal processing technology to overcome this redundancy. The proposed scheme is to easily implement an equalizer in receiver side. Proposed method is implemented in conventional feedback control system that requires two equalizers, one for plant and the other one for controller. As a consequence, we could realize a sufficient response.

Finally, as a result of this study, we could realize and confirm the feasibility for the joint system of multivariable robust control and adaptive Tele-communication system.

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