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Adaptive PD Controller Performance for Direct Cooling of Thermoelectric Refrigerator

Abstract

Refrigerator is the key component to keep the medicine and biological sample in the hospital. The domestic refrigerator has the problem of larger size and heavier weight since to the compact system like condenser, compressor, evaporator and expansion valve are assemble and using in the refrigerator. This project focused on design of temperature control of the portable thermoelectric refrigerator for medical purpose. Thermoelectric refrigerator is using the direct cooling method through thermoelectric module. Thermoelectric refrigerator has several advantages such as smaller size, lighter and silent when operated. Since maintain a constant temperature for the storage of medical product is important, a specific refrigerator is needed to ensure the medicine is stored in desired temperature. This project is to design and develop an adaptive control system which can perform a good temperature control for the thermoelectric refrigerator. The second order model is applied to design adaptive Proportional-Derivative (PD) controller. The selected controller is the adaptive PD controller because the performance of response shows 0.42 C of less steady state error and 0.21 C of lower undershoot. The adaptive PD control system designed able to let the refrigerator operate in different operating condition without influence the performance of the refrigerator.