

ABSTRACT

Central Processing Unit (CPU) is a unit where instructions are being processed. CPU might reach high temperature when it is used in very long term, and the full state of CPU involving several components such as processor, memory, and VGA is loaded simultaneously. The maximum temperature or so-called critical temperatures and CPU utilization describing the performance of the processor can be used as a reference for analyzing the optimum work of CPU. A heat sink and fan are usually applied around the processor in order to distribute heat via absorption, conduction, and convection heat transfer. In this study, a force convection process in CPU will be controlled using Proportional control, Integral control, and Derivative control (PID). We tune initial PID control parameters using Ziegler Nichols curve as well as simulate the PID control effect using MATLAB software. The initial results are further implemented experimentally on Processor Intel® Pentium® 4 CPU 3.00 GHz. Further, the temperature distribution is modeled and analyzed using Comsol Multiphysics 4.4 software. The temperature stability is observed to be more quickly achieved when the PID control is applied with parameter values of $K_p = 40$, $K_i = 33.33$, $K_d = 4$. A stable temperature 324 K is reached within 500 s. On the other hand, the temperature is stabilized at 326 K within 3000 when the CPU is run without PID control.

Keywords: heat transfer, force convection, PID control.