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Abstract
In the past few years, there has been a lot of aggressive developments in fuzzy field, such as air-conditional control, GPS data processing, image processing, pattern recognition and so on. By using the linguistic rules which capture the approximate and qualitative aspects of human knowledge, the FLC (Fuzzy Logic Controller) can infer desired output actions properly. The key benefit of FLC is that the system behavior could be represented with simple “if-then” relations instead of complex mathematical models.
In this thesis, we made some improvements over the past FLC. For the membership function generation, a simple hardware has been designed to quickly generate either triangle-shaped or trapezoid-shaped membership functions. By inferring the active rules only, we designed an efficient fuzzy inference unit to implement the inference process in parallel and quickly. In the defuzzifier, the calculation of center of gravity (COG) has been simplified to speedup the defuzzifier.. Compared with previous designs, our defuzzifier can implement the COG (Center of Gravity) defuzzification faster and more efficient.
Finally, the hardware architecture is implemented with an Altera Stratix EP1S10F780C6ES chip. An SOPC fuzzy temperature control system is built by the analog to digital circuit and the motor circuit to verify the performance of our FLC.
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