amplitude. The conversion involves quantization of the input, so it necessarily introduces a small amount of error. Instead of doing a single conversion, an ADC often performs the conversions ("samples" the input) periodically. The result is a sequence of digital values that have been converted from a continuous-time and continuous-amplitude analog signal to a discrete-time and discrete-amplitude digital signal.

5.1 Proposed System Advantages

- Speed is high compared with processor design.
- Digital PID controller implemented in FPGA technology is a configurable controller in terms of latency.
- High bit width controllers in FPGA technology.
- Latency of the controller.
- Reuse arithmetic elements such as multiplier and adders.
- Adaptive algorithm to improve the flexibility hardware system.
- Accuracy, power, compactness, and cost improvement over processor based implementation techniques.

5.2 Applications

- Industrial automation applications.
- Temperature controlling cambers.
- Servomotor controlling.
- Power electronics converter controller.
- Robotic controller.
- Motion controller.
- Voltage Regulator controller.
- Fan speed controller.

6. Conclusion

This paper presents a digital PID controller for speed control applications using FPGA. Here, a digital PID controller is successfully implemented using the FPGA and its performance is verified and tested on a DC fan speed control for real-time control. The test results showed that with PID controller added, the error is eliminated and the desired output speed is obtained. The implementation of controller has reduced the total hardware complexity and cost. In brief, the role of FPGA, in measurement and control point of view, is to acquire the data from analog to digital converter, do the processing on the acquired data and then generate control signals, which intern controls the parameter being measured. FPGAs ensure ease of design, lower development costs, more product revenue, and the opportunity to speed products to market. Building PID controllers on FPGAs improves speed, accuracy, power-efficient, compactness and cost effectiveness over other digital implementation techniques.

7. Future Enhancement

The process developed in this project is working satisfactorily. In this project single channel PMOD AD1 (analog to digital converter) is used. In future work multichannel analog to digital converters can also be used. In my project work, digital controller is developed to control the speed of a dc fan. So in future work we can plan to investigate implementation of fuzzy logic controllers on FPGAs instead of digital controllers. Same setup can be extended by using DA (Distributed Arithmetic) based system.

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