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FPGA Based Data Smoother for Sensor Data [1]

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The primary output of any experiment in which significant information is to be extracted is information which measures the phenomenon under observation. Indistinguishable from this information are random errors which, regardless of their source, are usually described as noise. Of importance to the experimenter is the removal of as much of this noise as possible without, at the same time, overly degrading the underlying information. In this experimental work, the information from vibration sensor is obtained in the form of four-column table of numbers. This paper is concerned with computational method for the removal of the random noise from such information as well as implementation of this method in HDLs (Hardware Description Languages) and run the algorithm on an FPGA (field programmable gate array). In this project, random noise from vibration sensor?s data is removed using the smoothing algorithm, which is called moving average. This algorithm is implemented inside an average block using VHDL and Verilog languages. The average block is using binary fixed point math library (fixed point addition and fixed point division) as well as Finite State Machine (FSM) and this is ran through the pipeline on an FPGA board. Finally, we show the outcome of smoothing data from the vibration sensor and what was the influence of the implemented smoothing method using graphs, histograms and simulation results. Keywords: FPGA, smoothing data, VHDL, Verilog, average block, fixed point addition, fixed point division, sensor data.

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