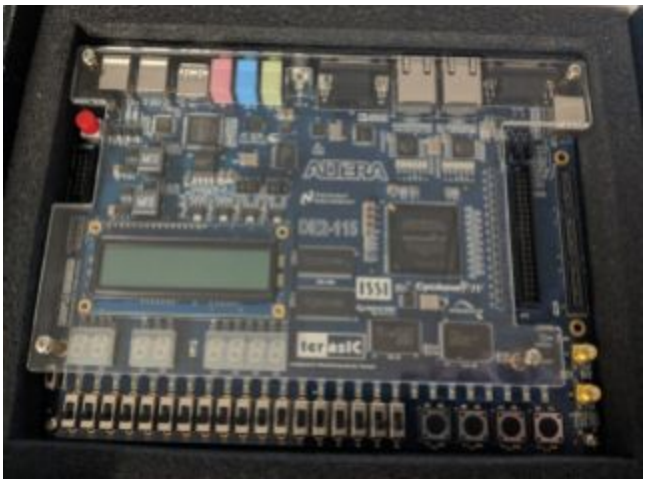
Configurable In-line Graphics Processing using an FPGA



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Abstract:

A variety of graphics processing algorithms are currently available for use. Many modern graphics processing algorithms involve full-frame analysis and computation. Full-frame analysis means that the display system must cache an entire frame of pixels and perform high-overhead computations prior to displaying these frames to the display output. This results in an immense amount of delay between the frame being sent to the screen and the frame actually being displayed. While unnoticable by most consumers, this lag has a significant impact on certain niche groups who desire high-quality graphics at high frame refresh rates and minimal lag.

The objective of this project is to create a video processing device that is fast, cheap, and efficient. Our FPGA-based product will be able to perform anti-aliasing, dithering, and real-time sensor-based graphics adjustments, and watermark overlay at rates that are not provided by current graphics-processing technology. We implement Laplace edge detection in order to smooth out harsh lines one pixel at a time. By adding adjustment knobs to tune each parameter, our device allows for the user to make rapid adjustments and gain an intuitive feel for how the image adjustments interact with each other.

The primary goal for this project is affordability. By working under tight budget constraints, the end product will more accessible to interested parties than any existing alternatives. The versatility of this device make additional high-end hardware unnecessary. Novel applications of this device that were not previously economically viable can be explored in the future.