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(57) Abstract :

[045] The present invention provides a high-speed, FPGA-accelerated system and method for real-time adaptive video processing capable of dynamically reconfiguring hardware modules during active video streaming. The system comprises a video input interface, an FPGA fabric with static and dynamic partial reconfiguration regions, an Adaptive Processing Selector utilizing machine-learning techniques, a high-speed memory management architecture, and a parallel video-processing pipeline. The method involves analyzing frame metadata, selecting optimal processing modules, dynamically reconfiguring FPGA regions without interrupting frame flow, and outputting processed video with deterministic low latency. The invention enables scalable, energy-efficient, and intelligent video processing suitable for high-resolution, high-frame-rate applications such as surveillance, autonomous vehicles, industrial automation, and advanced imaging analytics. Accompanied Drawing [FIGS. 1-2]

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