

Case ID:M23-232P^

Published: 4/3/2024

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Dynamic Voltage Scaling of Image Sensors towards Low-Power IoT Vision

Image processing systems gather and convey information using image sensors enabling a variety of IoT and mobile applications. IoT systems utilize image sensors to perform a multitude of various tasks that are important in all aspects of life such as detecting wildfires in forests, lifesaving medical imaging and reality headsets that use body tracking. Current modern image sensors lack the task of efficiently using energy. Present visual computing systems regularly supply a fixed voltage to the sensor's analog circuitry regardless of the frame. This is inefficient because of the analog readout which consumes hundreds of milliwatts of power in its efforts of continuous visual tasks. There is a need for dynamic voltage scaling of image sensors as means to significantly reduce sensor power consumption.

Researchers at Arizona State University have developed a voltage controller and software to dynamically control voltage scaling for image sensors, capturing frames at varying fidelities for increased energy efficiency. This system introduces a simple voltage controller hardware interface that programmatically constructs desired sensor voltage in result of the request by diverse applications. Additionally, this system presents a software API enabling application developers to harmoniously specify voltage schedules through the vision applications on a frame-by-frame basis. While only slightly degrading the visual task accuracy, this system demonstrates up to 73% sensor power savings.

Related publication: [A Framework for Dynamic Voltage Scaling of Image Sensors Towards Low Power IoT Vision](#)

Potential Applications:

- Commercial SoCs
- AR/VR devices w/ image sensors
- IoT devices w/ image sensors (e.g., smartphones, tablets, wearables, etc.)

Benefits and Advantages:

- Performs by adapting the voltage of analog circuits versus current adaptations to the digital circuits for significant power savings
- Applied directly on any commercial off the shelf cameras without explicit changes to the sensor design
- Flexibly specify camera voltage

