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Energy Aware Memory Allocation Scheme for Hybrid FRAM-SRAM Microcontrollers used in Internet of Things (IoT) Devices

A hybrid Random Access Memory (RAM) model enhances performance by up to two times and reduces energy consumption by up to 20 percent in low-power IoT devices.

By 2020, the Internet of Things (IoT) is expected to be comprised of approximately 50 billion devices worldwide. With the use of internet connected devices growing exponentially, different sources of energy are being tested in order to keep the IoT's footprint on the environment as minimal as possible. Different energy harvesting sources are in development, ranging from motion-related charging for smartphones to solar energy for various internet connected appliances around the household. However, energy harvesting is still in its early stage, and so, can only sustain low power IoT devices. This lack of power lessens the computational powers of a device, severely limiting its use.

Researchers at Purdue University have developed a technology that utilizes two different forms of Random Access Memory (RAM) that increases performance and decreases energy usage simultaneously. By combining the efficient, unreliable Static Random Access Memory (SRAM) with the inefficient, reliable Ferroelectric Random Access Memory (FRAM), a new hybrid model was developed. This hybrid, combined with several built-in techniques to optimize the system, experimentally demonstrated a performance boost of up to two times and decreased energy usage of up to 20 percent over a high quality FRAM-based model. This could be used as a basis for improving performance in low power devices powered by energy harvesting sources.

Advantages:

-Demonstrated up to two times better performance

-Simultaneously showed up to 20 percent reduction in energy use

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-Avoids the negatives of the individual types of RAM

Potential Applications:

-Smartphones

-Computers

-Televisions

-Other household appliances

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Intellectual Property:

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Keywords: Hybrid Random Access Memory, SRAM, FRAM, energy usage reduction, performance boost, low power devices, Internet of Things, IoT, energy harvesting, computational powers