Energy Conservation On Realtime Embedded System Using Machine Learning

A unit of energy saved is equivalent to a unit of energy generated. Energy Conservation is one among top global issues that needs to addressed on priority. Embedded system with intelligent computing driven by recent advances in machine learning and cognitive algorithms coupled with process technology and new design methodologies, has the potential to usher unprecedented disruption in the way conventional real time system solutions are designed and deployed. These innovative approaches often provide an attractive and efficient alternative not only in terms of performance but also power, energy, and cost.

National resource Canada has introduced programs supporting to increase energy efficiency in home, transportation, alternative fuels and buildings. One way to accomplish energy conservation is by using real time operating systems (RTOS), thereby efficiently managing the energy consumption, Artificial intelligence and Machine Learning techniques can help embedded systems perform smarter, Machine learning methodologies improvise from their experience by analyzing their observations, updating models based on previous action and using those insights to make better decisions.

As per the research carried out earlier, we find that energy conservation strategies are focused in areas like automatic process control of lighting in production area, energy saving in data centers and EV's in automobile industries plays a crucial role. Additionally, Machine learning and embedded AI is being implemented at the architectural level. AI based ASIC's & SoC's designed to reduce the energy consumption and enhance the performance are already in production. Energy efficiency and high performance continue to be prime research objectives for processor designers. Additionally, energy can be minimized through Dynamic Voltage Frequency Scaling (DVFS), enabling on-the-fly optimization of frequency and voltage.

From my previous industry experience, I have observed products like Relays do not support installation of software remotely. Configuring and managing relays is tedious as the engineer must be physically present in field. We came up with a cloud-based solution (FOTA) for managing firmware binary updation for relays in customer base. This involves Linux and RTOS firmware binaries to be updated to the board based on the new release of firmware versions remotely. This system currently lacks intelligence of making observations and adjusting the models.

Control systems such as relays as a use case can be improvised by adding features of

collecting the environment response and apply predictive analysis and optimize the power requirements and features of Dynamic Voltage Frequency Scaling (DVFS), enabling on-the-fly. Remotely monitoring of energy meters and control systems can be improved that can results in energy conservation and enhanced performance in RTOS based environment.