

Title: Deep spike Neural Network for Fast Rendering in Global Illumination

Joseph Constantin
Research Laboratory in Networks, Computer Science and Security (LaRRIS)
Lebanese University, Campus Fanar, BP90656 Jdeidet, Lebanon.

Deep artificial neural networks have been very successful in accelerating global illumination algorithms. However, their implementations make them hungrier for energy. It is known that spiking neural networks are less efficient than Convolution Neural Networks when running on standard hardware. In fact, convolution neural networks are static, requiring only one forward pass through the network to compute the output, whereas spiking models are dynamic, requiring the input to be presented for a number of time steps and thus a number of forward passes. However, when we need to implement deep learning models on hardware that can take full advantage of the sparsity that spikes provide, spike neural networks can be more efficient than the equivalent convolution neural networks. The objective of this paper is to build a more biologically plausible network to assess noise quantity and to find a stopping criterion for fast realistic lighting in global illumination. The idea is to improve the learning performance by selecting the most pertinent features using deep learning spiking neural network in order to obtain high quality rendering. The experiments are conducted on global illumination scenes which contain diverse image distortions and large number of images with different noise levels. The proposed model is also compared with the human visual system thresholds. The results provided better performance, and advantages in terms of area efficiency due to the use of lesser number of neurons, increasingly biologically plausible network and ease of implementation in hardware.

Biography

Joseph Constantin received his Master's degree in Mathematical Modeling and Scientific Software Engineering from the Francophone University Agency in 1997. He earned his Ph.D. in Automatic and Robotic control from the Picardie Jules Verne University, France, in 2000. Between 2001 and 2019, he was a senior associate professor at the Lebanese University, Faculty of Sciences 2 and a researcher in the Applied Physics Laboratory of the Doctoral School of Sciences and Technology at the Lebanese University. Currently, he is a full professor at the Lebanese University, Faculty of Sciences and a researcher in the Research Laboratory in Networks, Computer Science and Security (LaRRIS). His current research interests are in the fields of clustering algorithms and traffic control, deep learning, kernel methods, computer graphics, image processing, robot dynamics and control, diagnosis systems, biomedical engineering.

Presenting author details

Full name: Pr. Joseph Constantin
Contact email: cjoseph@ul.edu.lb
Linked In account:
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