University of Rochester Department of Electrical and Computer Engineering Distinguished Speaker Colloquia

Accuracy-Aware Systems: Signal Processing and Control

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Wednesday, October 16th 11:00 AM – 12:00 PM Computer Studies Building (CSB) 209

Abstract: Computer scientists have traditionally striven for (and assumed) exact computation. However, when we deal with the physical world, it is worth questioning our assumptions about the degree of exactness required. We will discuss accuracy-awareness in two different contexts: image compression and control. We explored accuracy-aware techniques for image compression, based on subthreshold logic, in collaboration with Prof. Uckdcn"Owmjqrqfj{c{øu"itqwr0"Uwdvjtgujqnf"nqike"ku"qh"kpvgtguv"hqt"kvu"xgt{"nqv"gpgti{"qrgtcvkqp0"Yg" developed an improved theory for error analysis of subthreshold logic operation. We used this to develop a subthreshold logic module for the discrete cosine transform (DCT). However, our results showed that net energy gains in the DCT were offset by energy losses in the memory system due to poor compression. We developed alternative accuracy-aware algorithms based on quantization that avoid this problem. We explored the relationship between schedulability and stability in control systems in collaboration with Prof. Hwokp"\jcpiøu"itgwr0"Dgvj eqpvtgn"vjggt{"cpf"tgcn-time systems theory traditionally view the sample period as involate. However, most real-time scheduling algorithms do introduce jitter in the execution interval of tasks. Until recently, the relationship between the schedulability of tasks and the stability of the control system had not been explored. We used Lyapunov analysis to show that, for a class of simple control systems running under rate-monotonic analysis, the goals of stability and schedulability are, in fact, consistent.

Bio: Marilyn Wolf is Farmer Distinguished Chair and Georgia Research Alliance Eminient Scholar at the Georgia Institute of Technology. She received her BS, MS, and PhD in electrical engineering from Stanford University in 1980, 1981, and 1984, respectively.