High-level .NET Software Implementations of the Unum Type I and Posit Floating-Point Number Types with Simultaneous FPGA Implementation Using Hastlayer

Álmos Szabó[1], Zoltán Lehóczky[1], András Retzler[1], Richárd Tóth[1], Márk Bartha[1], Benedek Farkas[1], Krisztián Somogyi

[1] Lombiq Technologies Ltd., Budapest, Hungary

The unum arithmetic framework has been proposed by Gustafson, D. J. to address the shortcomings of the IEEE 754 Standard's floating-point. In this talk, we present how unums compare to IEEE floating-point and why they are beneficial for scientific use-cases, and we showcase our software and hardware implementations of Type I and posit unums.

The software implementation is built on the .NET platform as an open source library written in the C# programming language. We automatically create hardware implementations using our .NET to FPGA converter tool called Hastlayer.

The amount of hardware resources needed for addition operations are quantified, and the performance of software and prototype hardware for posits are compared. We show that posits are significantly more hardware friendly than Type I unums. Furthermore, our posit FPGA implementation is about 2.04 times more efficient per clock cycle than its software implementation.