High-level synthesis (HLS) is the driving force of design abstraction, offering an automated and seamless path from high-level behavioral specifications down to circuit-level implementations. Being now in its mature phase, a continuously growing community of IC designers have adopted HLS techniques to tackle design complexity and to meet tight time-to-market requirements. However, the rise of design abstraction exposes a large number of interdependent design decisions, making designers to reason on differing trade-offs among the set of design parameters. Until recently, this quest for optimal designs silently neglected trade-offs produced from the combined impact of behavioral-level together with architectural-level parameters. In this talk, it is shown that this semantic separation of the design parameters fragments the solution space, negatively affecting designs’ efficiency and optimization potential. Explorative Synthesis framework is introduced, i.e. a set of scalable design space exploration techniques for HLS that study an extended but defragmented instance of the HLS solution space in a practical manner, thus enabling a shift towards higher quality design solutions. Current extensions of the framework are presented, utilizing advanced machine learning techniques that actually predict the behavior of the HLS engine, thus preserving the generation of the high quality designs without resorting to many costly architectural synthesis evaluations. The talk concludes showing results from recent research studies that prove the effectiveness of adopting Explorative Synthesis in the emerging Many- and Approximate-accelerator design paradigms.
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