

PERFORMANCE-PORTABLE STENCIL CODE GENERATION WITH LIFT

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ABSTRACT

STENCIL COMPUTATIONS ARE USED IN A WIDE RANGE OF APPLICATIONS FROM PHYSICAL SIMULATIONS TO MACHINE-LEARNING. OPTIMIZING AND TUNING THEM FOR PARALLEL HARDWARE REMAINS CHALLENGING.

LIFT IS A NEW APPROACH TO ACHIEVING PERFORMANCE PORTABILITY BASED ON A SMALL SET OF REUSABLE PARALLEL PRIMITIVES. ITS KEY NOVELTY IS ENCODING OF OPTIMIZATION AS A SYSTEM OF REWRITE RULES WHICH ARE USED TO EXPLORE THE OPTIMIZATION SPACE.

WE EXTEND LIFT WITH SUPPORT FOR STENCIL COMPUTATIONS BY ADDING A SMALL NUMBER OF PRIMITIVES TOGETHER WITH A FEW REWRITE RULES TO ACHIEVE PERFORMANCE PORTABILITY FOR STENCIL COMPUTATIONS. PERFORMANCE RESULTS ON SEVERAL APPLICATIONS SHOW THAT THIS APPROACH LEADS TO HIGH PERFORMANCE.

