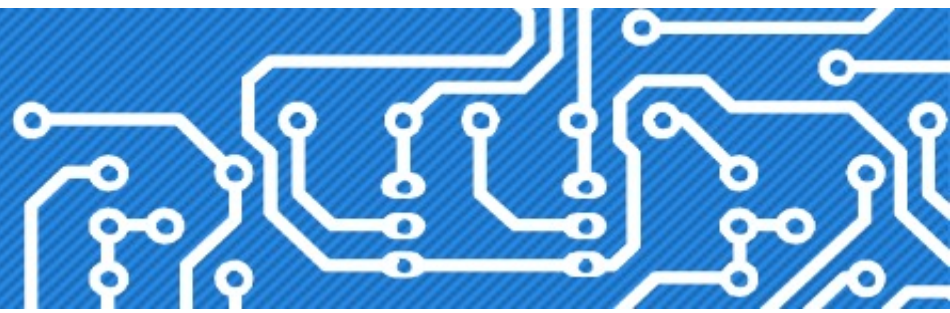




Global Placement Exploiting Soft 2D Regularity

Donghao Fang¹, Boyang Zhang², Hailiang Hu¹,
Wuxi Li³, Bo Yuan², Jiang Hu¹

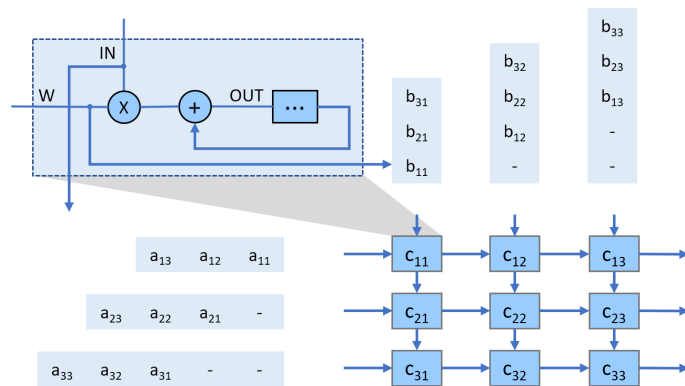
- ¹Texas A&M University, ²Rutgers University, ³Xilinx Inc

Systolic Array and 2D PE Array

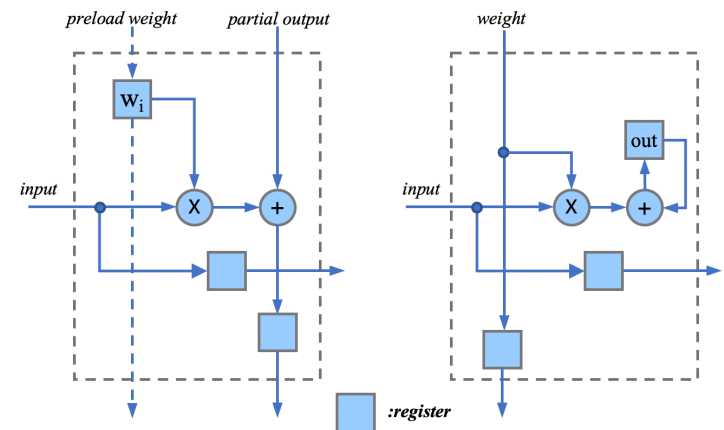
- Systolic Array applications:

- CNN computing
- Signal processing
- Communication circuits

- Consist of 2D PE array



Systolic array for matrix multiplication $C = A \times B$

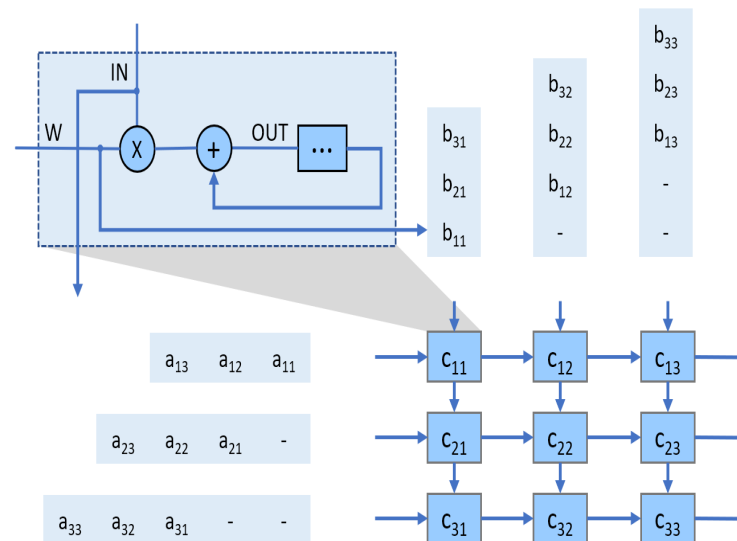


Weight-stationary(left) and output-stationary(right)



Problem Formulation

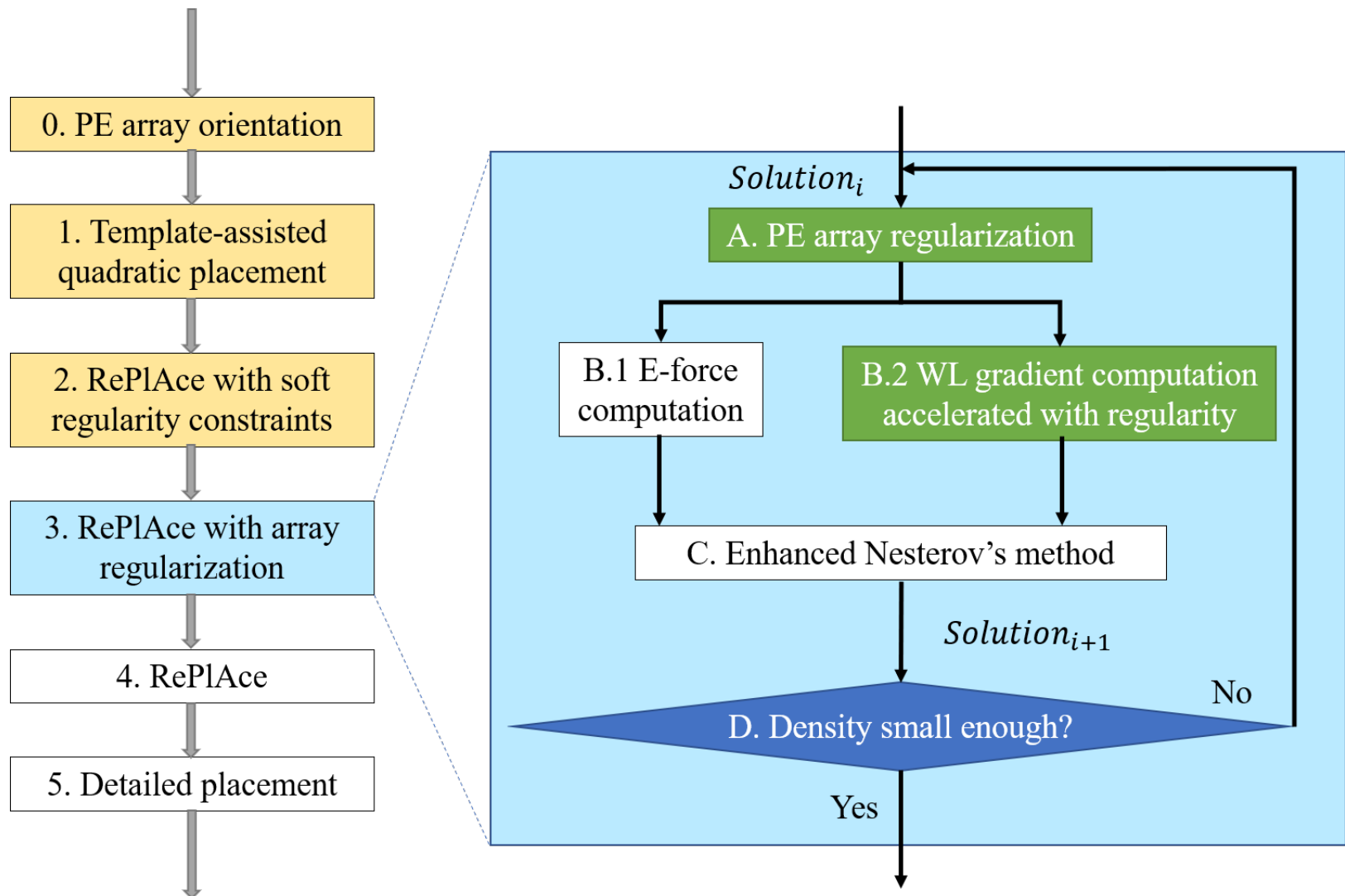
- Problem: Placement for circuit design with 2D PE array
- Objective: HPWL minimization
- Contribution: The first global placement technique exploiting regularity of 2D PE arrays



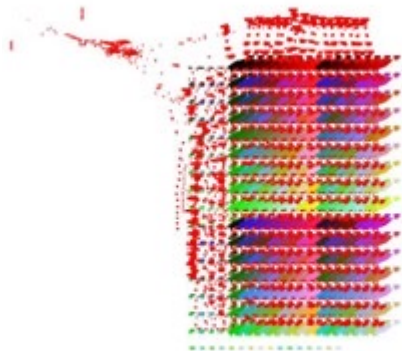
Systolic array with 2D processing
element(PE) array



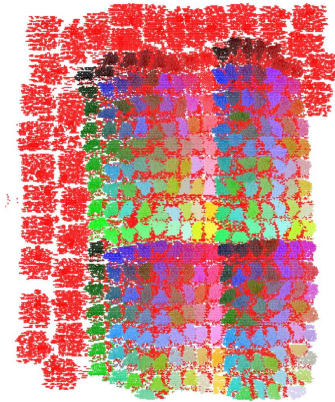
Overview of Regularity-aware Placement



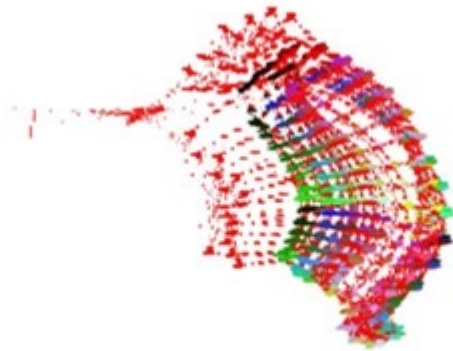
Placement Illustration



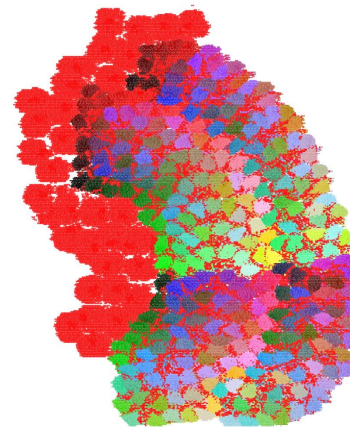
(a)Our flow 200 iteration



(b)Our flow detailed placement



(c)RePIAce 200
iteration



(d)RePIAce detailed placement



Conclusion

- Considering the regularity of 2D PE arrays improves placement quality
- HPWL and routing WL are reduced 8.3% and 11.0% compared with RePlAce
- HPWL and routing WL are reduced 8.4% and 8.2% compared with structrue-aware placement



Thank you!