INCREMENTAL MULTIROW LEGALIZATION METHOD

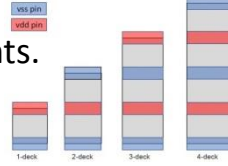Jorge Ferreira, Paulo F. Butzen, Ricardo Reis

PGMICRO - UFRGS

The complexity of the legalization in modern circuit designs is not only about the high number of standard cells. To meet various design requirements like:

- Multi-deck cells occupying multi-rows and additional power-rail constraints.

- Cell legalization has become difficult because complicated design rules, and constraints need to be addressed, such as **fence region** constraints.

- Global placement solution can put cells outside of the fence region or/and the circuit's cells in the fence regions.
- Despite the density, ranging from 5 to 95%, some fence regions have a high-density of cells in a specific area, shown in purple in the figure below.
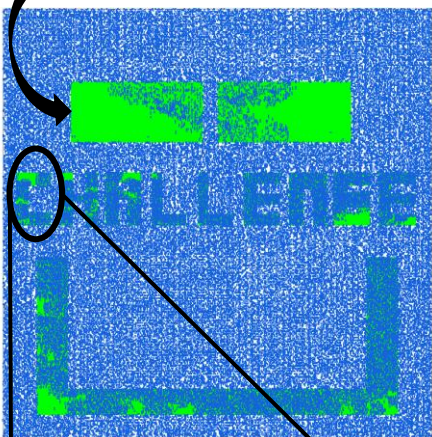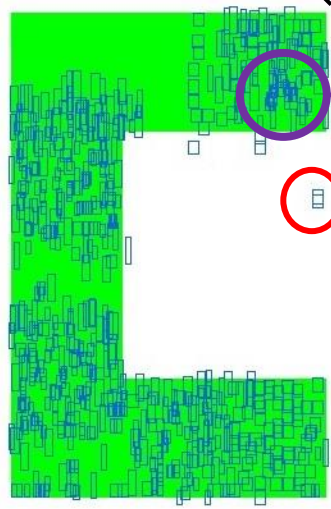
Pseudocode:

Split the circuit into regions composed of segments and cells;
For each of the regions of the circuit
While as there are violated cells
While as cells exist outside the region
Legalize cell outside the region;
Update segments of the region;
Identify the block of cells with higher overlaps;
Legalize this block of cells;

Preminaries results:
The table below shows characteristics of some circuits from benchmarks of the ICCAD'17 contest.

Conclusion:
As a result, we want to present a legalized placement with fast runtime, without unnecessary movements, and minimal displacement.

Circuit	Total cells	Multi cells	Fixed cells	Fence Region			
				Nº	Multi cells	Higher occupancy	Lower occupancy
des_perf_a	108292	4699	4	4	4699	75.9%	18.9%
des_perf_b	112644	5862	0	12	5862	95.3%	10%
edit_dist	127419	12353	6	1	344	9.7%	9.7%
fft_a	30631	3200	6	0	0	0	0
pci_bridge32_a	29521	4282	4	3	2289	32.1%	7.5%
pci_bridge32_b	28920	1468	6	6	3	62%	5.5%