Routability-Driven Detailed Placement Using Reinforcement Learning

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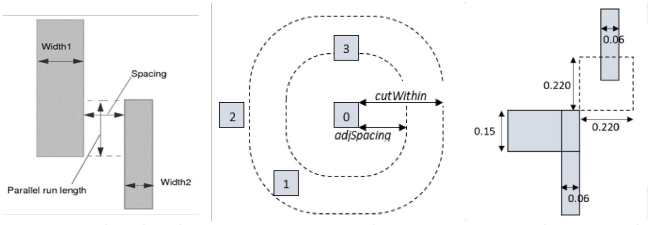
Sub- 90nm Technology: Complex DRC rules

Imply in more DRC violations

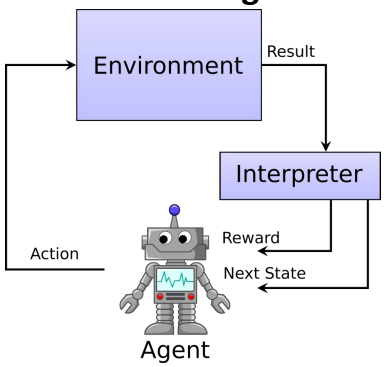


Detailed Placement is the most indicated step to address those challenges [1].

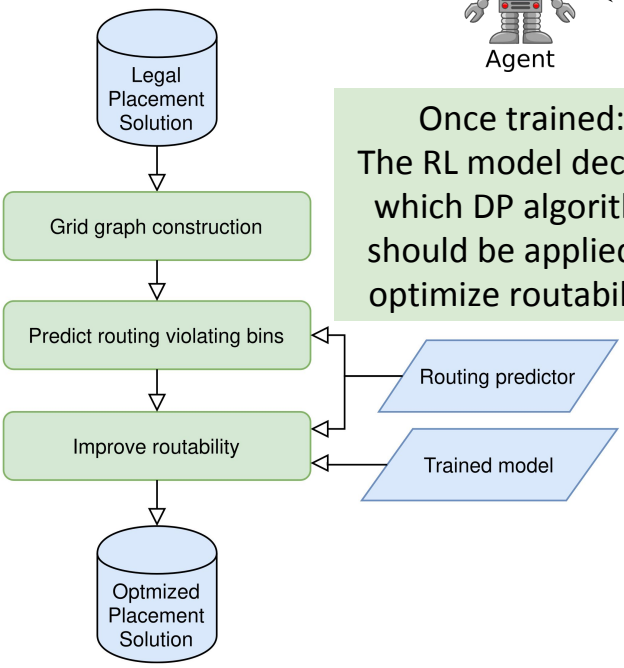
Advantages of **Reinforcement Learning**:

-Training data is generated on the fly.

-Agent learns creative solutions.

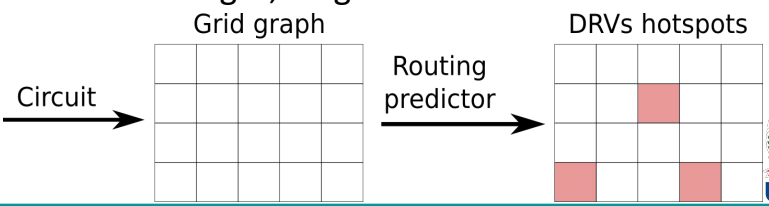


Once trained:
The RL model decides which DP algorithm should be applied to optimize routability.



Routing predictor [2]: Sup. Learning NN

Training features: pin and cell density, macros, width and height, neighbor node features.

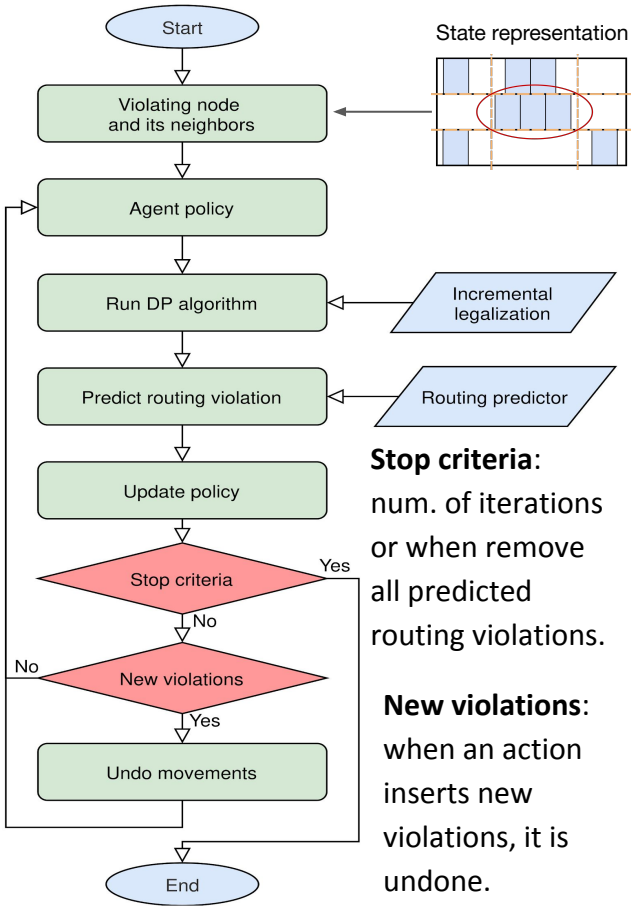


Goal

A reinforcement learning framework to improve circuit routability in detailed placement step.

State: part of the grid graph where the center is the predicted node.

Reward: wirelength change and signal is determined by legalization and the routing predictor.



Stop criteria: num. of iterations or when remove all predicted routing violations.

New violations: when an action inserts new violations, it is undone.

Integrate the routing predictor with Detailed Placement algorithms to start the training.

Decide which RL learning policy is suitable for the problem.

References:

[1] Lin, Y et. al. Detailed placement in advanced technology nodes: a survey. ICSICT' 16.
[2] A. Tabrizi et. al. A machine learning framework to identify detailed routing short violations from a placed netlist. DAC' 18.
[3] Liu, et. al. Initial detailed routing contest and benchmark with advanced routing rules. ISPD' 19.
[4] Murray, et. al. Adaptive fpga placement optimization via reinforcement learning. MLCAD' 19