OBSTACLE-AWARE ROUTING PROBLEM IN A RECTANGULAR MESH NETWORK

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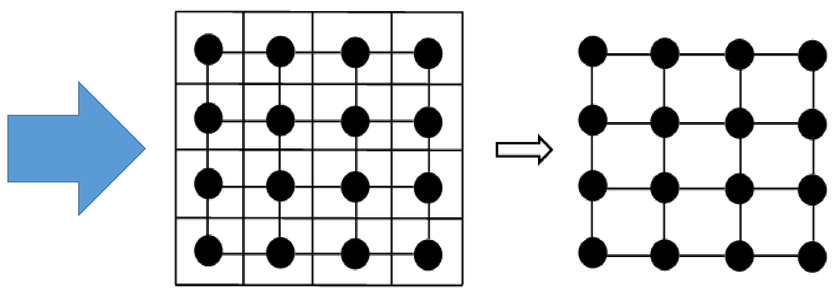
RESEARCH PROBLEM OVERVIEW

Definition: Routing in a VLSI design is the process of determining and prescribing paths between various electronic components in order to establish the connection between a given source node and its target.

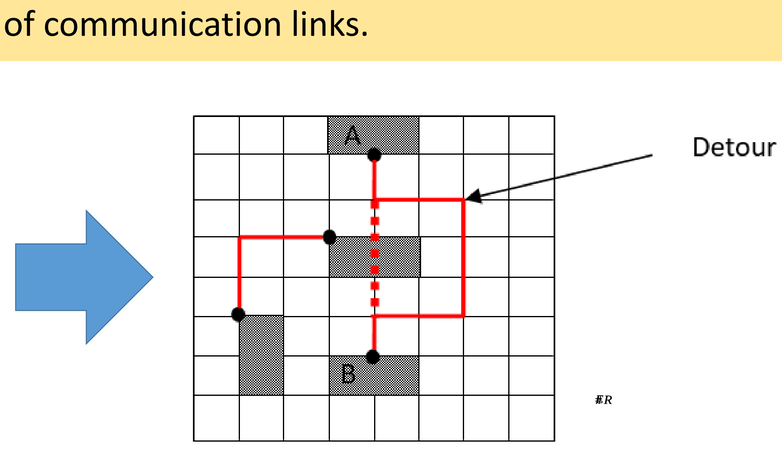
Tessellated into rectangular array.



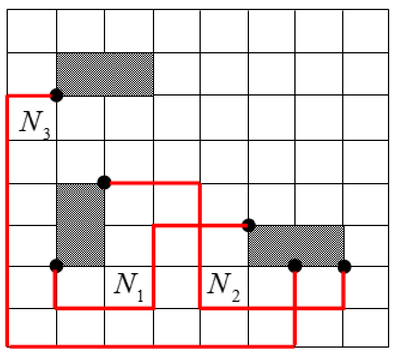
Objective: To maximize no of routed nets (*pair of source-target pins*) while having the minimum energy inside the routing region.

Motivation: Many routing methods that deploy shortest path strategy reported in the literature without considering the placement of obstacles. The presence of obstacles complicates the routing process as its limits the number of communication links.

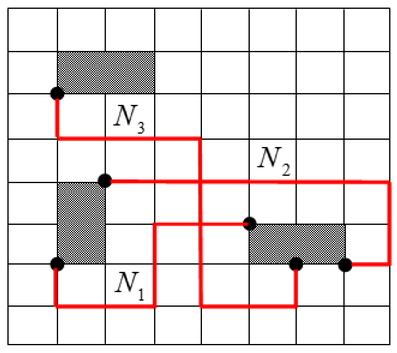
Route for certain net might take longer or sometimes impossible to complete.



Net Ordering Problem: Net ordering problem plays an important role in producing high quality routing.



N1, N2, N3. E=31



N3, N1, N2. E=27

ROUTING METHODS

Shortest Path Tool

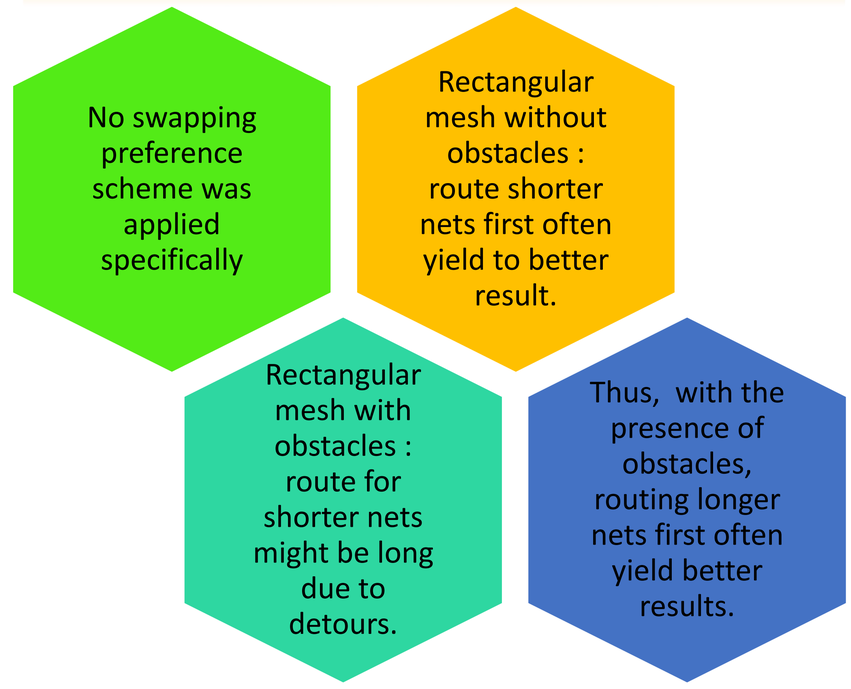
- Dijkstra's Method

Rip up & Re route

- Simulated Annealing Method
- Worst result will not be rejected directly.
- It will be consider under Boltzmann Probability Function

$$P(\Delta E) = e^{\frac{-\Delta E}{T_i}}$$

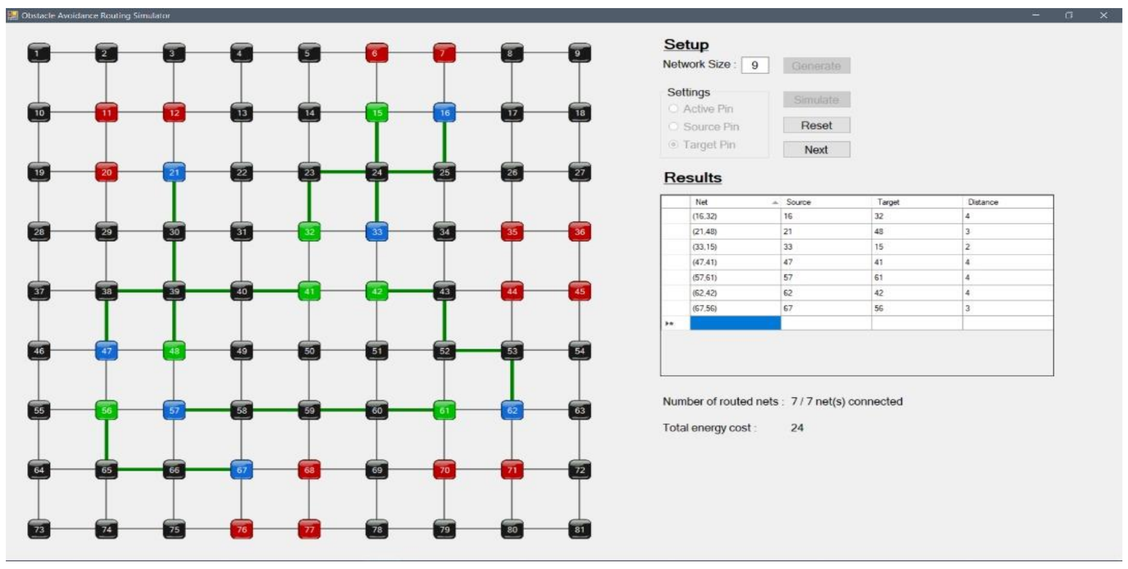
RESULTS & CONCLUSION



Net. Size	#Nets	Obs.	SA		GM	
			$\#R$	$\#E$	$\#R$	$\#E$
7x7	5	14/84	4	28	4	28
9x9	7	21/144	6	61	6	61
11x11	9	28/220	8	94	8	94
12x12	4	14/264	4	44	4	44
	6	21/264	6	65	6	65
	8	28/264	8	90	8	90
	10	35/264	9	105	9	107

*__Net.__=Network, __Obs.__=Obstacles

The GUI interface developed using Microsoft Visual C#. User can define the placement of obstacles, source pins and target pins.



In conclusion, it was shown that our proposed method able to provide good results with the presence of obstacles. The proposed algorithm can be applied and extended to any sequential routing problem.

RELATED PUBLICATIONS

[1] Adzhar N and Salleh S 2014 *MESH ROUTING: Maximing number of connections using heuristic method. Proc. International Conference on the Analysis & Mathematical Applications in Engineering & Science* p 161
[2] Adzhar N and Salleh S 2014 *Simulated Annealing Technique For Routing In A Rectangular Mesh Network. Modelling and Simulation in Engineering*
[3] Adzhar N and Salleh S 2015 *Obstacle-Aware Routing Problem In A Rectangular Mesh Network. Applied Mathematical Sciences* **9** 14

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