Project Title:	VLSI Signal delay analysis and minimization
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Abstract:
A new perturbation method, called Hierarchical-Congregated Ant System (H-CAS) has been proposed to perform the variable-order bottom-up placement for VLSI. H-CAS exploits the concept of ant colonies, where each ant will generate the perturbation based on differences in dimensions of the VLSI blocks. In this project, it is mathematically proved that area-based two-dimensional cost function can be reduced to difference-based one dimensional cost function which avoids local optima. Lack of global view is a major drawback in conventional bottom-up hierarchy, and hence, ants in the H-CAS are made to introduce global information at every level of bottom-up hierarchy. New relative whitespace for bottom-up hierarchy is derived mathematically and the H-CAS embeds it into its unique update formula. A variable-order bottom-up hierarchical technique is proposed which adopts the meta-heuristics H-CAS. H-CAS is introduced as a technique which will store the memory of the bottom-up clustering information and behave as the global view of the clustering information at every earlier stage of clustering. Also, the result of H-CAS bottom-up clustering will converge to the optimal solution in a short period of time compared to the available robust models.

H-CAS has the unique pheromone update algorithm and congregation properties which are adopted to improve the optimal search by reducing the complexities involved. Meanwhile, the area-based two-dimensional cost metric is reduced to difference-based one dimensional cost metric. The reduced cost metric is proven to show the avoidance of local optima while the original 2D cost metric might have trapped into local optima. The ants in H-CAS are able to communicate with each other leading to reduction in subsequent search space and complexity. The H-CAS gives better optimal solutions and yields low standard deviations. The results expected out of H-CAS will be a high performance placer irrespective of scaling, convergence, stability, and reliability.