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Research Statement

In computer science, algorithmic efficiency is a property of an algorithm which relates to the amount of computational resources used by the algorithm. An algorithm must be analysed to determine its resource usage. Algorithmic efficiency can be thought of as analogous to engineering productivity for a repeating or continuous process. For maximum efficiency we wish to minimize resource usage. However, the various resources (e.g. time, space) cannot be compared directly, so which of two algorithms is considered to be more efficient often depends on which measure of efficiency is considered the most important, e.g. the requirement for high speed, minimum memory usage or some other measures of performance.

My Ph.D. thesis entitled “*Efficient Randomized Algorithms for Graph Theoretic Applications*” under the supervision of Prof. Deepak Garg, Computer Science and Engineering Department, Thapar University was in the domain of Algorithm Design. My work was focused on the formation of randomized algorithm to find Hamiltonian circuit in rectangular grid graph. We had presented a randomized algorithm to find Hamiltonian circuit in rectangular grid graphs with vertical size m and horizontal size n . The algorithm, first finds all the restricted edges in linear time and then, constructs a Hamiltonian circuit by joining the sub-graphs. Algorithm uses random selection to construct the Hamiltonian cycle. My Ph.D. thesis resolved various issues related to the graph theory which is core area of computer science. Apart from this, I also worked on Load Balancing in Distributed Networks where the focus was on load balancing for processor-to-dispatcher (secondary load balancing). In Join-Idle Queue (JIQ) approach, a processor joins the queue on either random or sampled basis. In both the cases, I-Queue of any dispatcher may remain empty. Our approach uses a dequeue so that as soon as the processor finishes the current task and turns to be in the idle state, it should tie up the dispatcher whose I-Queue is empty.

As a part of my research activities, I shall also be focussing on following points to be achieved:

- Workshops/Seminars: With reference to my research work, which is in core algorithms, I will conduct workshops and seminars on designing & analyzing algorithms for U.G., P.G., and Ph.D. students. This will enhance their knowledge and will prove useful in their ongoing courses as well as from research aspects.
- Collaborative Publications: Collaboration with my area experts for publications where focus is on SCI/SCIE indexed journals which will promote our department to outshine in this competitive & ever changing research world.
- Project Support and Writing: I shall also engage in research projects and also collaborate with faculties for writing new project proposals.

The next five years are very crucial for my academics as well as research. As a part of my research, following are the points which I shall be focusing on:

- Setting up a research lab or work with the existing lab with some additions.
- Enrolling B.E., M.E./M.S. and Ph.D. competent students for product-based research.
- Research publications in the upcoming areas of computer science.
- Actively engage to get funding from public as well as private sectors.

- Focus will be on Domestic as well as international Patents.

Sincerely yours,

Kuldeep Sharma