Paper Review for "Brief Announcement: A Greedy 2 Approximation for the Active Time Problem"

Summary:

In the given paper titled "Brief Announcement: A Greedy 2 Approximation for the Active Time Problem" the author proposed active time problem simple 2 approximation. In this problem, a set of pre-emptible jobs are given where each of them has a release time that is integral, a deadline and a required handling length. This paper proposed an algorithm where it minimizes the time it takes for a machine with the capability of *g* distinct parallel job units per integral time slot to finish all the jobs. If the machine is processing at least one job at any given point of time, it is considered to be "active". Thus the name of this paper and the model proposed by the author says *Active Time.* The authors cite a few other research papers where similar problems have been investigated and solved. They especially mention one paper where Chang et. al. solved a problem with random integral job length with minimal active time is a 3 approximation. The same authors bettered this solution at 2 approximation through another more complicated approach using LP rounding. According to the authors claim, this is the best upper bound found till date for this exact problem. Which they have achieved through the algorithm presented in this paper.

The Greedy algorithm presented in this paper considers that all existing time slots are open at first and they are considered in an increasing order from left to right. The assignment of slots happens like this - at first the time slot in consideration is closed, then it is checked if an attainable schedule exists in the slots that are open. If it does not exist then the slot that was closed is opened and the whole process is tried again. If it does exist then the slot is kept closed and proceed to the next slot.

After explaining the main algorithm presented in this paper, the author then went on to prove it using the help of four Lemmas. These lemmas were proved first which eventually proved the correctness of the Greedy Algorithm presented.

Three Strengths:

- The biggest strength of this paper is the simplicity. The author has been able to prove that a simple greedy algorithm can achieve the best upper bound for active time problems. Previously this upper bound was achieved through a long and complicated process, which is visible in the research paper titled “LP rounding and combinatorial algorithms for minimizing active and busy time”.

- The assumptions are explained well and the lemmas were simple gradual steps towards the main theorem itself. Which in turn helped to understand the proof presented in this paper.

- As the algorithm presented minimizes the *active time* for a given machine, we should see an increase in the efficiency of power use and computation. As with the same amount of power and computational power we would be able to get more work done.

Three Weaknesses:

- This paper achieves the same upper bound that existed before. The author could not really get a better result out of their algorithm.

- The authors did not calculate the time and space complexity of this algorithm. Which casts a big doubt on its efficacy.

- As no benchmark testing is done in the presented research paper, we do not really know how well it will perform with an increasing number of inputs or any kinds of inputs.

Future Work:

Researchers can work on calculating the complexity of this algorithm as according to the author, it is yet to be calculated. Researchers can also work on finding a better upper bound than what this paper has achieved. The author suggested that a local search technique might help to do that.