CSC373: Lecture 5

Charging argument for EFT on JISP

The problem set again

Fixed order vs adaptive order greedy

Question 2 scheduling problem as a special case of JISP

Charging arguments revisited

- We will give (see notes on web page) a charging argument for the JISP problem showing that EFT is a 2-approximation algorithm; in fact, the charging argument show a stronger result than necessary, namely that there is a 2-1 mapping of OPT into EFT.
- We can also revisit the proof of the optimality of the EFT algorithm for ISP in terms of chordal graphs and a greedy algorithm that uses the perfect elimination ordering (PEO). Here we establish a 1-1 mapping by mapping any vertex in OPT onto the earliest (wrt the PEO) vertex in EFT.

Charging argument for greedy on chordal graphs using PEO

- Claim: proof is “cleaner” since geometry has been abstracted by the PEO. Same can be said for greedy colouring of chordal graphs using the reverse of a PEO and in doing showing that the clique # = chromatic #.
- However, we cannot abstract the geometry when considering the greedy algorithm for m machine (aka m-colourable) interval scheduling. For that problem we used the geometry in the best fit EFT algorithm in an essential way and in fact, there are classes of chordal graphs for which it is NP hard to compute the analogous m-colourable

Comments on the problem set

- Question 1 of the problem set discusses a greedy algorithm for graph colouring. It uses a breadth first search to determine the order of vertices being coloured. For arbitrary graphs, determining is a graph can be 3 coloured is NP hard.
- Question 2 discusses a scheduling problem related to the JISP problem as will be explained. We will first explain the notation.

Fixed order vs adaptive order greedy

- The algorithms for interval scheduling and colouring choose a (fixed) ordering of the input items (i.e. intervals) and then consider them in that order. The algorithm stated in question 2 of the problem set has a somewhat different structure than the algorithms for interval scheduling/colouring in that the order in which inputs (e.g. jobs) are considered is decided adaptively based on previous decisions.