COMP3121 21T2 Assignment 2 Q2

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Since there are N workers are looking for jobs, each with skill level of x_i, then workers can be sorted based on their skill levels by using merge sort, and stored into the array of $workerSkill[N]$. $workerSkill[1]$ represents the worker with lowest skill level, and $workerSkill[N]$ indicates the worker who has highest skill level. Similarly, entry-level jobs and senior jobs can be sorted in similar manner, and stored into array $entry[P]$ and $senior[Q]$ in ascending order based on their required skill level. Each merge sort will result the time complexity of $O(nlog(n))$, hence the sum of three merge sorts will lead to $O(NlogN + PlogP + QlogQ)$.

Eventually, workers can be assigned by comparing first worker who has lowest skill level in $workerSkill[N]$ with first job which has minimum skill requirement in $entry[P]$, if requirements are satisfied, then assign current worker into current entry job, and check next worker with next entry job in the array. Otherwise, compare the current worker with next entry job, because next worker will have higher skill level, then it is meaningless to compare next worker with current job which requires lower skill level than the current worker. When the entry job are all taken, start to assign the rest of the workers in $workerSkill[N]$ into senior jobs in the opposite manner, since senior job sets the minimum skill level, but entry job sets the maximum skill level. Hence, start with the workers who have not been assigned in $workerSkill[N]$, assign the current worker into current senior job if requirement is satisfied, and check next worker with next senior job in the array. Otherwise, compare the next worker with current senior job, because next worker who has higher skill level will have higher chance to pass the requirement.

At the end, the number of assigned workers are the maximum number of workers can be assigned to jobs, the overall assignment took in time $O(NlogN + PlogP + QlogQ)$ since merging process cost $O(nlogn)$ and assigning process uses $O(n)$, which satisfied the requirement given by the question.