What is the FRCPSP?

- A Project scheduling problem (PSP) is an optimization problem where the goal is to minimize the total duration (makespan) of a project consisting of a set of activities with resource & time requirements.
- When a PSP is Resource constrained (RCPSP), this means that there are limits imposed upon the number of resources available at a given time.
- In a RCPSP, the resource allocation for each activity is usually fixed. In a FRCPSP, the activities are given a work content which can be fulfilled flexibly.

Precedence constraints (PCs)

- A positive PC is the minimum lag between the start of a predecessor & the start of a successor.
- A negative PC is the maximum lead between the start of a predecessor & the start of a successor.

The greedy serial generation scheme (SGS)

- The SGS is the heart of the heuristic algorithm we use to solve the FRCPSP. We input lists of activities known as activity list representations (ALRs) & the SGS attempts to build a schedule of activities step-by-step.
- A greedy SGS schedules each activity at its earliest possible precedence- & resource-feasible start time & allocates the maximum number of available resources to the activity.

Flaws of the greedy SGS

- In some projects, time constraints will require that certain activities need to be started whilst their predecessor is ongoing. Unless both activities can use their maximum resource the greedy SGS will not allow this.
- Always schedules activities as soon as possible leading to activities being stuck in gaps between other activities and not able to meet constraints.

The new SGS (greedy SGS with flaws corrected)

- The average makespan of the old SGS is 35.74 and for the new SGS it is 35.65.

Conclusion & Future aims

- For certain projects (The three projects in the third column of the table), the SGS will only produce a successful schedule for a very specific ALR which is often not tested. The algorithm needs to be improved so it can recognise these situations and find the correct ALR quickly.
- Testing larger projects and data-sets to demonstrate that the new algorithm is watertight.
- Testing with real-life data e.g. from Sellafield Ltd.

References

- https://www.lancaster.ac.uk/stor-i/internships/interns/j.trainer@lancaster.ac.uk