Benchmarking and Comparison of Software Project Human Resource Allocation Optimization Approaches

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Problem Statement:
Successful resource allocation by Staffing and Scheduling the Software Projects (SSSP) is tremendously challenging as a variety of variables need to be considered, such as task dependencies and complexity, resources availability and competencies, and project time [1-4].

- Different optimization techniques specifically meta-heuristics have been used by diversity of SSSP approaches in various incarnations [3, 5, 6].
- These approaches tend to vary in the parameters they consider which means their accuracy, performance and applicability can vastly differ, making it difficult to select the most suitable approach for the problem.

Optimized SSSP Approaches Architecture

Data Input of Resources and Projects
- Productivity
- Skills
- Effort
- Task Dependencies

Resource Allocation Method
- Individually Assign
- Pareto Front
- Team Allocation

Objectives
- Minimize Time
- Minimize cost
- Minimize risks

SSSP Approaches

2. SSSP Classes:
Five SSSP approaches are used in this study that belong to two different classes - as can be seen in the table below. These approaches use meta-heuristics such as Genetic Algorithm (GA) and Simulated annealing (SA) to find near optimal solutions.

Application to Set of SSSP Approaches:
Five SSSP algorithms are used in this study that belong to two different classes - as can be seen in the table below. These approaches use meta-heuristics such as Genetic Algorithm (GA) and Simulated annealing (SA) to find near optimal solutions.

3. Comparison Metric and Overall Scoring Model:
The overall Scoring Model consisting of two formulas. The Accuracy (A) and Complexity (C) performance of an SSSP approach using the following equations:

\[ A = \frac{\text{Accuracy}}{\text{Complexity}} \]

\[ C = \frac{\text{Complexity}}{\text{Accuracy}} \]

Expected Contribution:
- Provide a validation dataset that has both resources and detailed project information for a range of SSSP challenges.
- Provide a systematic process and a set of performance measures that can compare SSSP approaches in various categories and supporting a range of optimisation criteria.
- Evaluate the performance of a set of SSSP approaches against well-defined performance measures that researchers can use to compare their own approaches to.
- A comparison of computational approaches and current industry standards.

Analysis Results:
The results of class one Dataset evaluation using three SSSP approaches presented in the following figure and table. The figure shows in graphical representation the data and the behaviour over multiple runs.

Research Agenda:
- Refinement of the benchmark dataset.
- Extend the set of implemented and evaluation SSSP approaches.
- Examine a mechanism that allows us to easily bridge the gap between SSSP approaches.
- Evaluate the SSSP benchmarking process suitability and relevance by means of empirical evaluation with industrial partners.

References:

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