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Project Review -1

CSE3001 - Software Engineering

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TITLE: Software project scheduling problem in the context of search-based software engineering

Introduction

Search Based Software Engineering (SBSE) is the name given to a body of work in which Search Based Optimisation is applied to Software Engineering. The aim of Search Based Software Engineering (SBSE) research is to move software engineering problems from human-based search to machine-based search, using a variety of techniques from the **metaheuristic search, operations research and evolutionary computation paradigms**.

Techniques & its Related Challenges

Software Engineering often considers problems that involve finding a suitable balance between competing and potentially conflicting goals. In Search Based Software Engineering, the term “search” is used to refer to the metaheuristic search-based optimisation techniques that are used. SBSE has been applied to testing design, requirements, project management and refactoring. It is efficient both quick to implement and fast in execution. Some of the methods and techniques used to perform SBSE are:

- Profiling via instrumentation in order to monitor certain parts of a program as it is executed.
- Obtaining an abstract syntax tree associated with the program, which can be automatically examined to gain insights into its structure.
- Application of program slicing relevant to SBSE include software maintenance, optimization and program analysis.
- Code coverage allows measuring how much of the code is executed with a given set of input data.
- Static program analysis
- Some of the common algorithms used for this purpose are:
 - a) Random Search
 - b) Hill Climbing
 - c) Simulated Annealing
 - d) Genetic Algorithm

Challenges:

- To find the algorithm that finds the global best search instead of local searches.
- To provide enough resources that the global searches are able to find the best global solutions.

Research Findings

According to our research we have found that at present the field of search-based software engineering is developing rapidly and has contributed the most efficient ways to solve the software project scheduling algorithms. This is because SBSE uses metaheuristic search techniques, such as genetic algorithm, simulated annealing and tabun search. We have also studied these algorithms and have discovered their properties and have also come across more advanced techniques which we are going to research upon in future.

Contributions

The algorithms used to perform SBSE were divided amongst the team members and we each studied a single algorithm properly as well as got some idea about other algorithms.

Theoretical Approach

Our main approach is to do a deep study of search-base software engineering (SBSE) along with various techniques, methods and algorithms used in it. We will also research and try to find more challenges faced in SBSE.

Base Paper and Reference Papers

- <http://www0.cs.ucl.ac.uk/staff/mharman/laser.pdf>
- <https://www.sciencedirect.com/science/article/abs/pii/S0164121219301086>
- https://www.researchgate.net/publication/228671024_Search_Based_Software_Engineering_A_Comprehensive_Analysis_and_Review_of_Trends_Techniques_and_Applications
- <https://dl.acm.org/doi/10.1145/3404555.3404588>
- https://www.researchgate.net/publication/325250941_A_survey_on_the_Software_Project_Scheduling_Problem
- <https://tarjomefa.com/wp-content/uploads/2018/04/187-English-TarjomeFa.pdf>