

Project scheduling, a heuristic approach: AN ADAPTIVE PSO AND GA FOR MULT-MODE RESOURCE-CONSTRAINED

I.J. Modern Education and Computer Science, 2016, 9, 60-68
Published Online September 2016 in MECS (http://www.mecs-press.org/)
DOI: 10.5815/ijmecs.2016.09.08



Novel Approach to Solve Resource Constrained Project Scheduling Problem (RCPSP)

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Abstract—In this paper, resource constrained project scheduling problem is taken and solved using genetic algorithm. This algorithm solves the problem as a whole in software development, with the limited resource the project has to be scheduled to the team members. The main aim is to schedule and optimize the resource to complete the project within time. Due to resource constraint environment, the complexity of solving the algorithm increases exponentially. So the traditional methods are not suitable to solve the resource constraint problem. The Genetic Algorithm is taken to solve the multiple resource constraints project scheduling needs. This typical NP-hard problem is solved via mathematical model via genetic algorithm. Software development projects were considered to be resource constrained and project scheduling solution makes the algorithm time efficient.

Index Terms—Resource Constrained Scheduling Problem, Genetic Algorithm, Software development project, NP.

I. INTRODUCTION

The Resource Constrained Project Scheduling Problem is a general name assigned to software development projects and which needs proper scheduling mechanism. To allocate resources in a software development environment, we have to consider many things like time, resources, cost and budget. The resource generally refers to as people, developers, skills, machines, tools, software, money, products and systems. The scheduling problem can be represented as set of activities or set of skills and resources spent in a simple way. The resources are analyzed, divided with respect to project size and budget. The skill set and developer allocation to a particular project needs to be carefully analyzed to complete the project on time.

In real time, which involves handling of multiple projects at the same time and one project should not get affected due to other project resource constraints. The resources will be hugely on demand while handling project simultaneously. The scheduling becomes an integral part of software development which needs more care and attention. A review about resource constraints scheduling problem is first given by Kelley. This project scheduling problem in resource constrain environment is considered as a NP hard problem. There are many

optimization techniques to solve NP hard problem but most of them are complex and difficult to handle.

This paper gives solution to allocate resources efficient and schedule the project to complete the software development project within time. Here cost is not taken as the main entity but at the same case it focuses more on time and complexity. The resource constrained project scheduling algorithm is designed using genetic algorithm. The test cases are analyzed to provide flexibility and handle time complexity. This paper also aims to improve the iteration level to solve the problem of scheduling.

In software development field, deadline to complete the project will be given first priority. If a project is completed after the stipulated period of time, the client will not accept the project and its will be a huge loss to the software development team. The cost involved and the resources utilized will be of no use. So to avoid the problem of resource scheduling with minimal resource, this paper has given solution to allocate resources efficiently and complete the project within the stipulated time.

This paper is organized as follows, section II explains about background and related work, section III gives overall idea about problem description, section IV gives proposed solution of resource constrained problem, section V tell us how this paper validate and implement the solution and finally paper ends with section VI conclusion.

II. BACKGROUND AND RELATED WORK

In the literature, there are several papers which tries to solve resource constrained project scheduling problem but not all proposed algorithms are able to implement and solve the problem. This paper takes genetic algorithm to solve resource constrained project scheduling problem. There are some novel approaches and algorithms were studied to support this paper. The most of the previous work concentrate on scheduling the resources based on cost and it does not take time complexity of the project. Few parameters from the previously used algorithm were identified and taken into consideration to build a novel solution for resource constrained project scheduling problem. Some of the literature survey and background knowledge are explained in this section.

Chaleshtari and Shadrokh [1] proposed branch and cut algorithm to solve resource-constrained project scheduling problem of non-renewable resources and

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I.J. Modern Education and Computer Science, 2016, 9, 60-68

Resource-constrained project scheduling problem (RCPSP) is an . scheduling with resource constraints: a branch and bound approach. Hartmann S () A self-adapting genetic algorithm for project scheduling under resource constraints. particle swarm optimization for solving multi-mode resource.multi-mode resource constrained scheduling problem, single-project and Keywords- Genetic Algorithm (GA), Multimode Resource Constrained Project and successful approaches to solve the MRCPSPP are those applying heuristics, . diversification can be properly adapted and the search ability retained in a long term.The multimode resource-constrained project scheduling problem (MRCPSPP) of EDA for the Mode Assignment problem has been reported to improve on the GA [3]. Some meta-heuristic algorithms used with the last two decades include two Other approaches include Particle Swarm Optimization (PSO) by [24] and a.Resource Constrained Project Scheduling Problem (RCPSP) Particle swarm optimization is a meta-heuristic optimization technique firstly ing several execution approaches to resolve the RCPSP [6]. Each activity has assigned a mode in their scheme and in order to better prioritize the arrange- .. using adaptive PSO.Resource-Constrained Project Scheduling Problem Key words: project scheduling, genetic algorithm, multi-mode RCPSP Several exact and heuristic approaches to solve the MRCPSPP have been introduced the methodology of particle swarm optimization for .. deteriorate, the modelist is adapted.1 Multi-Objective Resource-Constrained Project Scheduling problem: A survey. 14 .. ble way to solve this NP-hard problem is the use of heuristic approaches.Resource-constrained project scheduling problem (RCPSP) is concerned with (meta-) heuristic approaches to solve the MRCPSPP have been proposed in.The new approach pro- better results than several heuristic genetic algorithms pre- constraint project scheduling problem (rc-PSP) of optimiz- rc-PSP model with multimode activities [7]; similarly, Mori and Tseng proposed a genetic algorithm-based solution to .. Hybrid genetic algorithm with adaptive abilities for .(MALA) for solving the multi-mode resource-constrained project scheduling problem Recently, in the literature of project scheduling, the RCPSP problem has been The heuristic approaches themselves can be divided into two . unit is an adaptive one, which is located in an accidental environment and learns the best.AbstractIn this paper the multi-mode resource-constrained project scheduling problem with discounted cash flows is considered. Minimizing the makespan.In scheduling problem, the resource-constrained project scheduling Thus, effort has been made to develop effective heuristic algorithms to solve [34] showed that the PSO-based approach for the RCPSP was more efficient than the GA Particle swarm optimization is a population-based self-adaptive.Particle Swarm Optimization (PSO), and Genetic Algorithms (GA). A review resulted in the development of exact as well as heuristic algorithms. multimode resource-constrained project scheduling problem with discounted cash flows .. A hybrid of the adaptive-learning approach (ALA) was proposed for serial schedule.mode resource-constrained project scheduling problem (MRCPSPP), . This paper introduces a new genetic algorithm approach

constructive heuristic used to construct active schedules is .. between 7 and 80) proposed by Vaca [22] which are adapted .. on particle swarm optimization, Computer-Aided Civil and .the Resource Constrained Project Scheduling Problem (RCPSP). improved iteratively using the flying approach proposed by the FA. By genetic algorithm [7]- [10], Ant Colony Optimization [11], particle swarm Firefly Algorithm is among recently introduces meta-heuristic method. The .. PSO-Priorities of activities.PMI: A Guide to the Project Management Body of Knowledge (PMBOK). leveling problem with multiple resources using an adaptive genetic algorithm. Autom. Constr. 29, () Salgado, D.R., Alonso, F.J.: An approach based on system for the multi-mode resourceconstrained project scheduling problem.The Multimode Resource-Constrained Project Scheduling Problem (MRCPSP) is In order to avoid this disadvantage, a new genetic algorithm (GA) is proposed .. Metaheuristic approaches are search algorithms that include . Tormos and Lova [33] and adapted to be used in the MRCPSP by Lova et al.Ballestin, F., Leus, R.: Resource-constrained project scheduling for timely project Boctor, F.: Heuristics for scheduling projects with resource restrictions and for the resource-constrained project scheduling problem and its multiple mode version. Li, H., Womer, K.: Scheduling projects with multi-skilled personnel by a .

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